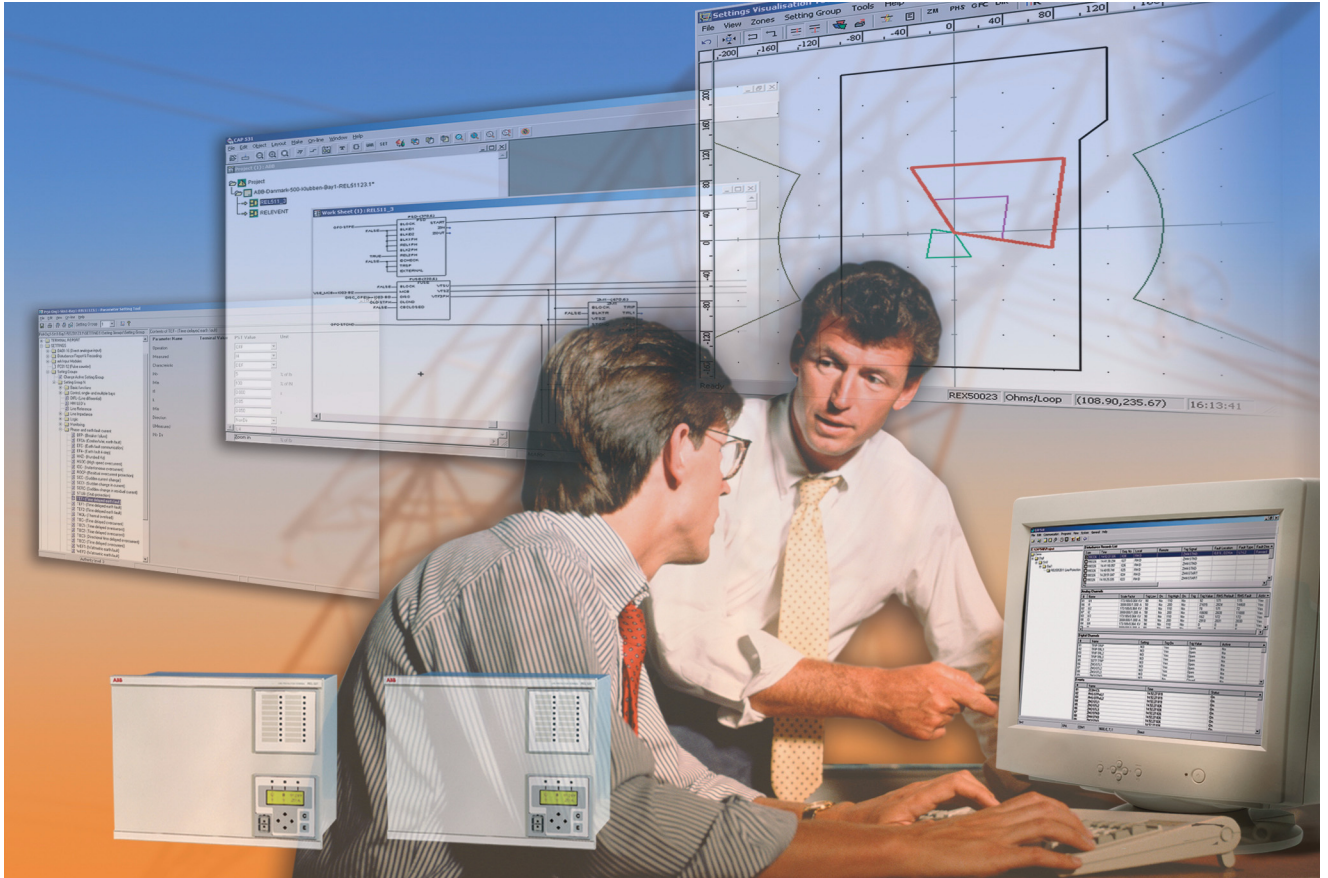


User's Manual

Engineer^{IT} Configuration and Programming tool CAP 531



ABB

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This is the user's manual for CAP 531*1.6

Document number: 1MRK 511 105-UEN

Revision: B

Issue date: February 2004

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As a result, it is possible that there may be some differences between the HW/SW product and this information product.

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1 Introduction

This chapter describes:

- The CAP 531 operating environment
- Documentation
- Symbols and conventions used in this document
- A brief overview of CAP 531 and related configuration products.

The **Configuration and Programming tool CAP 531** enables configuration management, programming, and error detection and correction for REx 5xx terminals.

1.1 Operating environment

CAP 531 runs under Microsoft® Windows, for window versions. See “Reference publications” on page 167. Reference [2]. So you must be familiar with this programs, which let you perform actions such as drag and drop, zoom, and scroll.

1.2 CAP 531 documentation

This User’s Manual describes CAP 531*1.6.

See also reference [1] for documentation on the Parameter Setting Tool.

See also reference [2] for documentation on CAP 540.

See “Reference publications” on page 167.

The CAP 531 documentation consists of these parts:



Part	Item	Description
Introduction		This chapter.
Instructions	Installation	Installation instruction.
Instructions	Help	Instructions of how to use the help function.
Instructions	Tutorial	Shows how to use CAP 531 with a mouse. Use this to learn how a project is run with CAP 531. The Tutorial goes through the normal procedures of a project.
Technical Description	General Project Tree Work Sheet Page Layout	Describes all parts of CAP 531. It contains the main topics in the context-sensitive help.
Customer feedback card		
Software registration form		
References		
Index		

There is also an on-line context-sensitive help in the program. Press <F1> from anywhere in CAP 531 to get detailed reference information about all of CAP 531.

1.3

Conventions used in this document

This document uses the following symbols:

Symbol	Indicates...
	Actions performed with the mouse.
	Actions performed with the keyboard.

This document uses the following conventions:

Convention	Indicates...
<ALT>	Press the Alt key.
<CTRL>	Press the Ctrl key.
<TAB>	Press the Tab key.
<ALT> + <F4>	Hold down the Alt key and press the F4 key.
<CTRL> + <C>	Hold down the Ctrl key and press the letter c.
<↓,←,→,↑>	Press one of the arrow keys.

Convention	Indicates...
< ENTER >	Press the Enter key.

All terminals that are supported by CAP 531 are referred to as REx 5xx in this User's Manual. REx 5xx can be considered as any of the 500-terminals that are supported by CAP 531.

1.4 Product overview

The ABB Automation Industrial IT concept for Substation Automation comprise a full range of protection and control terminals for protecting, controlling and monitoring all parts of electrical power transmission networks. The application and internal logic in these terminals are configured using the CAP 531 and the CAP/REx 5xx function libraries for the specific terminal types.

To work with the parameter settings for the protective functions in the terminals, the parameter setting tool (PST) and the corresponding PST/REx5xx library are used.

1.5 IEC 1131 programming

The IEC 1131 standard includes several graphical and textual programming languages. The CAP 531 function block diagram (FBD) is one of the IEC 1131 languages.

FBD is a graphical language. It is a widely used programming language used for creating complicated networks with functions or function blocks. Networks are created with lines that connect or duplicate information.

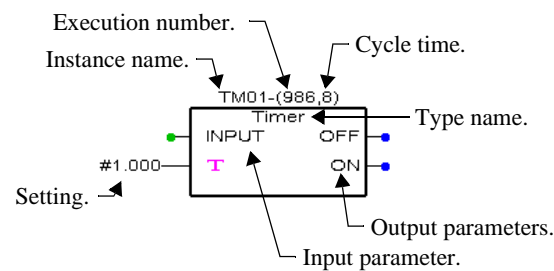


Fig. 1 Function block in the CAP 531 work sheet.

In CAP 531, all the functions available in a terminal are represented by function blocks. A function block includes input and output parameters, a type name and function block name. According to Fig. 1 above.

A function that is represented as a function block in CAP 531 can be one of the following:

- protection function
- control function
- monitoring function
- logic function

The instance name makes the function block unique. Cycle time is the time between executions (8 ms in Fig. 1).

Each function block has an execution number (986 in Fig. 1). The execution number tells you in which order the function blocks are executed.

Example:

Function blocks with cycle time 8 ms are executed in the terminal every 8 ms and execution number 986 is executed after execution number 985. All function blocks with this cycle time are executed within a period of 8 ms.

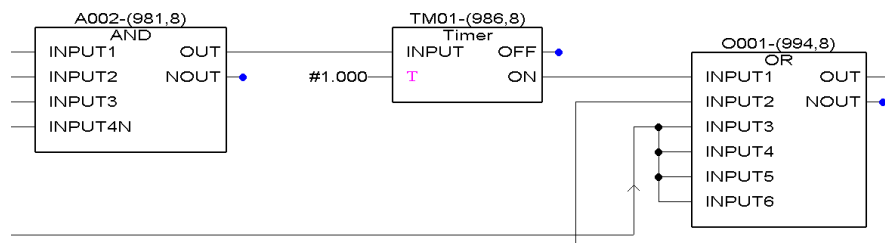


Fig. 2 Function block diagram.

Some settings are done in CAP 531. They are presented as inputs with magenta color.

In Fig. 2 the Timer function block has a setting of a delay time set to 1.000 seconds. A setting can be both numbers (as for a timer) or names.

Note!

Ensure that the function blocks in the configuration are executed consecutively to minimize delay.



Installation

This chapter describes:

- Pre-installation requirements
- The README file
- What is installed
- Installation of CAP 531.

1 Introduction

1.1 Pre-installation requirements

See reference [2] for requirements on PC and operative system, See “Reference publications” on page 167.

1.2 The ‘Readme’ file

CAP 531 comes with a ‘Readme’ file, including last-minute updates that were made after this document was printed. The file also includes important information about this version of CAP 531.

Read the ‘Readme’ file before you start CAP 531.

2 Installation of CAP 531

CAP 531 is part of the CAP 540 tool package installation. Reference [2]. See “Reference publications” on page 167.

The icons that will be added to the start menu in Programs\CAP 531 are:

- CAP 531 1.6 Help
- CAP 531 1.6 README.TXT
- SPA Emulator
- Terminate processes

Help

This chapter describes the help functions in CAP 531.

3

Using help

The CAP 531 context-sensitive help includes topics that cover all parts of the program. The items in the Help menu are:

Menu item	Select this command to...
Contents	Open the table of contents of the CAP 531 help.
Index	Open the index of the CAP 531 help.
Current Object	Provides help on a selected object.
Current Window	Provides help on the active window.
About CAP 531...	Specifies the CAP 531 version number, copyright information and user registration data.

If you want help regarding what you currently work with, you select current object in the help menu.

To get an overview of all topics, you can start the table of contents in Help. From the table of contents, you can select a topic.

4


Other help actions

When you are in help, you can select the menu bar, buttons, or the underlined words. The underlined words are hypertext jumps (links). Click on them to quickly go to other topics. You can also use the search button, which displays a dialog box that prompts you for search words.

5

Help on function blocks

It is possible to access help on the function blocks directly in the work sheet.

 To access help on function blocks:

- 1 Mark the function block in the work sheet.**
- 2 Double-click on the left or right mouse-button.**
- 3 Select help on FB type.**

Note!

The help text might not be available on all function block types.

Tutorial

This chapter instructs the user how some typical tasks are performed when working with CAP 531*1.6.

6

Introduction

This tutorial chapter will follow all the steps in a project, from setup of the project structure to the downloading, debug and final documentation.

This chapter will show how to work with CAP 531 using a mouse. It is also possible to operate CAP 531 from the keyboard.

The steps that will be gone through are:

- Insert work sheets or a template configuration
- Upload options
- Function selectors
- Work in the work sheets, make a configuration
- Variable, setting, text
- Copy, paste and save
- Compile
- Download
- Debug
- Compare configurations
- Page layout
- Print
- Exit from CAP 531.

7

Quick Guide for using CAP 531

The table below describes the work order when you use the program. For detailed information on each step, please see the referenced chapter. For a full understanding of the program, we recommend you to go through the entire tutorial chapter.

Step	To do...	Reference
1	Install CAP 531.	See "Installation of CAP 531" on page 17.
2	Start CAP 531.	See "Start CAP 531" on page 22.
3	Insert a work sheet or a template configuration in the selected terminal.	See "Insert a new work sheet" on page 24 and "Insert a terminal configuration template" on page 25.
4	Before downloading to a new terminal always run upload options, load uploaded data to the function selector and make update version.	See "Upload options" on page 27. See "Using function selectors" on page 32.
5	Use the Function Selector tool to select hardware and main functions in the terminal.	See "Using function selectors" on page 32
6	Open the work sheet.	See "Open the work sheet" on page 34
7	Insert function blocks and connect them.	See "Insert function blocks into work sheets" on page 35 and "Connect objects" on page 36.
8	Close the work sheet.	See "Exit from work sheets" on page 38.
9	Compile the configuration.	See "Compile and link work sheets" on page 49.
10	Run Upload Options before the first downloading to a terminal, if this has not been done earlier in the project.	See "Upload options" on page 27.
11	Download the configuration to the terminal.	See "Download terminal configurations" on page 55.
12	Debug the configuration.	See "Debug mode" on page 57.
13	Prepare the drawing form by the use of the Page Layout.	See "Start the page layout work" on page 61.
14	Print the configuration.	See "Print" on page 74.

8 Getting started

8.1 Start CAP 531

☞ To start CAP 531:

- 1 CAP 531 is started from within the CAP 540, reference [2]. See “Reference publications” on page 167.
- 2 The project will open automatically and prompt for password.

8.2 Create a project tree

You create a new project tree from within the CAP 540, Reference [2]. See “Reference publications” on page 167. Password for a new project is **<NEW>**.

A project tree in CAP 531 can only have the levels terminal and work sheets. In the work sheets you make the graphical configuration of the corresponding terminal.

The work sheets are added with ‘Insert’ in the Edit menu.

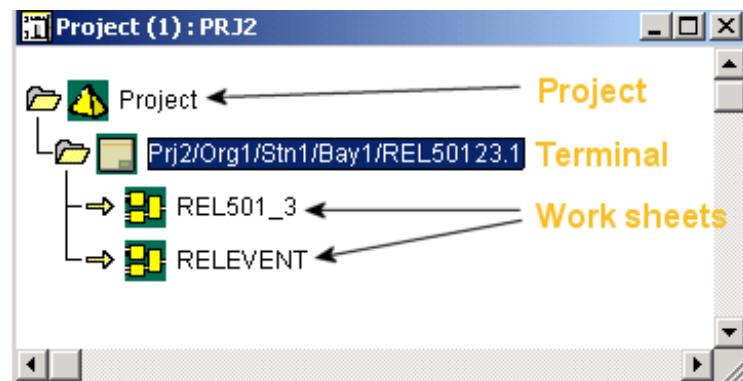


Fig. 1 Project tree.

8.3 Open a project

You can open a project that is already prepared. This is done from CAP 540 with the ‘Open Project’ command in the File menu. A password is required. This password is set by the creator of the project.

8.4 Import configurations from previous versions of CAP 531

You can copy earlier done terminal configurations into CAP 540, Reference [2]. See “Reference publications” on page 167 and See “How to move configurations from CAP 531*1.3 or CAP 535 to CAP 540” on page 96.



Note!

Only the terminal configuration from earlier versions of the CAP 531 tool can be imported. When you work with CAP 531, you always work in the same structure as CAP 540 uses.

8.5

Password handling

Password of a new project is always <NEW> with access right 1. This means that the person who creates a new project has the complete system rights to the entire project. The creator can set a number of different passwords with different access levels (higher numbers). See “Password handling” on page 95.

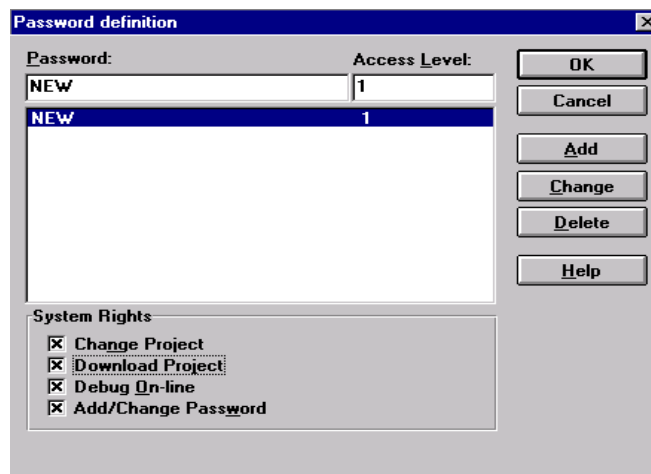


Fig. 2 Password definition.

9

Start configuration work

You can start the configuration work with one of the following:

- blank pages (new work sheet)
- an example/standard configuration (template)
- a saved and prepared work sheet

If you start the configuration work with blank work sheets, you start by inserting a work sheet ('Edit' - 'Insert').

If you start with an example or a standard configuration, you start by inserting a template configuration ('Edit' - 'Insert template').

If you start with a prepared work sheet, you start by inserting this work sheet ('Copy' / 'Paste' in the project tree, or 'Insert from' in the work sheet).

9.1

Insert a new work sheet

If you start your configuration work without using any previously prepared configuration, you start work by inserting a new work sheet inside the terminal.

☞ To insert a new work sheet:

1 Select the terminal in the Project Tree.



**2 Select the 'Insert' icon on the toolbar.
A dialog box appears.**

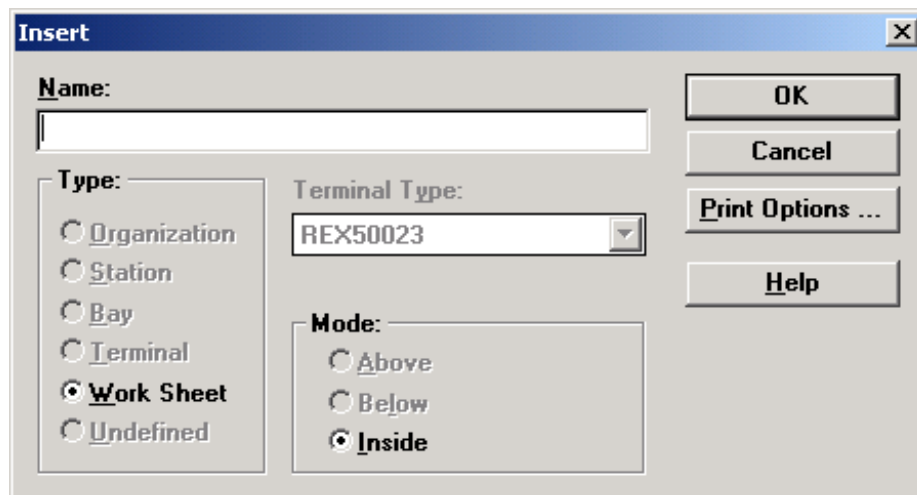



Fig. 3 Insert dialog box.

- 3 Select type: Work sheet.**
- 4 Type a name for the work sheet.**
- 5 Select <OK> to confirm.**

9.2

Add another work sheet

If you want to split up your configuration on several work sheets, you can add more work sheets to the terminal. This can be done in the same way as described above, which inserts the new work sheet as the bottom one in the terminal, or in the following way.

 To add a work sheet:

- 1 Select a 'Work Sheet' icon. You can insert the new work sheet above or below this selected work sheet.



- 2 Select the 'Insert' icon on the toolbar. A dialog box appears, see Fig. 3.



- 3 Type a name for the work sheet. Select to place the work sheet above or below the selected one.
- 4 Select <OK> to confirm.

9.3

Insert a terminal configuration template

You can start your configuration work by using a previously prepared configuration (template). This prepared configuration can be a:

- standard configuration of a company.
- configuration used in a previous project.
- example configuration included in the CAP/REx 5xx program module.

For a more complex terminal with a comprehensive configuration, it is a big advantage to start the work by using an existing configuration as a template and only make the necessary changes.

Note that the default programming of terminals might differ from the example configuration included in the corresponding CAP/REx 5xx program module.

Use the 'Insert Template' command in the Edit menu to insert the templates.

Note!

The terminal must not have any work sheets connected to it to start with. Otherwise the insert template command is not active.



To insert a template:

- 1 Click on the terminal in the Project Tree to select it.
- 2 Select the 'Insert Template' command in the Edit menu, and the Insert Template dialog box appears.
- 3 Select a template.
- 4 Select <OK> to confirm. 'Update Version' will run automatically.

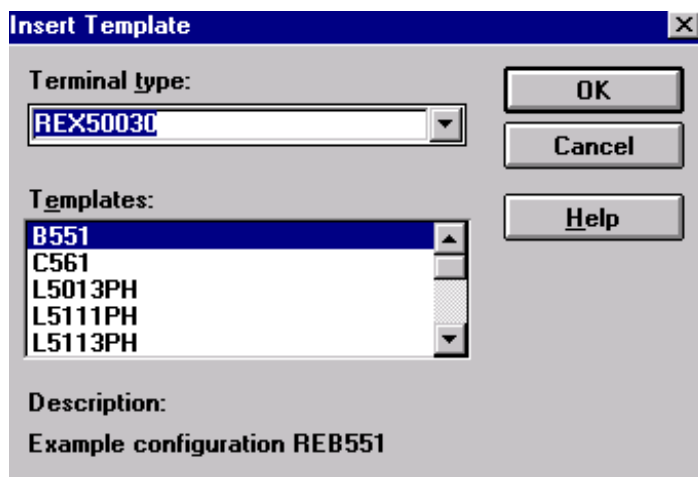


Fig. 4 The Insert Template dialog box.

9.4

Insert a work sheet from a file

You can use the 'Insert From' command to insert a stored work sheet into a new terminal configuration.

 To insert a stored work sheet:

- 1 Insert a new work sheet in the Project Tree.
- 2 Open the new, empty work sheet.
- 3 Make an insertion mark in the upper left corner of the work sheet by clicking with the left mouse button.
- 4 Select the 'Insert From' command in the Edit menu, and the Insert From dialog box appears.
- 5 Select the directory and the file name of the stored work sheet.
- 6 Select <OK>

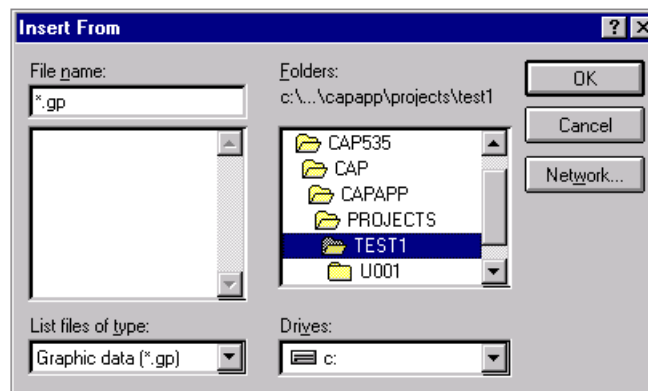


Fig. 5 The Insert From dialog box.

10

Upload options

When you start working with the configuration of a terminal, it is important that the functionality in the terminal is represented correctly in the CAP tool. This is done by running:

- 1 Upload Options — if the terminal is available or Terminal Options if this is supported by the terminal
- 2 Function Selector tool
- 3 Or by off-line, Terminal Options in the Edit menu. See “Terminal options” on page 30.

If the terminal is available, it is recommended to connect the PC to the terminal and run 'Upload Options' in the On-line menu. You can connect the PC either to the front port of the terminal or to a rear SPA-port.

Note!

Before you start communicating to a terminal, make sure the communication setup in CAP 540 is correct. See "On-line functions" on page 51.



The 'Upload Options' command uploads from the terminal

- List of functions installed in the terminal
- Function selector information

The terminal includes the set of functions that were ordered for this terminal. By running Upload Options, the list of available function blocks in CAP 531 will match the installed functions in the terminal.

In CAP/REx 5xx product module, function blocks representing all functions in the terminal (standard and optional) are available, and replace the complete list of functions that is provided by CAP 531. After uploading, Update Version runs automatically. The library used by CAP 531 for this terminal will be reduced so that it corresponds to the functionality.

Uploading also involves the uploading of the function selectors of the terminal. In the function selector it is possible to choose Uploaded data as input to the function selectors. See chapter "Function selector" on page 30 for more information.

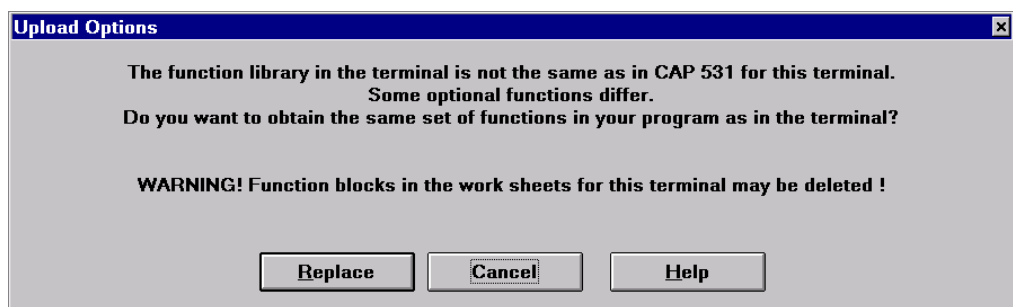


Fig. 6 A warning is displayed if the library of elements differs.

The warning in the Fig. 6 is displayed if the list of available functions differs from the terminal and the corresponding library in CAP 531. This will be the normal case when you run 'Upload Options' for the first time from a certain terminal.

A message is displayed if no differences are found between the list of functions used in the terminal and the library list that is used in the tool.

☞ To upload the list of functions and function selectors from the terminal:

- 1 **Click on the terminal in the project tree to select it.**
- 2 **Check that the communication setup in CAP 540 is correct by looking at 'Setup' in the On-line menu.**
- 3 **Select 'Upload Options' in the On-line menu, and uploading starts by uploading the list of functions. A warning is displayed if contents differ.**
- 4 **Select 'Replace', and the list of functions is replaced and Update Version starts automatically.**



If a function appears in a work sheet, and this function is not available in the terminal, an error list is generated by the Update Version.

☞ If error messages are displayed from Update Version, then:

- 1 **Double-click on the error in the error list.**
- 2 **Double-click on the functions block and the Replace dialog box appears.**
- 3 **Select the functions block for replacement, and then select <OK>. The functions block is replaced.**
- 4 **Select the next error in the error list and repeat the above steps until all functions block are replaced.**

☞ When all errors are corrected, then run 'Update Version' again manually:

- 1 **Click on the terminal in the project tree to select it.**
- 2 **Select 'Update Version' in the Make menu, and updating of the library starts.**



10.1

Terminal options

The Terminal options command is available for some terminal types.

Run Terminal Options in the Edit menu. The terminal options can be imported for off-line engineering if the terminal options are available in a file. Import the file from a diskette, or browse the disks for its current location.

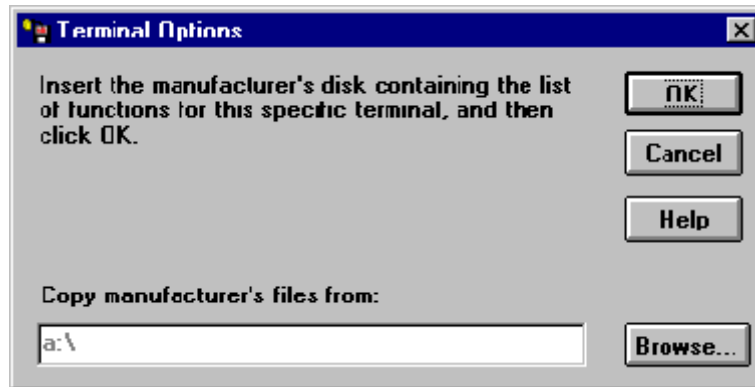


Fig. 7 The Terminal Options dialog.

11

Function selector

When you start to work with the configuration of a terminal, it is important that you use the correct set of functions. Some of these functions are selected in the 'Function Selector' in the Edit menu.

Note!

Versions 2.0 and later of the REx 5xx terminals uses the function selectors.

Function selectors are used to choose one of many available function blocks for the same function.

If the terminal is available, it is recommended to connect the PC to the terminal and run 'Upload Options' before you run the 'Function Selector'. In this way, the library of functions in the PC will match completely the library of functions in the terminal.

If you cannot connect the PC to terminal, you run the 'Function Selector' directly.

11.1

Example of function selectors

I/O module01 in the CAP/REx 500 program module can be configured to be either of:

- BIM Binary Input Module
- BOM Binary Output Module
- IOM Input Output Module
- IOPSM
- DCM

This choice of modules gives different shape of the function block for the I/O module01.

Assume that you want to change the logical I/O module01 (IO01-) from being a Binary Input Module (BIM) to a Binary Output Module (BOM).

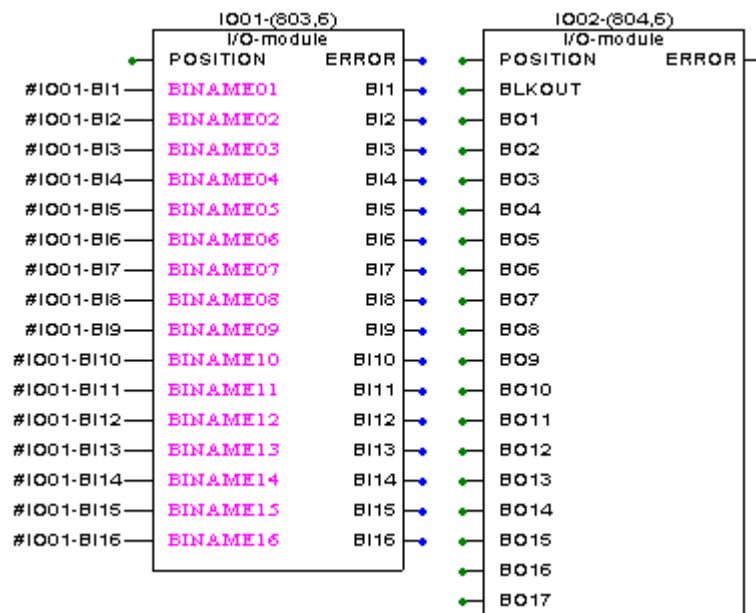


Fig. 8 Compare the I/O module as BIM (left) or as a BOM (right — only a part of the function block is shown).

When you select a Binary Output Module in the Function Selector tool, the library is updated with the new function block, and only the selected module can be used in the configuration.

11.2

Using function selectors

☞ To start the 'Function Selector':

- 1 Select the terminal in the Project Tree.
- 2 Select the 'Function Selector' in the Edit menu.
- 3 Select the 'Load' command in the File menu to select the data sources for the function selector tool.



Input data (data sources) to the Function Selector can be:

- Working data — displayed on the screen
- Default data — presented the first time for each terminal
- Uploaded data — comes from the terminal at Upload Options

When the CAP 531 is opened, working data is displayed; it includes the last saved data. The CAP/REx 5xx product module specifies the default data. Default and working data are equivalent before the working data is changed. Uploaded data consist of the function selectors that comes from the terminal while running 'Upload Options', which is an On-line function.

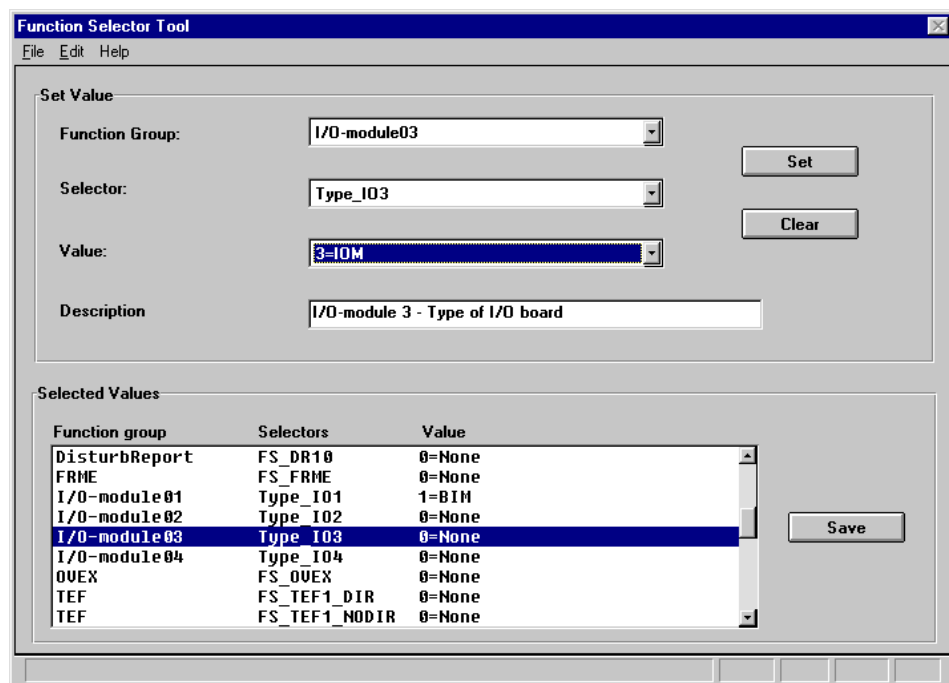


Fig. 9 The function selector.

The function selector contains these sections:

- Set Value (upper section), which you use to change the function selector values.
- Selected Values (lower section), which gives you an overview of all function selector settings.

When you scroll the Value, you can see what types of function blocks you can select.

☞ To change the Type_IO1 function selector for the I/O-module01:

- 1 Select Function Group: I/O-module01.**
- 2 Use the Value scroll bar to change the value from BIM to BOM.**
- 3 Select the 'Set' button, and the value changes in the Selected Values section.**
- 4 Select the 'Save' button, and the new function is saved.**

☞ To close the function selector:

- 1 Select 'Exit' in the File menu.**

12 Work sheet

12.1 Open the work sheet

You open the work sheet from the project tree.

☞ To open the work sheet:

- 1 Double-click the left mouse button on the work sheet icon for the terminal, and the work sheet appears.

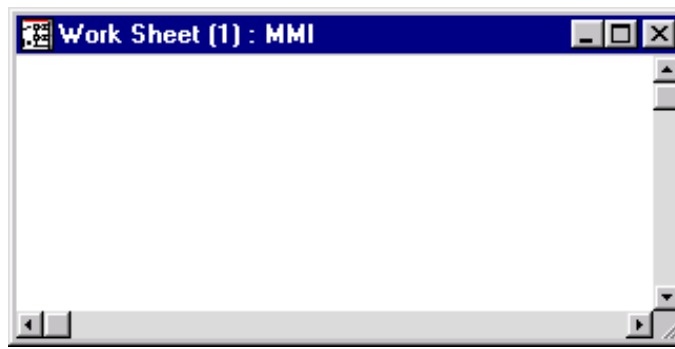


Fig. 10 Work sheet called MMI.

12.2 Using work sheets

A work sheet can consist of several pages. You set the number of pages from the Work Sheet size (WS size) dialog box on the Layout menu.

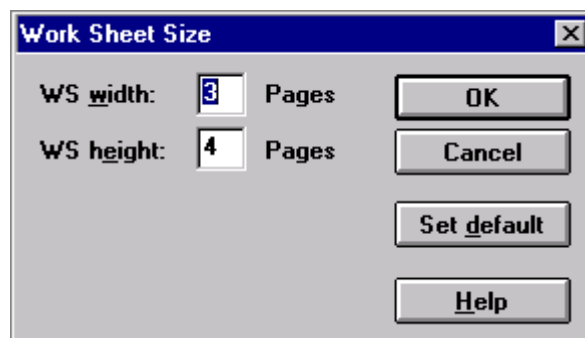


Fig. 11 Work Sheet Size dialog box.

You can use the work sheet to structure the different functions in the terminal configuration, where each work sheet can represent one or several functions.

Select the 'Page Border' command in the Layout menu to display the page border. The size of the page and page orientation is set in the Page Layout with the 'Paper Orientation' command in the Layout menu.

12.3

Insert function blocks into work sheets

This section assumes that you want to insert an AND-function block called A067.

☞ To insert this function block:

- 1 Click the left mouse button to set an insertion mark in the work sheet.
- 2 Click the left mouse button on the Insert Function Block icon on the toolbar, and the Function Block dialog box appears.

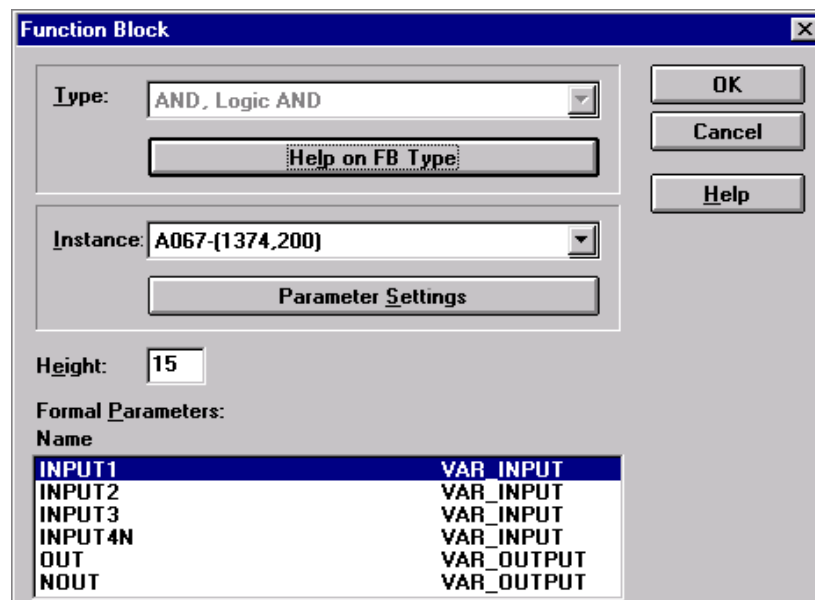


Fig. 12 Function Block dialog box.

☞ To use the Function Block dialog box:

- 1 **Select the type: AND.**
- 2 **There are more than one AND function blocks. Select A001 from the Instance list.**
- 3 **Select <OK> to confirm, and the function block is inserted at the insertion mark.**

After insertion, the function block is no longer visible in the list of functions, because the function block can only be used once in the terminal.

12.4

Connect objects

If you insert function blocks or variables (objects) in your work sheet, you want to connect them to other function blocks.

Assume that you want to connect the AND-function block A001 with the Timer-function block TM01. First you must insert also TM01 by following the procedure described above.

☞ Connect two objects:

- 1 **Click the left mouse button on the Connect Objects icon on the toolbar.**
- 2 **Position the cursor at the ON output (the blue circle) of the TM01 function block and click the left mouse button.**
- 3 **Move the cursor towards the INPUT1 input of the A001 function block. Click the left mouse button whenever you want a new direction of the connection line.**
- 4 **Click the left mouse button when you reached INPUT1 (the green circle), and the connection is set.**

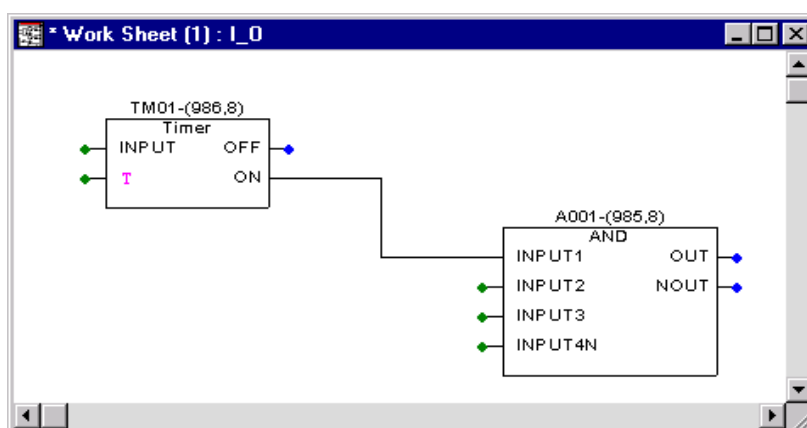


Fig. 13 The two objects is connected by using the connection mode.

You can also connect objects by moving them close together:

☞ To connect two objects:

- 1 Position the cursor on the A001 function block.
- 2 Press and hold the left mouse button.
- 3 Move towards the function block TM01 so that the connection points (blue and green circle) overlap.
- 4 Release the mouse button, and the connection is set.

You can now move one of the function blocks to a free position if desired.

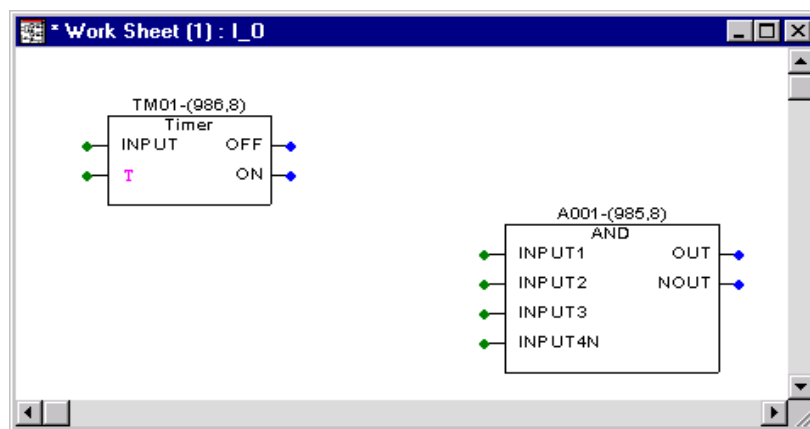


Fig. 14 The function blocks, before the connection is set.

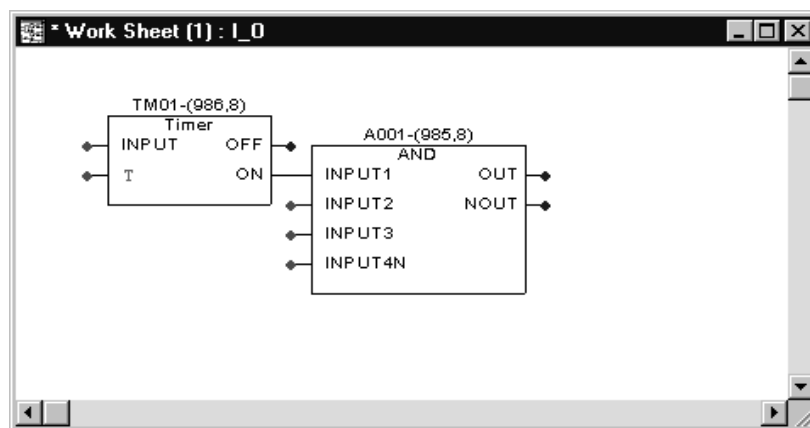


Fig. 15 The connection is set.

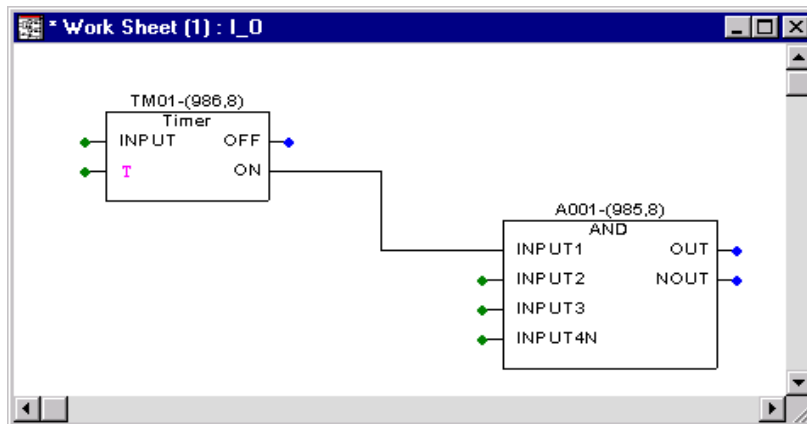


Fig. 16 A001 is moved to a free position with the present connection.

12.5

Save work sheets

Regularly save your changes while you work. If, for example, a power failure occurs, you risk losing data if you do not save it.

In CAP 531, you can save changes in:

- all opened work sheets for one terminal.
- all opened work sheets for all terminals.

☞ To save all opened work sheets for all terminals:

1 Select 'Save All' in the File menu, and the work sheet is saved.

12.6

Exit from work sheets

You close a work sheet by using the 'Close Terminal' command in the File menu.

Note!

Select the 'Close All' command on the File menu to save and exit from all opened work sheets.



13 Variable, setting, text

13.1 Variable

Variables are used in a configuration in order to increase the readability of the configuration. They provide a way of connecting signals between function blocks without drawing lines. The connection is made using variable names instead of lines. You assign the output of a function block a user-defined name (Variable), and the same name is assigned to the input of another function block. The CAP 531 program interprets this as a connection. The Variable name can have maximum 32 characters.


With the use of Variables, it is possible to connect signals to and from function blocks in different work sheets, and function blocks in different pages of the same work sheet.

13.2 Insert variables

You can insert variables into a work sheet in two ways:

- Directly connected to a function block
- In the work sheet without connection to a function block

Assume that you want to insert a variable that is directly connected to the AND A001 function block.

 Insert a variable at the input INPUT1:

- 1 Click on the input INPUT1 to select it.
- 2 Click the left mouse button on the Variable icon on the toolbar, and the Variable dialog appears.

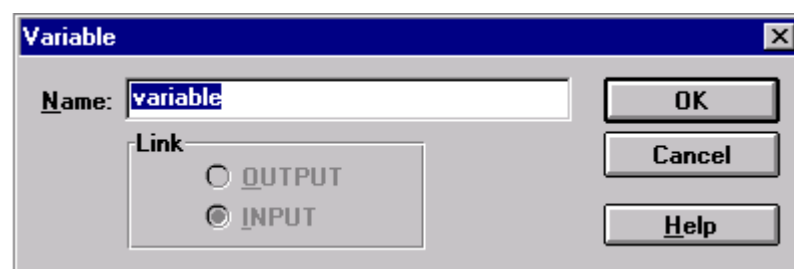


Fig. 17 Variable dialog box.

☞ To use the Variable dialog box:

- 1 **Type the variable name, a text string of up to 32 characters.**
- 2 **Select <OK>, and the variable is inserted at the INPUT1.**

☞ Insert a variable anywhere in the work sheet:

- 1 **Click on the left mouse button to set an insertion mark in the work sheet.**
- 2 **Click the left mouse button on the Variable icon on the toolbar, and the Variable dialog appears.**

A small rectangular icon with the letters 'VAR' in a bold, sans-serif font.

Fig. 18 Variable dialog box.

☞ To use the Variable dialog box:

- 1 **Type the variable name.**
- 2 **Choose if the Variable is to be connected to an OUTPUT or an INPUT on a function block.**
- 3 **Select <OK>, and the variable is inserted at the insertion mark.**

Note!

*Use Copy and Paste to avoid mistyping of the Variable names. The input and output Variable must have **identical** names to be connected by the CAP 531.*



13.3

Settings

A setting is, for example, a time delay or a name. The setting parameter name is displayed in magenta color on the work sheet. The program uses magenta color to highlight a setting input. Settings can be numbers or text strings.

13.4

Insert settings

Assume that you want to set the T parameter to 2.50 seconds in Timer TM01.

☞ To set the value:

- 1 Click the left mouse button on the T parameter in TM01.
- 2 Click the left mouse button on the Setting icon on the toolbar, and the Parameter Settings dialog box appears.
- 3 Change the value to 2.50.
- 4 Select OK, and the 2.50 value is displayed to the left of the T parameter.



After you set a value in the work sheet, you can move the value. The connection to the input parameter remains.

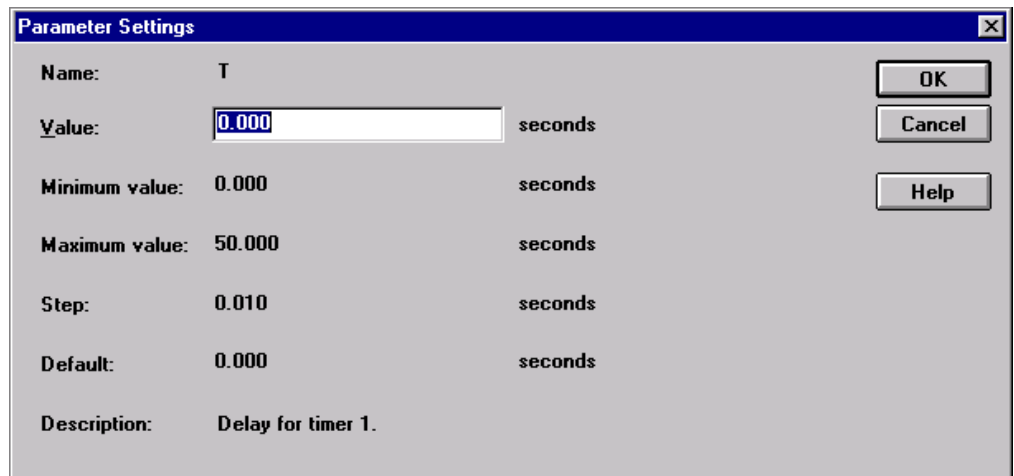


Fig. 19 The Parameter Setting dialog box.

13.5

Insert text (Comment)

Free text can be placed anywhere in the work sheet. This text can be used for different purposes. The configuration and the signals can be explained for the reader. This can also be used for temporary comments during the configuration work.

☞ Insert a comment in the work sheet:

- 1 Click on the left mouse button to set an insertion mark in the work sheet.
- 2 Click the left mouse button on the Text icon on the toolbar, and the Comment dialog appears.

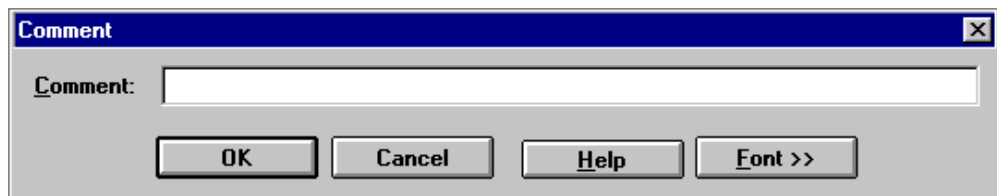


Fig. 20 Comment dialog box.

☞ To use the Comment dialog box:

- 1 Type the text.
- 2 Press Font to change font, size and color of the text.
- 3 Select <OK>, and the text is inserted at the insertion mark.

14

Copy, paste and save in files

14.1

Clipboard functions

You can use standard MS Windows commands such as cut, copy and paste within a work sheet or between work sheets. The commands can be applied to function blocks, variables and text comments. It is also possible to use the clipboard functions in the project tree.


If you try to copy an existing function block, the Replace dialog box is displayed, because one function block (one instance) can only exist once in each terminal (see Fig. 21).

14.2

Replace function blocks

You can exchange a function block for another function block of the same type e.g. to change execution order. Or you can totally change the function block type e.g. when changing the I/O-module after an upload options command has been executed.

Assume that you want to change AND A001 to OR O001.

 To replace the function block:

- 1 **Select the AND function block A001.**
- 2 **Click the left mouse button on the Replace icon on the toolbar, and the Replace dialog appears. Or, position the cursor on the A001 function block and double-click the left mouse button.**
- 3 **Change the function block type to OR.**
- 4 **Select the O001 function block.**
- 5 **Select <OK>, and O001 replaces A001.**

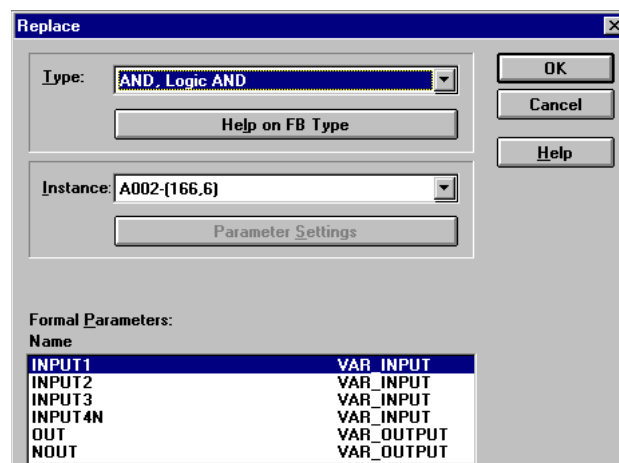


Fig. 21 The Replace dialog box.

Assume that you want to change a function block AND A001 to AND A005, which has a different execution number. Functions should be executed in consecutive order, to avoid additional time delay. Therefore you might want to change execution number of the logic function blocks.

☞ To replace the function block:

- 1 **Select the AND function block A001.**
- 2 **Double-click the right mouse button.**
- 3 **Select the A005 function block.**
- 4 **Select <OK>, and A005 replaces A001.**

14.3

Groups

You can group several function blocks by connecting them to get a structure of different functions. You can also copy the group to a library in order to enable reuse of the group in other terminals in the same project or other projects. The group is saved and reused as a file. It is not possible to perform copy and paste commands on a group.

14.4

Create groups

Assume that you want to create a group that consists of Timer TM01 and AND A001, and that you want to store it under a new name called Delay 1.

☞ To create a group:

- 1 **Click the left mouse button on the 'Group' icon on the toolbar to activate the group mode.**



- 2 **Select the area that you want to group: Press and hold the left mouse button and move the cursor over the objects that will be in the new group. A frame appears around the area that you selected.**
- 3 **Release the mouse button, and the 'Group' dialog box appears.**
- 4 **Type Delay 1, which is the new group name.**
- 5 **Select <OK>.**

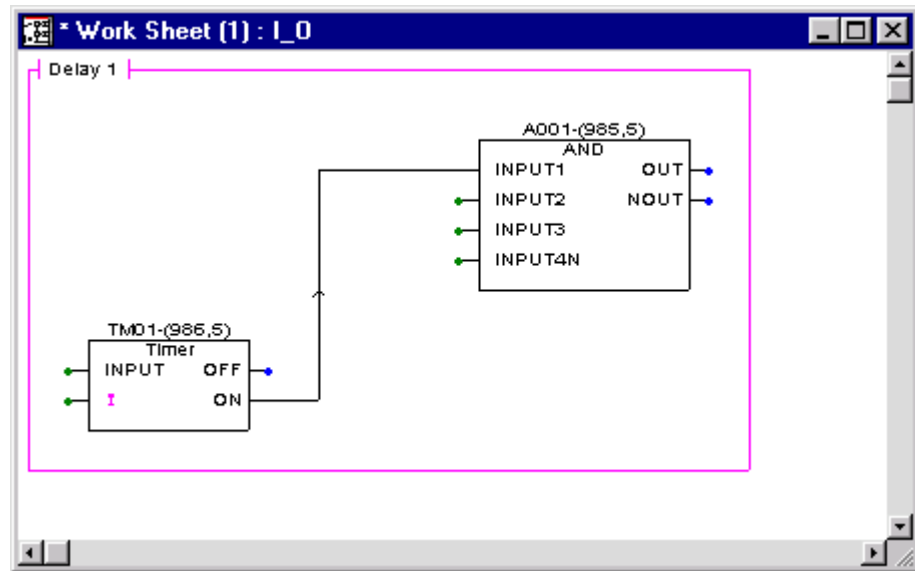


Fig. 22 The Delay1 group.

Note!


You should not create a group of function blocks with connections leading outside of the group. First you create the group, such as in Fig. 22. Then you can connect the function blocks in the group to other objects outside the group.



14.5

Save groups as files

You can save a group as a file. In this way you can use it for other terminal configurations in the same project or other projects. You can not use Copy and Paste on a group.

 To save a group as a file:

- 1 Click the left mouse button on the group to select it.
- 2 Select the 'Copy To ...' command in the Edit menu, and the Copy To dialog box appears.
- 3 Select a directory and type a file name for the group.
- 4 Select <OK>.

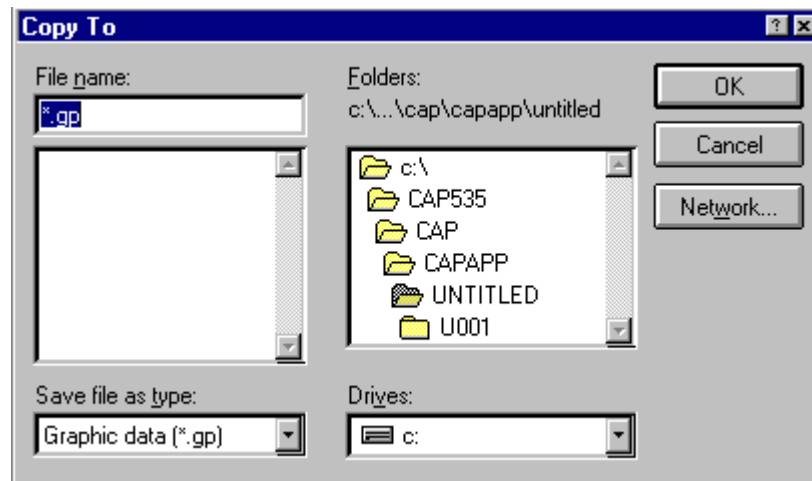


Fig. 23 The Copy To dialog box.

14.6

Insert groups from files

Use the 'Insert From' command to insert a stored group into a work sheet.

☞ To insert a group:

- 1 **Select the 'Insert From' command in the Edit menu, and the Insert From dialog box appears.**
- 2 **Select the directory and the file name for the stored group.**
- 3 **Select <OK>.**

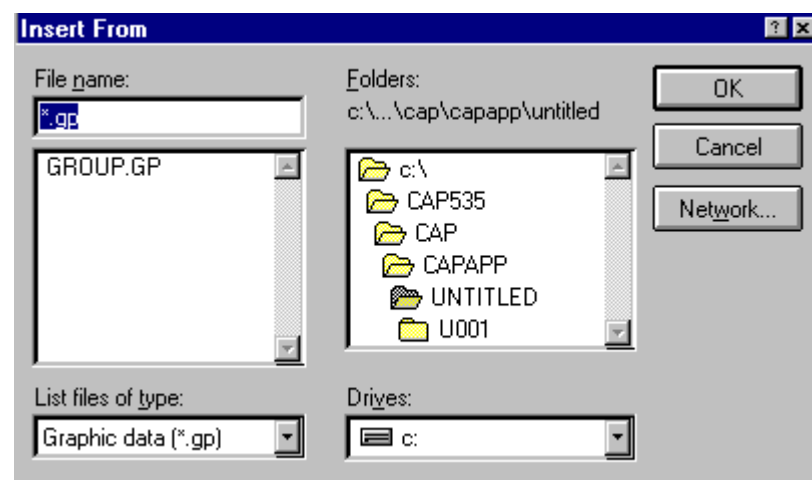


Fig. 24 The Insert From dialog box.

If a function block in the group already exists in the terminal, the Replace dialog box will be displayed, because one function block can only exist once in each terminal (see Fig. 21).


14.7 Save work sheets in files

In CAP 531 it is possible to save:

- a complete terminal as a template
- a single work sheet

14.7.1 Save all work sheets in a terminal


All work sheets in a terminal can be stored as a template and be reused in the same project or in other projects. It is also possible to create an internal standard as a base for future configuration work, stored as a template.

 To save a template:

- 1 **Select the terminal (in the Project Tree).**
- 2 **Select the 'Generate Template' command in the Edit menu.**
- 3 **Write a template name and a description.**
- 4 **Select <OK>.**

14.7.2 Save work sheets as files

You can save a single work sheet as a separate file, which you can use in other terminal configurations in the same project or in other projects.

 To save a work sheet as a file:

- 1 **Open the work sheet that you want to save.**
- 2 **Select the 'Mark All Objects' command in the Edit menu.**
- 3 **Select the 'Copy To ...' command in the Edit menu, and the Copy To dialog box appears.**
- 4 **Select a directory and type a file name for the work sheet.**
- 5 **Select <OK>.**

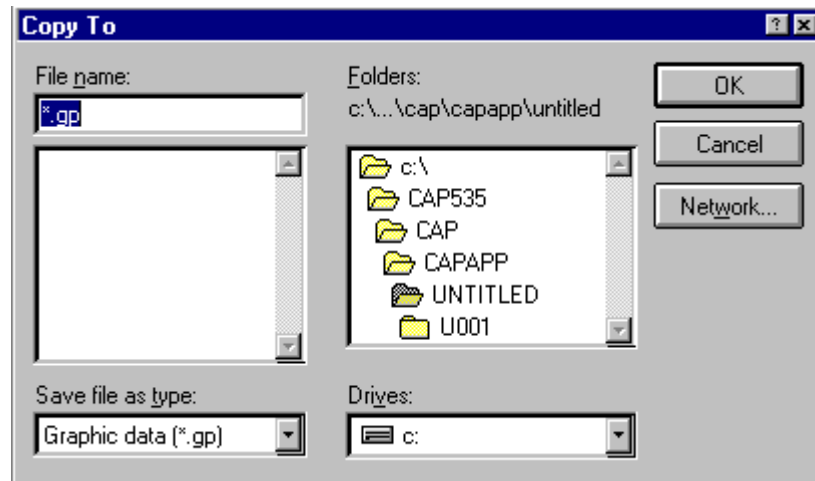


Fig. 25 The Copy To dialog box.

14.7.3

Insert work sheets from files

You can use the 'Insert From' command to insert a single stored work sheet into a new terminal configuration.

☞ To insert a stored work sheet:

- 1 **Insert a new work sheet in the Project Tree.**
- 2 **Open the empty work sheet.**
- 3 **Point with the cursor in the upper left corner in the work sheet.**
- 4 **Click on the left mouse button to set an insertion mark in the corner.**
- 5 **Select the 'Insert From' command in the Edit menu, and the Insert From dialog box appears.**
- 6 **Select the directory and the file name for the stored work sheet.**
- 7 **Select <OK>.**

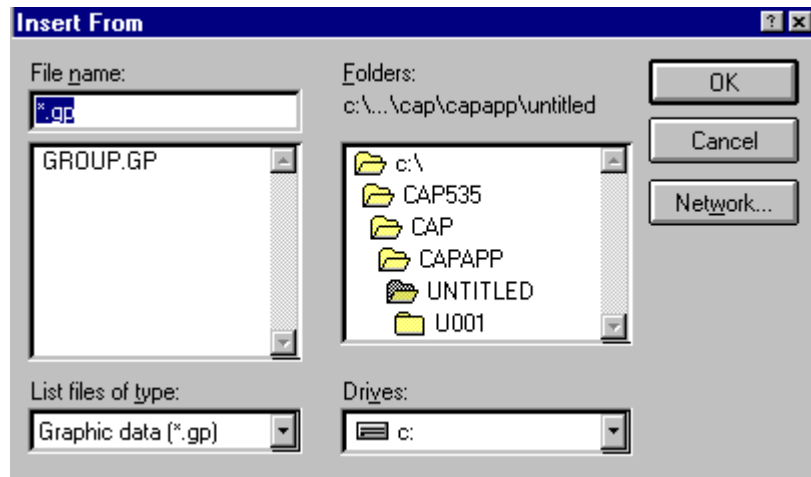


Fig. 26 The Insert From dialog box.

15

Compile and link work sheets

The program goes through the configuration in order to detect errors and to prepare the configuration for downloading into a terminal. This is done in a compilation procedure.

In CAP 531, you can compile the configuration in:

- One terminal
- All terminals in the project

We recommend you to compile only one terminal at a time during the configuration work. This gives a better overview of the compilation errors.

☞ To compile a terminal:

- 1 Select the terminal that you want to compile in the project tree.



- 2 Select the Compile Terminal icon on the toolbar, and the progress bar for compilation appears.



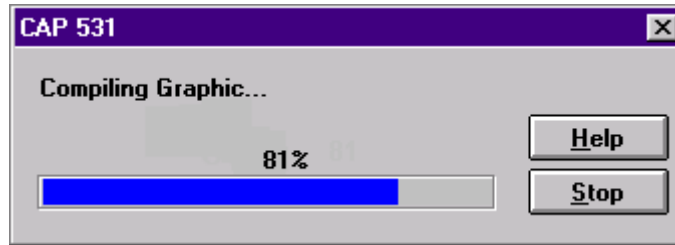


Fig. 27 The progress bar for compilation, which indicates the graphic compiler phase of compilation.

Compilation is performed in several phases, which you can see when working. Fig. 27 indicates the graphic compiler phase.

When compilation ends without detecting programming errors, the progress bar for compilation disappears and the status bar displays this message: 'Code generation successful'.

During compilation for the first time, the compiler detects programming errors such as duplicate variable names or typing errors. When errors occur, a message box displays the number of detected errors.

When you confirm the message box, CAP 531 displays an error list on your screen as shown in Fig. 28.

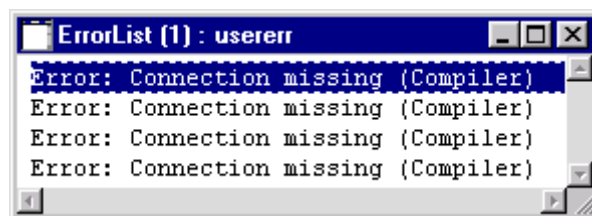


Fig. 28 Error list with error messages.

To get help, highlight the error in the error list, and press <F1>. CAP 531 displays:

- The reason for the error
- Corrective measures that you can take to correct the error

Double-click with the left mouse button on the error in the error list to go directly to the work sheet that contains the error. Normally, the line that contains the error is highlighted. If you cannot find the error list, it is accessible with 'Error List' in the Make menu.

Note!

If the error is of type 'Connector not found', the program always marks an input signal. If the error is caused by a misprint of a Variable, the mistake might be on the corresponding output signal connector, and not on the input which is marked by the program.

If an error occurs, it is important to run the compilation once again after the errors have been corrected. It is possible that another part of the compiler can detect more errors in a second compilation since the compiler can proceed further than the first time.

It is therefore necessary to repeat the compilation process until there are no errors from the compilation.

16**On-line functions**

It is possible to perform the following functions when connected to the terminal:

- Upload Options
- Download Configuration
- Debug
- Compare Configurations

All on-line functions require a connection between the PC and the terminal. You can connect the serial COM-port of the PC either to the front port of the terminal or to a rear SPA-port of the terminal.

16.1**Communication setup**

Before you run 'Upload Options' or any other on-line task, it is necessary to check the communication setup in CAP 540.

- 1 Select the terminal in the project tree.**
- 2 On the On-line menu, click Setup.**

The following dialog appears:

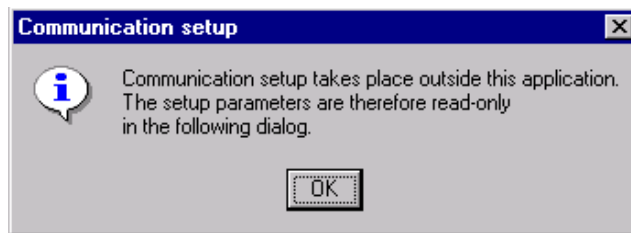


Fig. 29 Information dialog, communication setup is done from CAP 540.



Fig. 30 Communication setup dialog.

3 Click Configure.

The following dialog appears:

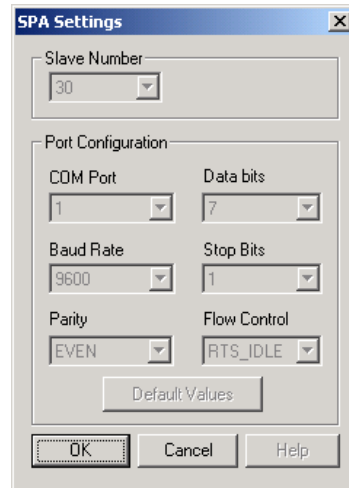


Fig. 31 Default settings for the front communication.

The default settings are prepared for front communication to the terminal. The Baud rate and the Slave number of the PC's COM-port must be set so they correspond to the settings of the front port of the terminal. This must be set both in CAP 540 and on the built-in HMI of the terminal. The COM-port number depends on the configuration of the PC.

For connection of the terminal to the PC a special cable is used. It is plugged into the optical contact on the left side of the built-in HMI. The other end of the cable is plugged directly into the COM-port of the PC. This cable can be ordered from ABB Automation Products. Please contact your ABB sales representative.

If rear communication with a direct fibre connection is used (no modem), the setup should look like Fig. 32.

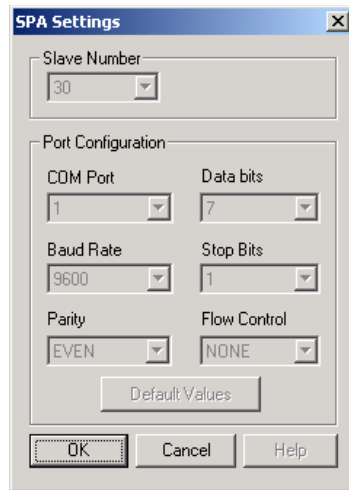


Fig. 32 Example of setup for rear communication.

The other parameters are set depending on the communication channel, but if a direct (or a loop) fibre communication is used, the other parameters should not be changed from the example above. Note that the Flow control parameter is different between front and rear communication.

16.2

Unlock terminal

There is a lock in the terminal that will prevent two concurrent connections (i.e. front and backside communication) from accessing information from different setting groups. The terminal will respond with a code to indicate that the setting group is locked if a request is made to access a different setting group than the locked one.

One problem that can arise with this sort of logic is if a lock command is issued and accepted by the terminal, but the communication is interrupted before the unlock command is received by the terminal. A special unlock feature is available in the setup dialog to eliminate this problem. Simply check the Unlock box and an unlock command will be issued to the terminal the next time a communication command is issued. The checkbooks will be cleared automatically after the communication attempt.

The reason why the command is not always used is to insure safety at all times. The operator must before the checkbooks is checked be sure that no other interfering communication will be performed.



Figure 33: Communication setup dialog for release of the locked setting group.

16.3

Upload options

You should always run 'Upload Options' as soon as you have access to the terminal. See "Upload options" on page 27.

16.4

Download terminal configurations

You can download a configuration to the terminal after compilation. If storing of the graphics is supported by the terminal, the graphics will also be saved in the terminal for uploading later. See "Upload configuration" on page 57.

First you get the following dialog:

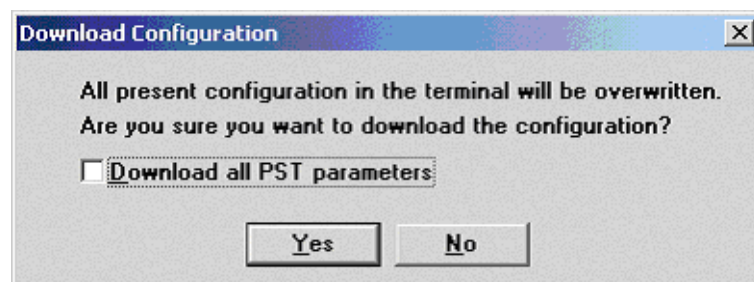


Fig. 34 Download configuration dialog

The settings of the terminal are downloaded when the download box is checked.

When downloading a configuration, a sequence of operations are performed in order to minimize the risk of maloperations.

CAP 531 starts the downloading by uploading the list of available functions, the version and the serial number of the terminal. These are compared with the library version and the function library used by CAP 531. The serial number of the terminal is compared to the registered serial number of any previous communication to this terminal in CAP 531. If no differences are found after the comparison, the download starts.

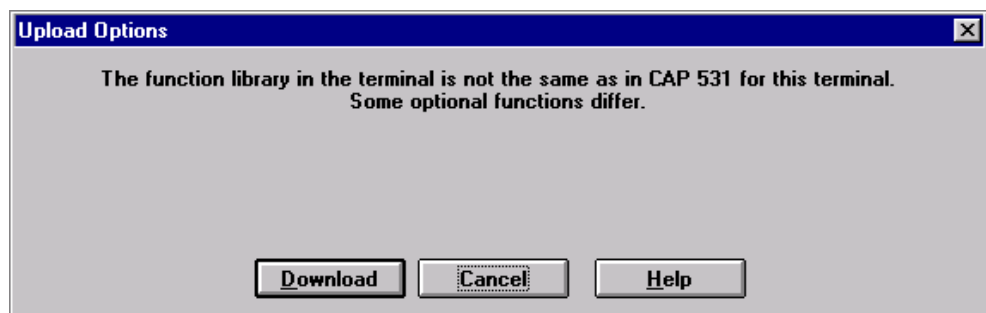


Fig. 35 A warning is displayed if the set of functions differs.

The warning message in Fig. 35 is displayed if the list of available functions differs between the terminal and the corresponding library in CAP 531. Interrupt the downloading procedure with 'Cancel' and run 'Upload Options' manually. After this you can start the downloading procedure again. No warning message will appear.

Note!



If you download a configuration with unavailable functions included, they will not be connected and the configuration of the terminal will not be identical to the configuration in CAP 531. You should therefore always press 'Cancel' when the warning message appears as in Fig. 35 .

☞ To download the configuration to the terminal:

- 1 **Click on the terminal in the Project Tree to select the terminal that you want to download.**
- 2 **Select 'Download Config.' in the On-line menu, and the Download configuration dialog appears.**
- 3 **Select Download PST configuration if relevant, click Yes, and downloading starts by uploading the list of available functions.**



The 'Compare Configuration' function starts automatically. If the downloading has been successful and there are no differences between the function libraries in the terminal and in the configuration, no differences will be detected in the comparison process. If differences appear in the comparison list, then start the downloading procedure again.

16.5 Upload configuration

This menu is active if the selected terminal supports this functionality. If the functionality is supported, the entire configuration is stored in the terminal and it can be uploaded to the PC. For back-up purposes and off-line engineering be sure to always keep a copy of the terminal configuration on your PC system.

16.6 Debug mode


After you compile the configuration and download it to the terminal, you can activate the debug mode for error detection and correction (debugging) in the work sheets.

First you open a work sheet and then set the work sheet in the debug mode. You can debug several work sheets at the same time.

Note!

CAP 531 will only debug signals visible in the work sheet. For fast updating of the signals, make sure that only signals of interest are displayed in the work sheet.

Ensure that the configuration in the terminal corresponds to the configuration in CAP 531, for example, by using 'Compare Configurations'.

 To set a work sheet in debug mode:

1 Double-click on the work sheet in the project tree to select it for debugging. The work sheet opens.



2 Click on the Debug icon on the toolbar. The work sheet switches to debug mode.



The status of different signals is indicated by different colors on a work sheet in debug mode. These colors represent different values:

Color	Meaning
Red	Boolean true (high)
Blue	Boolean false (low)
Green	Present analogue values

It is necessary to have the Global Debug in the On-line menu marked active if you intend to debug a work sheet. The Global Debug works like a main switch to the debug functionality.

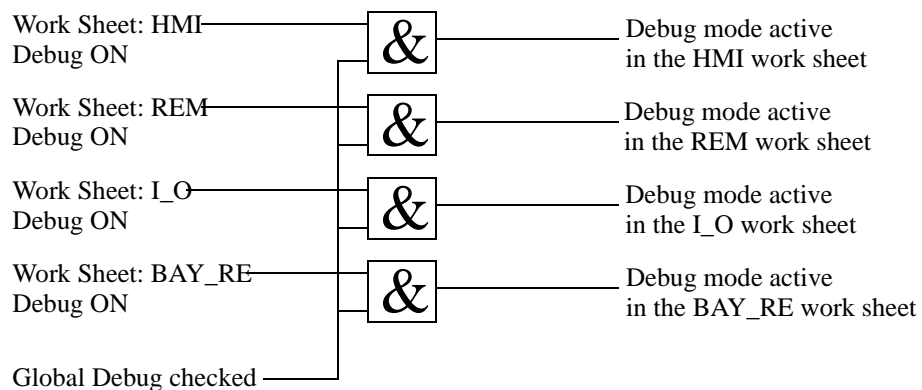



Fig. 36 Global debug affects the debug mode in all work sheets.

16.7

Compare configurations

CAP 531 contains functionality that lets you compare the terminal configuration and the CAP 531 configuration. You can compare CAP 531 configurations against previously uploaded terminal configuration or you can upload a new configuration from the terminal and then make a comparison.

The main purpose of Compare Configurations is for the user to verify that the configuration in the terminal is the same as the configuration is CAP 531.

 To compare configuration when you are connected to a terminal:

- 1 Click on the terminal in the project tree to select it.
- 2 Select the 'Compare Configurations' command in the On-line menu, and the Compare Configurations dialog box appears.
- 3 Select the 'Upload and Compare' command in the File menu, and the upload starts. The comparison starts after the configuration is uploaded. A list displays the differences, see Fig. 39 .



Example:

Fig. 39 show the difference between Fig. 37 and Fig. 38 . Note here that TRUE and FALSE are defined by the FixedSignal function block.

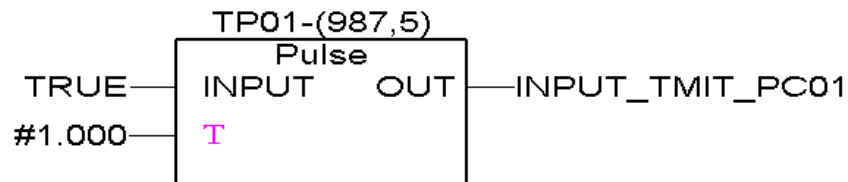


Fig. 37 Configuration in the terminal.

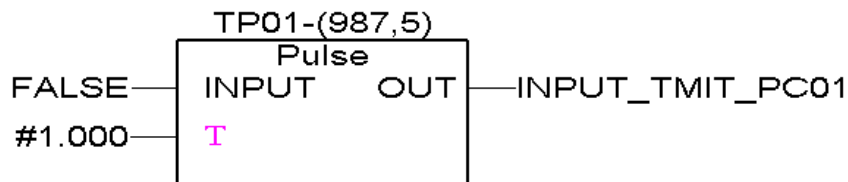
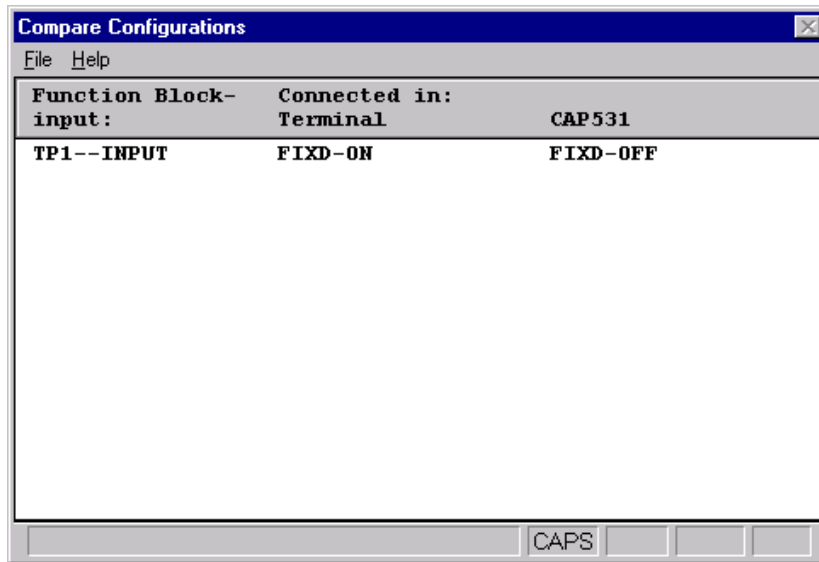


Fig. 38 Configuration in CAP 531.



Function Block-input:	Connected in: Terminal	CAP 531
TP1--INPUT	FIXD-ON	FIXD-OFF

Fig. 39 Comparison result given by Compare Configurations.

In this case, the variables TRUE and FALSE were connected to the outputs FIXD-ON and FIXD-OFF.

The main purpose of Configuration Compare is for the user to verify that the configuration in the terminal is the same as the configuration is CAP 531.

Note!

Do not confuse the 'Compare Configurations' upload of a configuration with the 'Upload Options' command in the On-line menu, which uploads the list of terminal options and the function selectors.

17 Start the page layout work

17.1 Introduction

The CAP 531 lets you create and print your own drawing forms that can comply with your internal layout standards. This is called the page layout.

The page layout includes a set of graphical tools for inserting lines and text in the headers and footers.

A default page layout is included in CAP 531, which follows an ABB standard drawing. This page layout is called DEFAULT.PLT. When you create your own standard drawing form, you normally start with a page layout that already exists and change this according to your needs.

Note!

*Not all information is included in the *.plt files. Use the 'Copy To...' menu item and the 'Insert from...' menu item to move page layouts between PCs.*

17.2 Assign page layouts to work sheets, terminals or project tree

When you insert a work sheet, the default page layout is used automatically for this work sheet. If you want to use another page layout, you assign this page layout to your work sheet or your project tree.

☞ To assign the page layout to a work sheet:

- 1 Position the pointer on the work sheet icon in the project tree.
- 2 Double-click on the right mouse button, and the Properties dialog box appears, see Fig. 40. Or you open the properties dialog by highlighting a work sheet, and then select 'Object Properties' in the Edit menu.

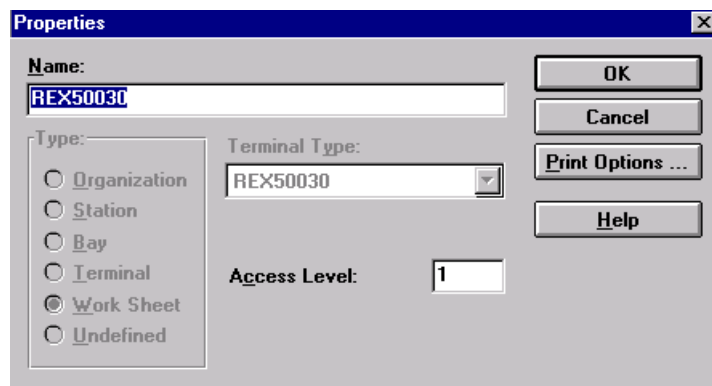


Fig. 40 The Properties dialog box, which is used to assign a page layout.

- 3 Select 'Print Options', and the Print Options dialog box appears, see Fig. 41.

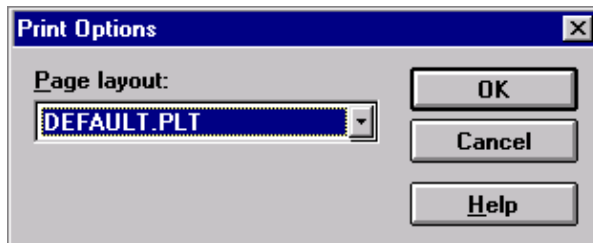


Fig. 41 The Print Options dialog box.

- 4 Select or type the name of the page layout that you want to assign.
- 5 Select <OK> in the Print Options dialog box.
- 6 Select <OK> in the Properties dialog box.

It is possible to assign a page layout to all work sheets in a terminal. To assign the page layout to a terminal, follow the steps for a work sheet, except that you double-click and highlight a terminal instead.

To assign a page layout to the project tree as such, highlight the project icon at the top of the tree, follow the same step 2 to 6 as described above for work sheets.

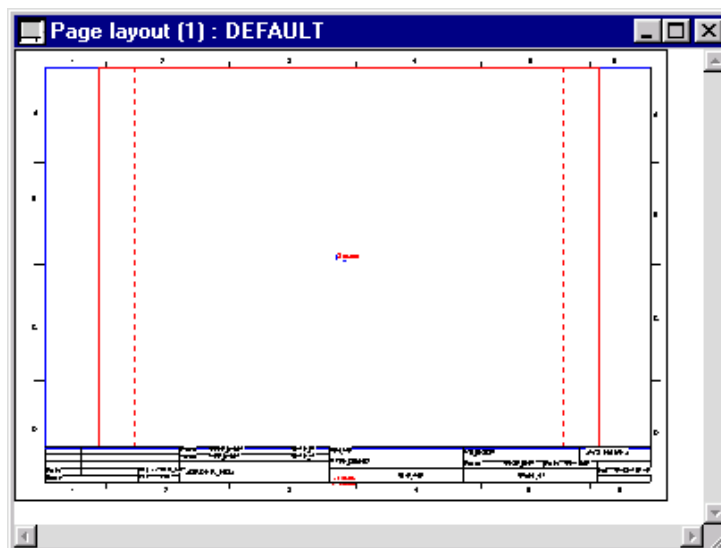


Fig. 42 The default page layout.

17.3

Create a new page layout

Normally you start the page layout work by reusing an old page layout and change it. If however you want to start with a blank page, you can create a new page layout, where you can define everything from the beginning.

☞ To create a new page layout:

- 1 Select 'Page Layout' in the File menu.
- 2 Select 'Open Page Layout'.
- 3 Select the 'New' command in the File menu and an *untitled* page layout is displayed.

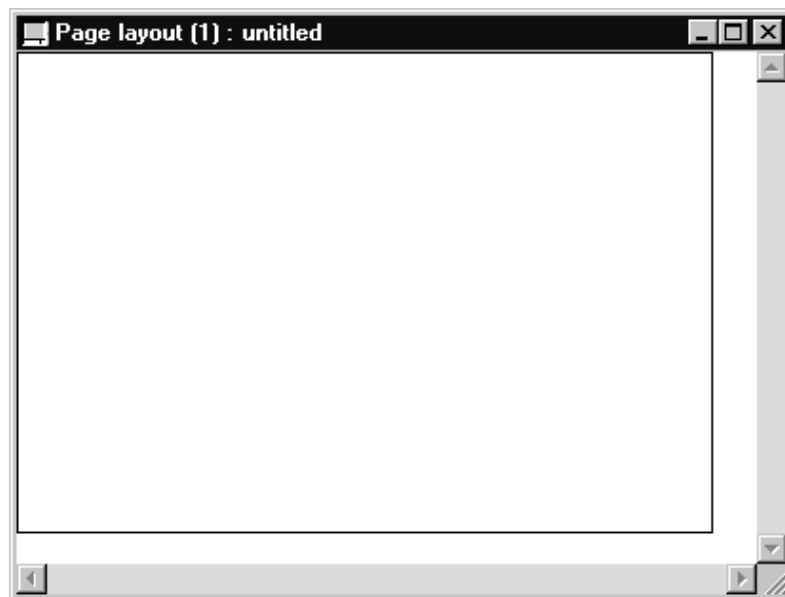


Fig. 43 A new page layout.

Note that you must associate this new page layout with the work sheets that you want to print with this page layout. This is not done automatically when you create the new page layout.

17.4

Copy and insert page layouts

All necessary information for a page layout is stored in several files. Use the 'Copy To...' command to copy this data to another directory. Use the 'Insert From...' command to insert a page layout into a project.

☞ To copy the page layout to the A: drive:

- 1 Select 'Page Layout' from the File menu.
- 2 Select 'Open Page Layout'.
- 3 Select the 'Copy To...' command in the File menu of the Page Layout and the dialog box appears.

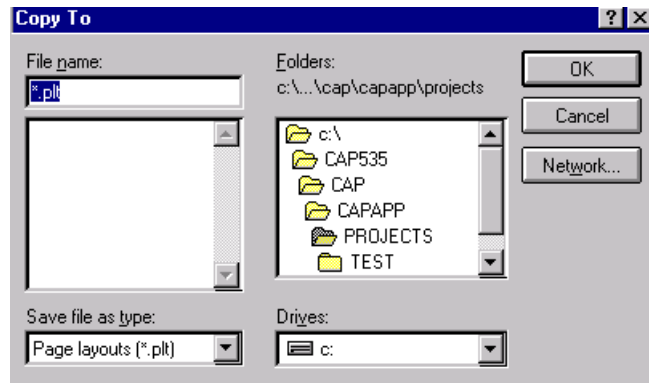


Fig. 44 The Copy To... dialog box.

- 4 Select the A: drive.
- 5 Select a directory and type a name, *.plt file name.
- 6 Select <OK>.

☞ To insert the page layout from the A: drive:

- 1 Select 'Page Layout' in the File menu.
- 2 Select 'Open Page Layout'.
- 3 Select the 'Insert From...' command in the File menu of the Page Layout, and the Insert From dialog box in Fig. 45 appears.

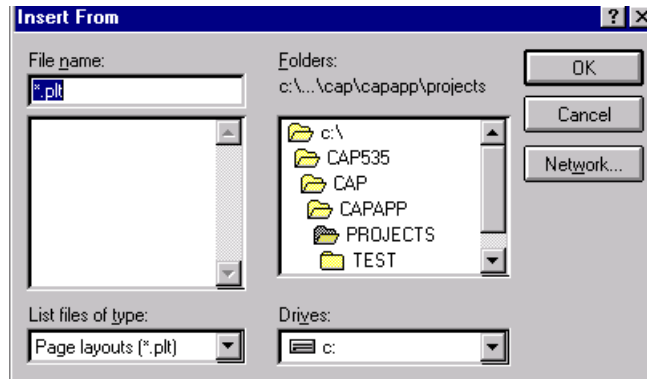


Fig. 45 The Insert From... dialog box.

- 4 Select the A: drive.
- 5 Select a directory and a file name.
- 6 Select <OK>.

18 Edit page layout

After you have created a new page layout, you must define the:


- source area.
- cross reference area.
- part of the source area from where the cross references are taken.

18.1 Source area

The source area is the area where you want to place the contents of the work sheet. It is limited by a red rectangle.

Note!

The size of the source area affects what will be printed on each page. Some function blocks or variables might be cut off if the source area is changed after the configuration is made.

 To define the cross reference area:

- 1 Select the Cross reference area icon on the toolbar, and the pointer symbol becomes a rectangle.**
- 2 Press and hold the left mouse button.**
- 3 Move the cursor across the area that you want to define as the area for cross references.**
- 4 Release the mouse button, and the cross reference area is drawn.**



Note!

If you want cross references shown on both the right and left side of the source area, the cross reference area is drawn so that it covers the entire page, including the source area. See the DEFAULT.PLT for an example.



18.3

Cross references from the source area

Some cross references are shown on the same page as the drawing with the configuration. The remaining cross references are shown on a separate page.

The cross references of the input and output signals that ends close to the left and right side of the source area will be shown on the same page. The signals that ends on the middle of the source area will be shown on extra pages after the last work sheet. The extra pages contain only cross references. Also references that cannot be printed on the left and right legend because of the limited space there, are shown on these extra pages.

The part of the source area from where the cross references on the same page are taken is shown with red dashed lines.

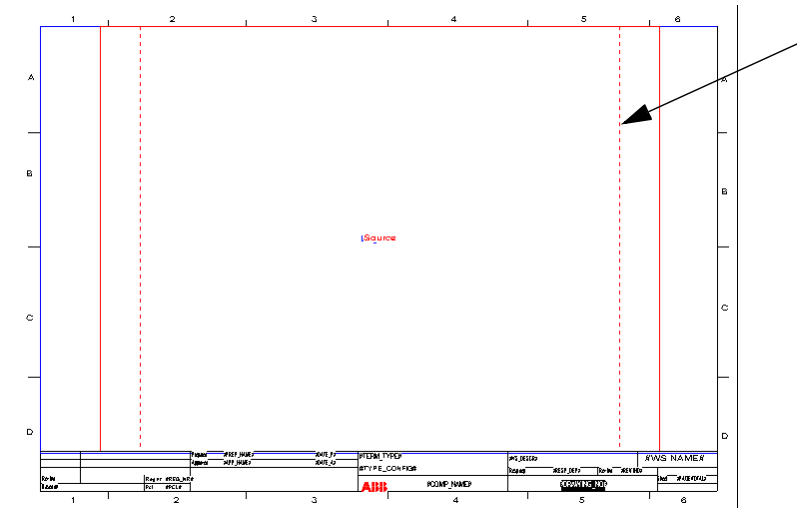


Fig. 47 Page layout with the dashed line for the described part of the source area.


The size of this area can be increased by:

- 1 Mark the source area (click with the mouse in the middle of the source area).
- 2 Double click with the right mouse button (or select 'Object Properties' in the Edit menu).
- 3 Write a higher number in the 'Width of the area' in the 'Left/right cross references' section.
- 4 Press <OK>.
- 5 The dashed lines will be moved.

18.4


Objects

In CAP 531, you can insert different objects on your page layout, for example, lines, rectangles, bitmaps or text.

 To insert a line:

- 1 Select the Line icon on the toolbar, and the pointer becomes the shape of a line.
- 2 Press and hold the left mouse button.
- 3 Move the cursor to draw a line.
- 4 Release the mouse button, and the line is drawn.



 To insert a bitmap:

- 1 Select the **Bitmap** icon on the toolbar, and the pointer becomes the shape of a rectangle.
- 2 Press and hold the left mouse button.
- 3 Move the cursor to area where the bitmap should be located.
- 4 Release the mouse button, and the Insert bitmap dialog window is opened.

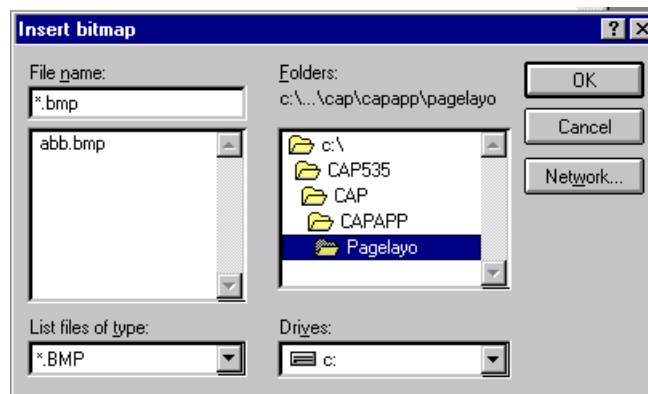


Fig. 48 *Insert bitmap dialog box.*

- 5 Select a bitmap file.
- 6 Press <OK>.
- 7 Change the size if necessary with 'Object Properties' in the Edit menu.

19

Edit environment items

You can insert variable objects into your page layout. These are called environment items or environment variables, such as page numbers, your company's name, and other text. CAP 531 contains standard environment items, which are called system items.

You can create user-defined environment items, and you can add them to the list of standard environment items. You can assign these special attributes (scope) to each environment item:

- All projects
- This project
- Terminal
- Work Sheet

Example:

Assume that an environment item is called *prep_name* (i.e. the name of the engineer preparing the configuration). Let us also assume that almost all the configuration is prepared by *Smith*. The configurations in one terminal was made by *Jones* instead. The environment item *prep_name* would then be given the assigned text Smith with scope Project. This can be done anywhere in the project. The other name must be assigned from the specific terminal. You open one work sheet in the terminal and activate Page Layout in the File menu. Select Environment Setup, modify the assigned text to Jones and change the scope to Work sheet.

Note!

It is very important from where you open the page layout and where you activate the Environment Setup. You see the assigned text and the scope of the items from where you are. If you open the page layout or activate Environment Setup from the Project tree, you only see the layout and setup of the tree, not of the work sheets.



After you edit the environment items, you can insert them into the page layout.

To edit environment items:

- 1 Select the Environment items icon on the toolbar. The pointer symbol becomes a T.**
- 2 Position the pointer in a field, where you want to insert the environment item. The Settings Environment Text dialog box appears.**



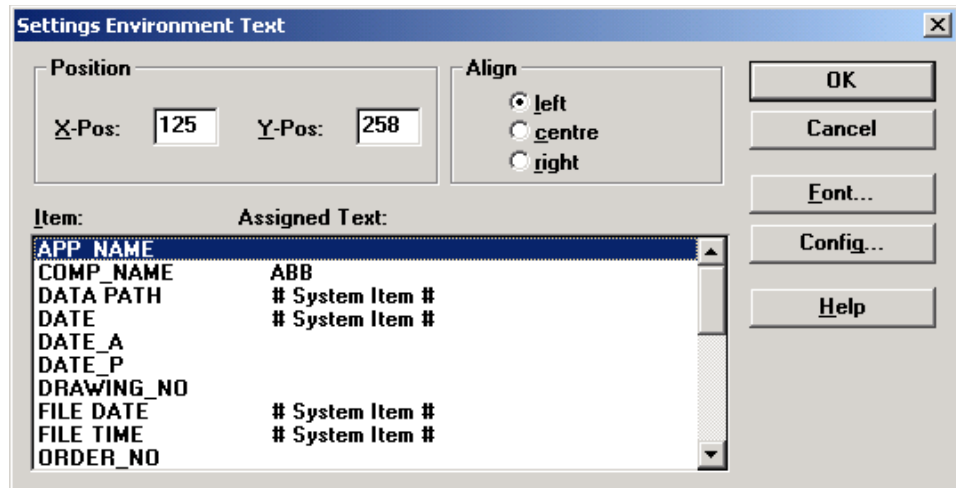


Fig. 49 Settings Environment Text dialog box.

- 1 Select the button <Config...> and the Environment Setting dialog box in Fig. 50 appears.

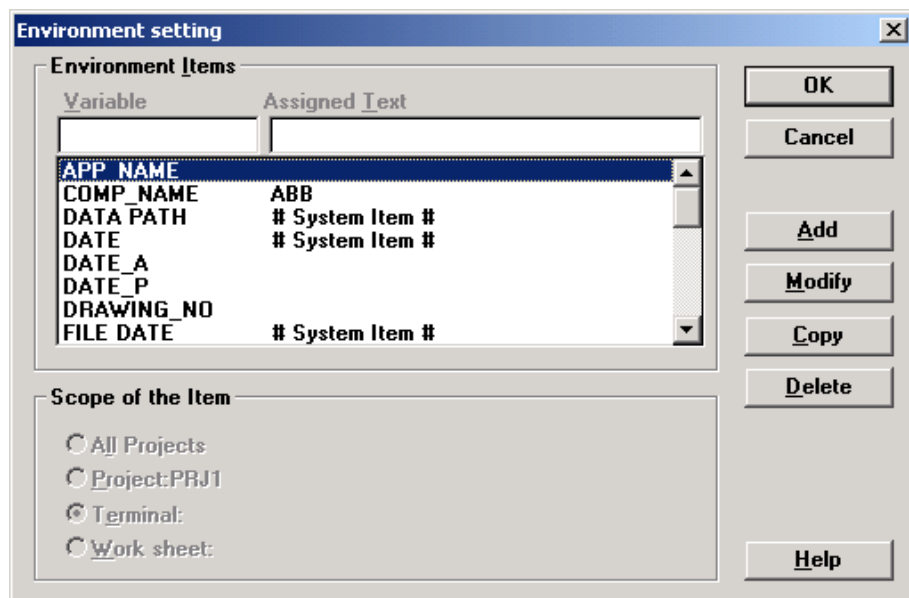


Fig. 50 The Environment Setting dialog box.

☞ To add a new item:

- 1 Select the <Add> button to activate the row above the list box.
- 2 Type *User name* in the Variable field.
- 3 Type *Smith* in the Assigned Text field.
- 4 Change the 'Scope of the Item' to 'All projects'.
- 5 Select <OK>, and the Settings Environment Text appears and the new item is displayed in the list box. Fig. 51

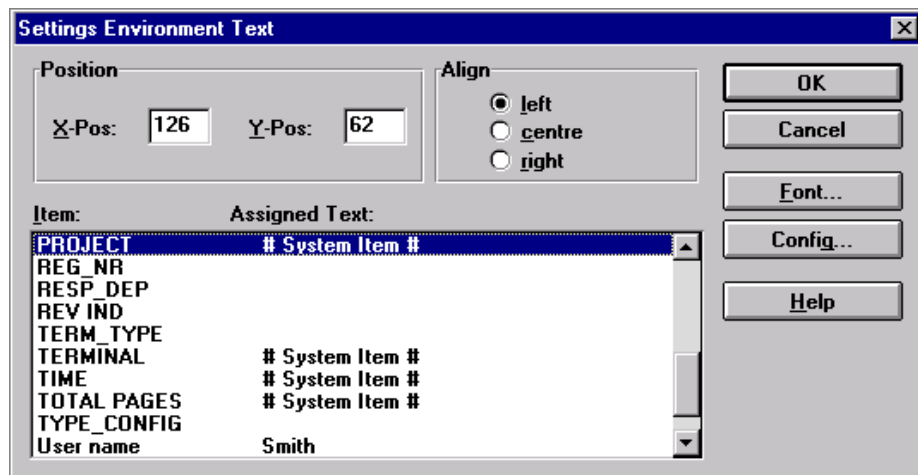


Fig. 51 The Settings Environment Text dialog box with the new item.

☞ To change items:

- 1 Select the item that you want to change from the 'Environment items' list box.
- 2 Select the <Modify> button, and the cursor is displayed in the 'Assigned text' field.
- 3 Type an Assigned text or change the text.
- 4 Change the scope if necessary.
- 5 Select <OK> and the item is changed.

Note that system items can only be changed with the Copy function.

To add items that are similar to existing ones, or to change a system item:

- 1 **Select the environment item that you want to change from the list box.**
- 2 **Select the <Copy> button, and the contents of the selected item will be copied into the Variable and Assigned text fields.**
- 3 **Type a new Variable for the item.**
- 4 **Type a new Assigned text for the item if desired.**
- 5 **Change the 'Scope of the Item' if desired.**
- 6 **Select <OK>.**

The assigned text of the environment item can be seen at print-out and with the 'Preview' function. See the Print chapter for more information.

20 Finish the page layout work

20.1 Save page layouts

Regularly save your work when working with the page layout so that you do not lose data if a power failure occurs.

Assume that you want to save the *untitled* page layout with the name *sample*.

To save page layout changes:

- 1 **Select 'Save As...' in the File menu, and the Save As dialog box appears.**
- 2 **Type *sample* in the file name field.**
- 3 **Select <Save As>.**

20.2 Exit from the page layout

Close the page layout when you finish working with the page layout. A dialog box prompts you to save or discard your changes.

To exit from the page layout:

- 1 **Select 'Close' or 'Close All' in the File menu. If you have not saved the page layout, the dialog box in Fig. 52 appears.**

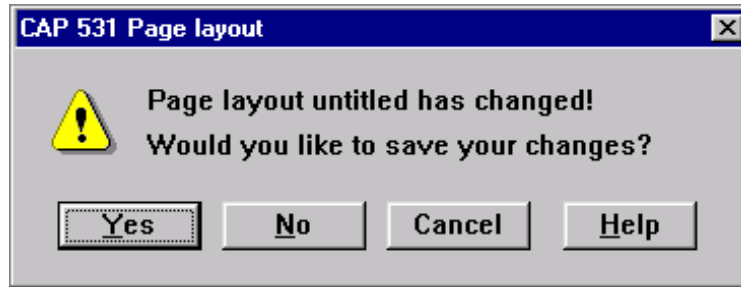


Fig. 52 The CAP 531 page layout dialog box.

21

Print

It is possible to print:

- the project structure.
- all work sheets in a terminal.
- one work sheet.
- one page of a work sheet.

In all cases, it uses the page layout assigned to the work sheet or the project tree. This can be verified with the 'Preview' command in the File menu.

The paper orientation is set in the 'Print Setup' command in the File menu. The paper size and orientation is also affected of the settings in the Page Layout. This is set with the 'Paper Orientation' command in the Layout menu.

21.1

Print work sheets

To print all pages in a work sheet:

- 1 Ensure that the work sheet is in the active window.
- 2 Select the 'Print' command from the File menu.
- 3 Select <Yes> if you want the cross references to be printed.

To print one page in a work sheet:

- 1 Ensure that the work sheet is in the active window.
- 2 Select the 'Preview' command from the File menu.
- 3 Select 'Cross References' if you want cross references to other pages.
- 4 Use the 'Next' button to select page.
- 5 Press the 'Print Page' button and the page is printed.

21.2 Print a terminal

You can print all work sheets in one terminal. It is possible choose if the page numbers should run consecutively in all work sheets or if each work sheet should have its own numbering.

To print a terminal:

- 1 Select the terminal in the project tree.
- 2 Select the 'Print terminal' command in the File menu.
- 3 Select if 'Scope of Page numbering' should be 'terminal' or 'work sheet'.
- 4 Select 'Cross References' if you want cross references between the pages.
- 5 Select 'Print PST Data' if you want to print the parameter setting values for the terminal.
- 6 Select <OK> and the terminal is printed.

21.3 Print the project tree

You can print the project structure.

To print the project tree:

- 1 Ensure that the project tree is in the active window.
- 2 Select the 'Print' command in the File menu, and the project tree is printed.

22 Exit CAP 531

You can exit from CAP 531 at any time. You do not need to close the windows.

If you do not save your changes, a dialog box prompts you to either save the changes or close the windows without saving.

To exit, save your work and then select the:

- 'Exit' menu item on the File menu.
The dialog box CAP 531: Exit appears.

23

Process Terminator

Sometimes when shutting down PST and CAP 531 some processes (program parts) are still running. These remaining processes are interfering the behaviour of PST and CAP 531 the next time these are started. To be able to shutdown these remaining processes, PST is provide with a small application called Process Terminator. The shutdown is straightforward which means that after clicking the Terminate button there are no point of return regarding unsaved data.

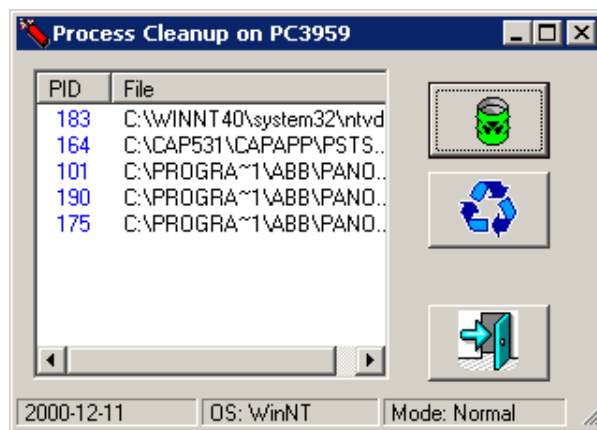


Figure 53: Process Terminator - CAP 531 and PST process terminator.

The application works like the Task Manager in Windows NT with the limitation to only effect the processes related to PST and CAP 531. The GUI comprise of a list presentation of the currently remaining processes related to PST and/or CAP 531, three buttons (Shutdown, Refresh and Exit) and a status bar showing current date, current operating system version and running mode. The title bar is also showing the name of the PC.

CAP 531 is a 16 bits application. On the PC system it is not possible to only terminate CAP 531 of the 16 bits applications. Close all 16 bits applications before terminating CAP 531 in order to not loose data.

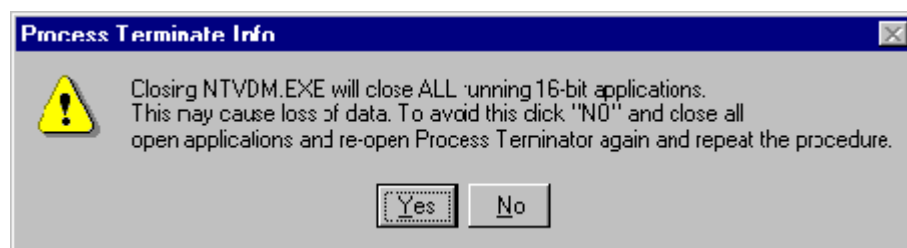


Figure 54: Process Terminate Info.

1 Start-up Process terminator

To start ProcTerm.Exe proceed according to following:

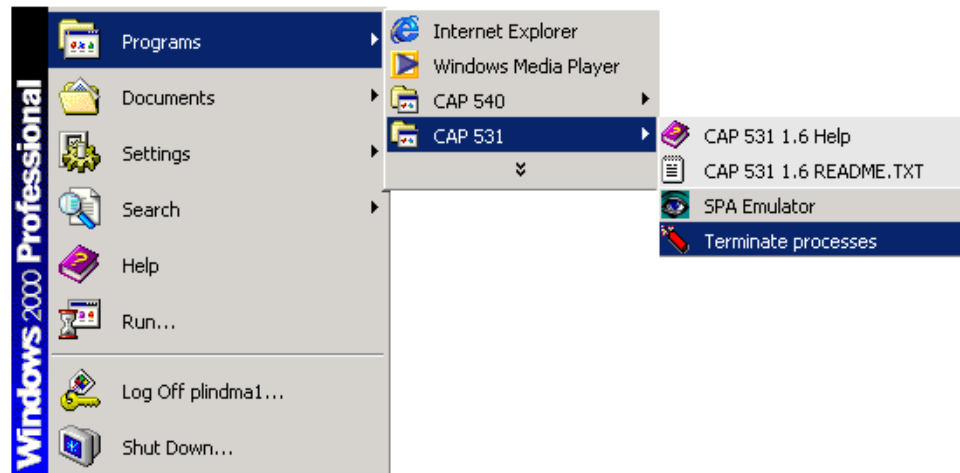


Figure 55: Process Terminator - How to find and start.

An alternative way is to select Program -> PST -> Terminate processes.

2 Process Terminator functionality

When ProcTerm.Exe is started the first appearance is according to the figure below. The appearance is modifiable by resizing the dialog, resizing column widths and to sort order. Sort order is changed by clicking on the column header of the list.

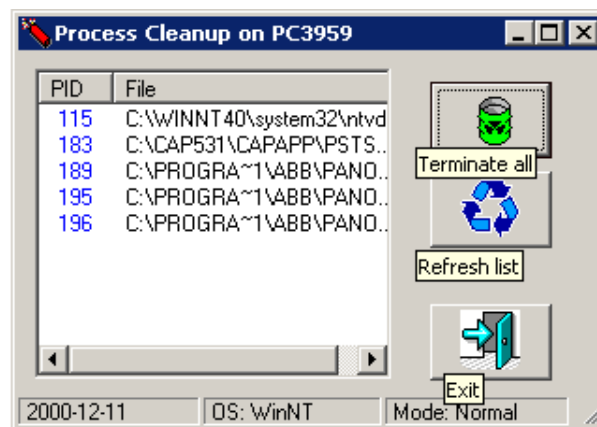


Figure 56: Process Terminator - Push buttons.

Performing shutdown of the listed processes is made by clicking on the Terminate all button. After this is completed the following message is displayed

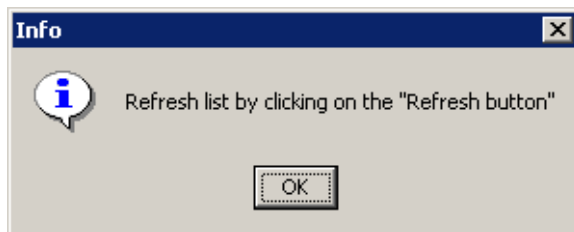


Figure 57: Process Terminator - Refresh message.

After the Refresh button has been clicked appearance is as following, note that Terminate all button is dimmed.

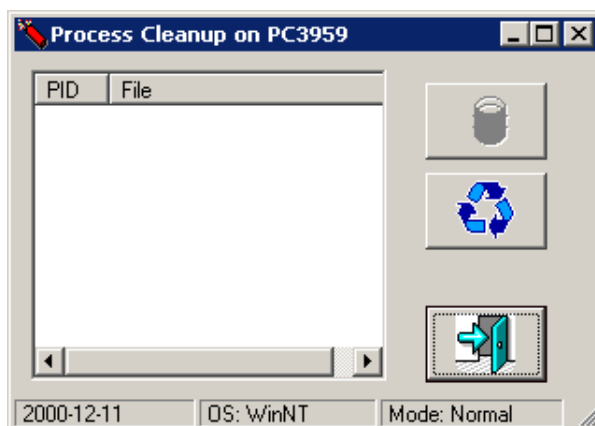


Figure 58: Process Terminator - Refreshed appearance.

3 Windows NT specific behavior

Windows NT executes 16-bit programs in a specific way. There is a special process called NTVDM.EXE which handles all 16-bit programs. When the Process Terminator shuts down CAP 531 and PST programs it also looks for the NTVDM.EXE process to be able to shutdown CAP 531 which is a 16-bit program. Because other 16-bit programs may be running the shutdown of the NTVDM.EXE program is prompted

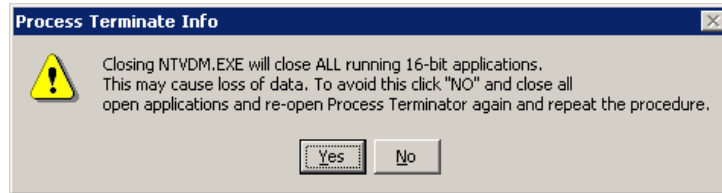


Figure 59: Process Terminator - Confirmation dialog.

At this point there is a possibility to skip, by select No in the message box, the termination of the remaining CAP 531 processes and save unsaved data for the other 16-bit programs. After this return back to the Process Terminator to repeat the shutdown.

General Information

This chapter describes the CAP 531 program entries, the CAP 531 interface and its different views.

1

The CAP 531 program entries

After you have installed CAP 531 via the CAP 540 tool package, the following program entries are available in the start menu under Programs\CAP540:

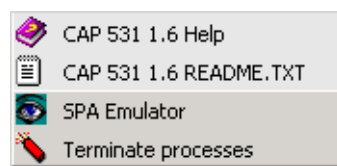


Fig. 1 CAP 531 program entries.

Icon	Description
CAP 531 1.6 Help	Activates the general help.
CAP 531 1.6 README.TXT	Provides updates on changes since the last version and describes new features. Also describes how to use previous projects in the new version of CAP 531.
Show Information	Versions and revisions of Substations Automation Tools, libraries and components.
SPA Emulator	Activates the SPA emulator for a simple test of the communication with the terminal.
Terminate processes	See "Process Terminator" on page 76.

2 The CAP 531 interface

As shown in Fig. 2, the CAP 531 interface consists of these parts:

- Menu bar
- Toolbar
- Main screen
- Status bar

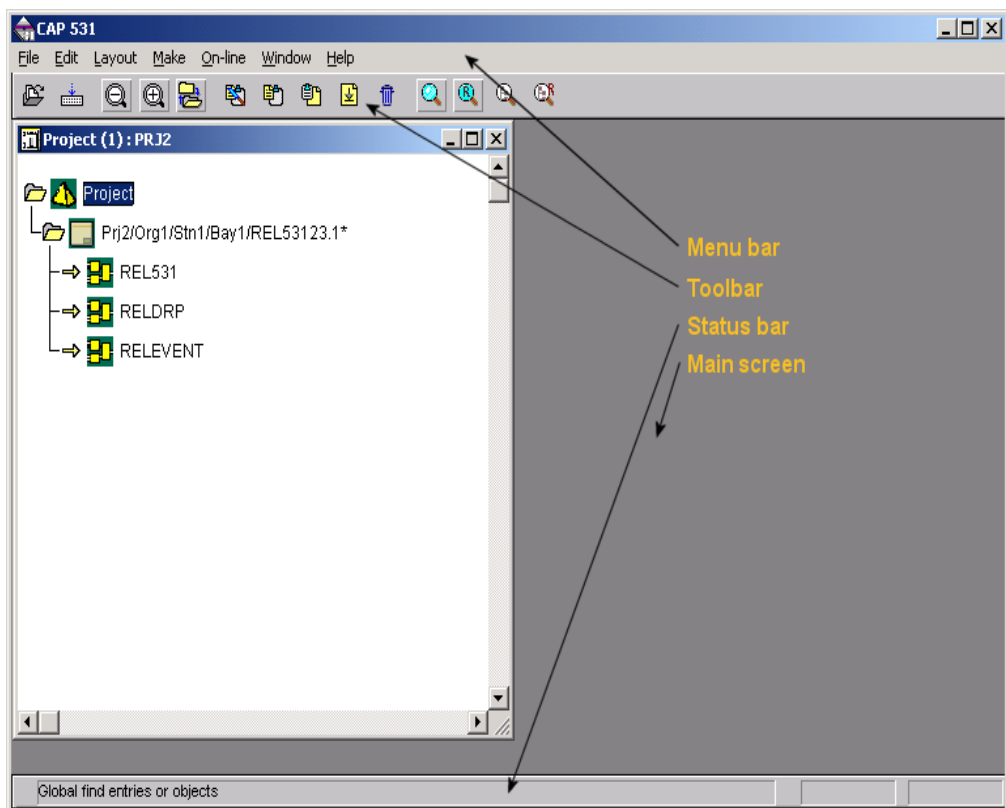


Fig. 2 User interface of CAP 531.

2.1

Menu bar

The menu bar contains these menus:

Menu	Usage examples
File	Password definition, access the page layout of the view. Preview and print a document. Exit CAP 531
Edit	Insert work sheets, generate templates, find and replace. Open the Function Selector and start of the Parameter Setting Tool.
Object	Insert objects that you can work with in the project tree, work sheet or page layout. This menu is only available when a work sheet is active.
Layout	Design your screen. Add page borders or insert a grid to better align objects in your work sheets.
Make	Start project compilation and other functions after your configuration work.
On-line	Upload and download commands. Enable debug mode.
Window	Arrange the windows and icons on your screen.
Help	Activate the on-line help.

The available menus and commands differ depending on the selected level in the project tree and also depending on the present view. The context-sensitive help explains exactly where different menus are available.

2.2

Toolbar

Click on the toolbar icons to quickly execute frequently used commands rather than selecting menus and commands from the menu bar. The toolbar is located below the menu bar.

The general part is always there while some of the icons from the specific part differs for every view. The context-sensitive help displays the name of each icon.

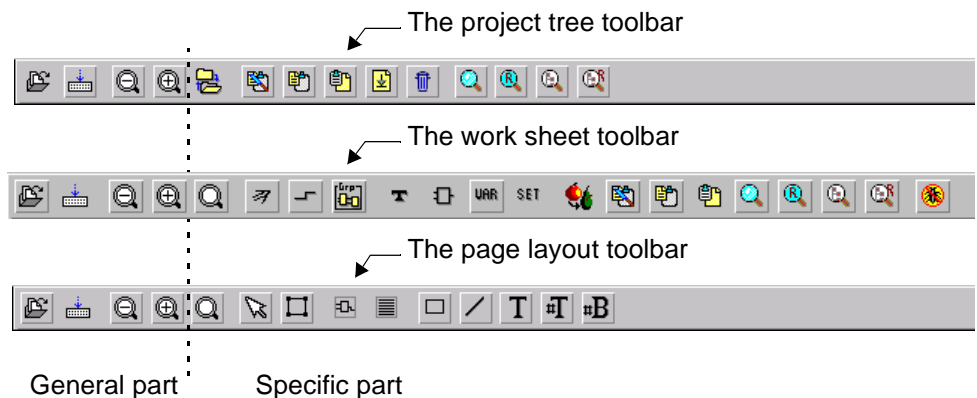


Fig. 3 The different toolbars in CAP 531.

2.3

Status bar

When you work with CAP 531, the status bar displays different information in different fields on the status bar:

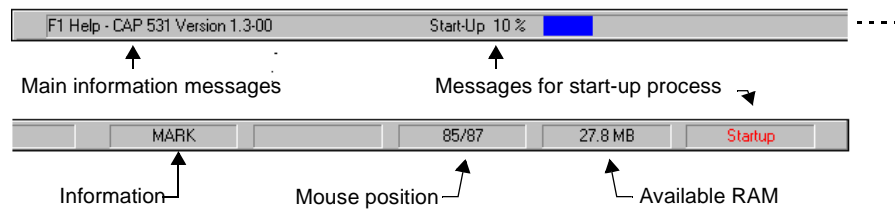


Fig. 4 Status bar.

3

CAP 531 views

CAP 531 comprise these views:

View	Used to...
Project tree	Organize terminal and work sheets.
Work sheet	Create the configuration, use debug at commissioning.
Page layout	Create drawing forms for printed pages.

3.1

Project tree

The project tree can have these levels:

- Project (always top level)
- Terminal
- Work Sheet

From the project tree menu bar and toolbar, you can insert and copy work sheets, and use find and global find.

If the terminal icon has a red cross, then CAP/REx 5xx program module is not installed, or the terminal type has no relevance in CAP 531. So you cannot work on that terminal type.

3.2

Work sheet

The configuration work is done in work sheets. All functions available in the terminal can be represented as function blocks in the work sheets. Connections between different functions on one sheet are drawn as lines between the function blocks.

From the work sheet menu bar and toolbar, you can perform actions, such as cut and paste, and find and replace to quickly create configurations.

You can debug the configuration in the work sheet. This is an on-line function that displays all signal levels of all internal signals in a terminal with different colours of the lines in the work sheet.

3.3

Page layout

The page layout is the template used for the configuration drawings. Use the page layout to adjust the drawing format of the work sheet pages that you print. For example, you can adapt the header and footer, you can insert order number, terminal type, names, the printing date and time, or bitmap files.

You can also create different sets of objects (environment variables) that are used by a specific project or user. You use environment variables to assure that correct information is printed on all pages in the project. They are also used to avoid the work to type the same information on the page layout for each work sheet.

From the page layout menu bar and toolbar, you can perform actions, such as cut and paste and find and replace. The Preview command on the File menu lets you view the results of your work before you print it.

You can assign a specific page layout to an active project tree or a single work sheet.

Project tree

This chapter describes the project tree functionality and how to select functions, update versions, compile terminals, compare configurations and work on-line.

4

Icons in the project tree

The project structure is displayed as a tree, see Fig. 5. When you work with a project, the project tree is always open.

Icons within the project tree indicate the corresponding project tree levels, which are:

- Project (always top level)
- Terminal
- Work Sheet

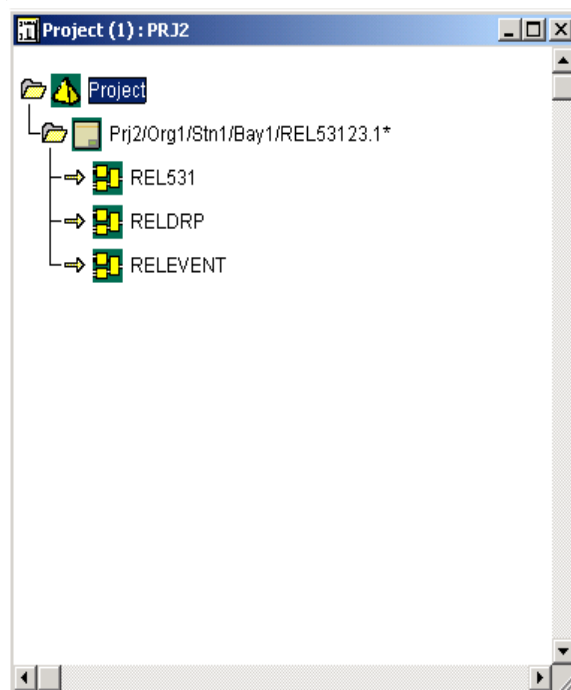








Fig. 5 An example of a structure in the project tree.




4.1

Level Icons

Icon	Icon name	This icon represents...
	Project	The project. This is always included in a new project. To display or hide the lower levels, double-click left mouse button on the icon.
	Terminal	The terminal. The same icon is used for all types of terminals. It is therefore necessary to type the terminal type in the name.
	Work sheet	The work sheet. The configuration of a terminal is always done in a work sheet, organized inside the terminal in the structure. The work sheet name is displayed beside this icon. To edit a work sheet, double-click left mouse button on the icon.
	No terminal	No terminal. The correct terminal library is not installed for the corresponding terminal. Install the correct CAP/REx5xx program module.
	Project not complete	A project tree imported from SMS is not complete.
	Undefined	The level is not defined.

4.2

Information icons

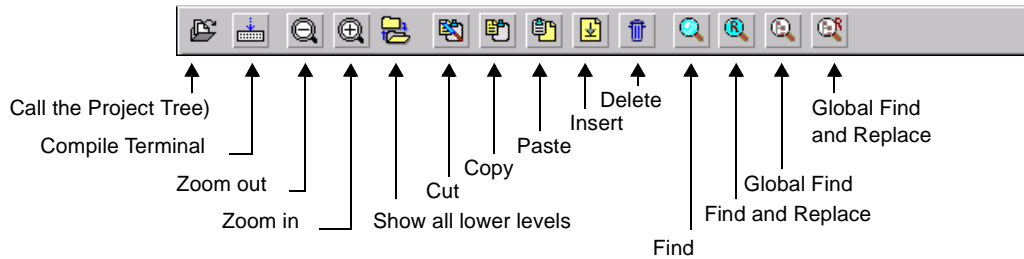
Icon	Indicates that...
	All lower levels are visible. To hide all lower levels, double-click left mouse button on the icon.
	All lower levels are hidden. To display all lower levels, double-click left mouse button on the icon.
	There are no lower levels.

Icon	Indicates that...
✱	The asterisk appears at the terminal name and the work sheet name. Changes in the current work sheet are not compiled. Compile the terminal and the asterisk (✱) will disappear.

5 Toolbar and menu bar

5.1 Toolbar

The toolbar contains icons to get quick access to frequently used functions. They are a complement to the menus or shortcut keys.



The icons on the toolbar are explained in the menu bar chapter.






5.2 Menu bar

5.2.1 File Menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Passwords			Change or insert password for user's with a lower access level to the project.
Page layout			Open page layout shows the page layout of the project tree. Use this to design a drawing form for the tree. Environment setup lets you change, for example, the date, company name, document number.
Preview			Start the page preview function, which shows you how the pages will look like when they are printed.
Print		<CTRL> + <P>	Print the project tree with the page layout for the tree.
Print terminal			Print all work sheets in an entire terminal. Optional also the PST data is printed.
Printer setup			Switch to another printer or select a different format. CAP 531 supports all printer setups in the Windows program manager. CAP 531 page layouts are based on the A4 size. So the results may be distorted if you use a printer with another format.
Exit		<ALT> + <F4>	Quit CAP 531. After your selection, the standard CAP 531 Exit dialog appears.




5.2.2

Edit Menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Insert		<INSERT>	Insert work sheets in the project tree.
Generate template			Save the contents of an entire terminal configuration. This lets you reuse the configuration on other computers.
Insert template			Insert the contents of an entire terminal configuration, which you saved with the generate template command.
Find			Search for a name or a character in an item name in the project tree.
Find and replace			Search for a name or a character in an item name in the project tree and replace it.
Global find			Search for a name or a character in any work sheet in the selected terminal.
Global find and replace			Search for a name or a character in any work sheet in the selected terminal and replace it.
Function selector			Start the function selector
Terminal options			Import a list of functions available in a certain terminal.
Parameter settings			Start the parameter setting tool (PST).
Object properties		<ALT> + <ENTER >	Change name and other properties of the selected item in the project tree.


5.2.3

Layout menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Toolbar			Hide or display the toolbar. If this menu item is checked, then the toolbar is displayed.
Status bar			Hide or display the status bar. If checked, the status bar is displayed.
Zoom in		Num < + >	Increase the scale of the active window.
Zoom out		Num < - >	Decrease the scale of the active window.
Previous view		Num < / > or Num < ÷ >	Switch to the previous view.
Default size		Num < * >	Switch to the default size from an increased or decreased size so that the project tree is displayed in the default size.
Redraw		<F3>	Rebuild the content of the active window on the screen.
Expand sub-tree		<#>	Hide or display the sub-tree. If checked, the sub-tree is displayed.

5.2.4

Make menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Compile all			Compile an entire project, which means that you compile all terminals in the entire project. Normally, this is not used.
Compile terminal			Compile the selected terminal.
Update version			Update the selected terminal's library. The library's contents will be reorganized to account for the new set of function blocks that can be used in the terminal.
Detect warnings			Display or hide warnings in the error list.

5.2.5

On-line menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Upload options			Upload the table of functions from the terminal. This table of functions file includes all information about available functions in the terminal.
Download configuration			Download the graphical configuration in CAP 531 to the terminal.
Upload configuration			Upload the graphical configuration to CAP 531 from the terminal. This function is not always supported by the terminal. This depends on the type of terminal.
Compare configurations			View differences between the terminal configuration and the graphical configuration in CAP 531.
Setup			Show the communication setup for work on-line with the terminal.

5.2.6

Window menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Tile			Arrange all open windows side by side.
Cascade			Arrange the windows so that they overlap (starting in the upper-left corner of the CAP 531 window). The title bar of each window remains visible.
Arrange symbols			Arrange the icons that are created if you minimize the windows.
Error list			View the error list if it is hidden. You can only show it if errors or warnings were detected.
Window list			Switch to a different open window. Select the window name that you want to be active.

5.2.7

Help menu seen from the project tree

Menu item	Icon	Short-cut key	Select this command to...
Contents			Open the table of contents of CAP 531 help.
Index			Open the Index of CAP 531 help.
Current object			Obtain help on a selected object.
Current window			Provide help on the active window.
About CAP 531			Read information about CAP 531 such as version number and copyright information.

5.3

Other short-cut keys

You can perform general actions by using shortcut keys and key combinations.

To	Press
Access help	<F1>
Exit CAP 531	<ALT> + <F4>
Go to parent/child level	<<> or <>> keys
Move up/down in the tree	<↑> or <↓> keys
Move to items on the same level	<CTRL> + <↑> or <↓> keys

6 The project tree functions

6.1 Project structure

You build up the project structure in CAP 540.

The project tree items can be:

- Terminal
- Work Sheet.

6.2 Password handling

It is possible to set the access right to a project so that it is possible to restrict the rights to change the configuration of a project. The access level in the object properties are related to the password handling.

If a user has a certain access level, it is possible to access the items with the same access level or higher.

The access levels can be separated with different access to the system rights concerning:

- Change project
- Download project
- Debug on-line
- Add/change password

In general, the password access levels are such that a user with an access level set to 1 has access to all items with a higher access level. If a user only has an access level set to 10, this person can only access the items with access level 10 or higher. So the lower the value, the more rights.

All projects are password protected. A new project always has password 'NEW'. It is then up to the creator of the project to change this password and to build up more access levels for other types of users that should not have the same access rights to the entire project as the person who created the project.

It is possible to set different access levels to different work sheets. You can also set an access level to the terminal that is different from the access level of the work sheets of that terminal.

Example 1:

A terminal is given access level 5. The terminal has two work sheets, WS1 and WS2. The access level of WS1 is set to 1, and the access level of WS2 is set to 5. All system rights are set equal for the two users.

Now if a user has access level set to 5 (linked to the password), the user can change:

- Terminal name.
- Page layout of the entire terminal with all its work sheets.
- Configuration in WS2.
- Access level for the terminal or WS2 to a higher value than 5.

But the user don't have any change possibilities (read-only) in WS1.

The user with access level set to 1 has all the possibilities above, but is also allowed to make changes in WS1.

Example 2:

A terminal is given access level 1. The terminal has two work sheets, WS1 and WS2. The access levels of the work sheets are set to the same as in the previous example: WS1 set to 1, WS2 set to 5. All system rights are set equal for the two users.

Now if a user has access level set to 5, the user can change:

- Configuration in WS2.
- Access level for WS2 to a higher value than 5.
- Page layout for WS2.

But the user don't have any change possibility when it comes to terminal name, page layout for the terminal, nor any change possibilities in WS1.

6.3**How to move configurations from CAP 531*1.3 or CAP 535 to CAP 540**

If you have a project tree, compressed project or a template.

- Project tree: Use Import CAP 531 Configuration in the file menu of CAP 540, reference [2]. See "Reference publications" on page 167.
- Compressed CAP 531/CAP 535 project: Decompress the project in CAP 531/CAP 535 and use Import CAP 531 Configuration in the file menu of CAP 540, reference [2]. See "Reference publications" on page 167.
- Template: Add a terminal module in CAP 540 corresponding to the template see 6.7 Insert template.

6.4 Insert items

The only item to insert is work sheet. To insert an item, you activate the 'Insert' command in the Edit menu. This dialog box appears when you insert an item.

Table 1: The fields in the dialog box.

Field, button, or checkbox	Description
Name	Specifies a name for the item. You can only use characters that are allowed in MS-DOS. A name can have up to 50 characters.
Print options...	Starts the Print Options dialog box.
Mode	Specifies if the new item will be inserted above, below or inside the current item.

6.5 Cut, copy and paste

It is possible to use cut, copy and paste work sheets in the project tree. The items that are pasted into the tree are always placed below the marked item. Cut, copy and paste also affects PST data when applicable.

6.6 Delete items

Use this function to delete work sheets in the project tree. Select the:

- 1 **Select the work sheet that you want to delete.**
- 2 **'Delete' command, and the delete dialog box will appear.**

6.7 Insert template

Use this function to insert an entire terminal configuration. This configuration can be:

- an example configuration
- a standard configuration already prepared
- a configuration coming from another project or terminal within the project.

The example configuration is in some cases delivered with the CAP/REx 5xx program module. This example configuration is similar to the standard factory configuration of the terminal. Note that there might be differences between the configuration of a certain terminal and the example configuration delivered with the CAP/REx 5xx program module. When a standard configuration is prepared, save it with the 'Generate template' command.

How to insert a template:

- 1 Select a terminal.
- 2 Select the 'Insert Template' menu item, the Insert Template dialog box appears.

Table 2: Use this dialog to select a stored terminal template.

Field, button, or checkbox	Description
Terminal type	Specifies the terminal.
Templates	Specifies the terminal template.
Description	Displays the comment for the template.

Note!

To activate the 'Insert Template' menu item you must select an empty terminal without work sheets.

The templates in CAP 531 and in the parameter setting tool are handled separately. The ones in CAP 531 cover only the configuration for a terminal, not the parameters.



6.8

Generate template

Use this function to save an entire terminal configuration. This lets you reuse the configuration in other projects. It is also possible to create a standard configuration for a certain type of terminal that can be used as a base for further configuration adaptations to the specific application. How to generate a template:

- 1 Select a terminal in the project tree.
- 2 Select the 'generate template' command in the edit menu, and the generate template dialog box appears.

Table 3: The fields in the dialog box.

Field, button, or checkbox	Description
Terminal type	Specifies the type of terminal to copy the template to. The default type is recommended.
Template name	Specifies the name of the template.
Description	Gives a description of the template. This description is displayed in the Insert Template dialog box.

**Note!**

The templates in CAP 531 and in the parameter setting tool are handled separately. The ones in CAP 531 covers only the configuration for a terminal, not the parameters.

6.9**Change the object properties**

Properties of an object implies more information about the object.

This can be:

- Name of a work sheet
- Printing information
- Access level

To change the properties for an object you can:

- Double-click the right mouse button on the desired object.
- Select the object and then select the 'object properties' in the edit menu.
- Select the object and then press <ALT> + <ENTER>.

The object properties dialog box will then appear.

Table 4: The fields in the object properties dialog box

Field, button, or checkbox	Description
Name	Specifies the name of your object.
Print options...	Opens the print options dialog box, where the page layout is associated.
Access level	The access level for the object. The access level is related with the password.

7 Function selector

With the Function Selector tool you can adapt parts of the library to functions available in the terminal. For some functions, the function block will have different shape depending on the selected options in the terminal.

7.1 Select functions and options

When you start to work with the configuration of a terminal, it is important that you use the correct set of functions. This is done by running:

- 1 Upload options
- 2 Function selector

If the terminal is available, you should connect the PC to the terminal and run upload options. This function reads the program module of the terminal. After running upload options, the program module in the PC will match the library of the terminal when it comes to most of the functions. The rest of the functions will be updated with the Function Selector tool, where you can select to use data read from the terminal (during upload options) as input.

If the terminal is not available, you run function selector.

Note!

Not all types of terminals use function selectors. For these terminals, it is enough to run upload options in order to obtain a program module that matches the one in the terminal.



Use the function selector tool before you start configuration of the terminal.

Function selectors are used to select one of many possible function blocks for the same function, e.g. input/output modules. The I/O module at a certain slot in the terminal can be of different types. The different types of I/O modules are represented by different types of function blocks.

7.2 Change the function selectors

Input data to the function selector tool can be:

- Working data — last saved data for this terminal
- Uploaded data — comes from the terminal at upload options
- Default data — presented the first time for each terminal

When the CAP 531 is started, the default data of the terminal is shown as working data. The CAP/REx 5xx program module specifies the default data for the corresponding terminal type. Default and working data are equivalent before the working data is changed. Uploaded data consists of the terminal function selectors. Uploaded data is available after you run upload options from a terminal.

Här ska det in något om TERMINAL OPTIONS; Pernilla kommer med det.

7.3 Menu bar in function selector tool

7.3.1 File menu

Menu item	Select this command to...
Load	<p>Import other function selector data than the ones displayed in the function selector tool.</p> <p>You can select between:</p> <ul style="list-style-type: none"> - Working data. - Uploaded data. - Default data. <ul style="list-style-type: none"> • Working data will present the latest stored function selectors for this terminal. • Uploaded data will present the function selectors uploaded from the terminal at upload options. • Default data will present the default function selectors that are included in the CAP/REx 5xx program module corresponding to the terminal.
Save	Save the function selectors settings. The same function as the save button.
Exit	Quit the function selector tool.

7.3.2 Edit menu

Menu item	Select this command to...
Undo	Undo your last action.

8 Update version

8.1 Changes in the program module

If the version or the contents of the program module change, either in CAP 531 or the terminal, you have to run 'update version'.

Examples of situations when the program module changes are when you:

- install a new version of the CAP/REx 5xx program module.
- run the 'function selector' tool and change data.
- insert a template into the terminal.
- run 'upload options' and a new set of functions are uploaded.

In most cases, 'update version' is performed automatically by CAP 531, but in some cases you must run 'update version' manually. This is mainly when a new CAP/REx 5xx version is installed. If you need to run 'update version', a message is displayed.

8.2 Update version

A REx 5xx terminal has several options defining which functions will be available in a specific terminal. By default, a CAP/REx 5xx program module contains the complete set of functions, both basic and optional, of a REx 5xx terminal. To match the program module in the CAP 531 with the program module in a certain terminal you must upload the terminal options.

☞ To update versions manually:

- 1 **Click on the terminal in the project tree to select it.**
- 2 **Select 'update version' in the make menu.**



After 'Update Version' is executed, you might get an error list that indicates that some function blocks were changed.

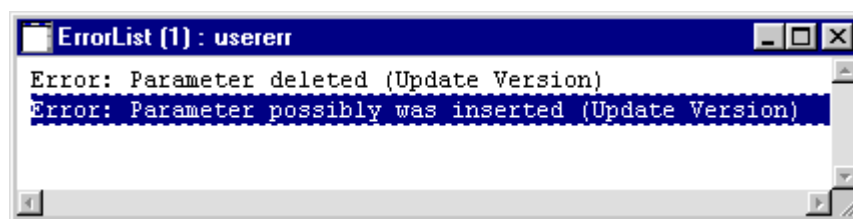


Fig. 6 Example of an error list that contains errors that occurred after Update Version is run.

Go through the list by double-clicking on each of the errors. The program will open the work sheet and indicate the parameter or the function block involved.

Run 'update version' again when the errors are corrected. The program module is updated if no errors occur during the update.

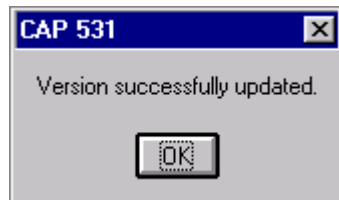


Fig. 7 Confirmation box, updating was successful.

9 Compilation

9.1 The compilation process

To compile means to translate and transform work sheet contents into special code that can be downloaded to -and understood by- the terminal. To link means to create connections among the work sheets and to store the results, which you download to the terminal.

The linking will be performed automatically after the compilation.

Compilation occurs in several stages:

- 1 Different work sheets are compiled.
- 2 The compiled work sheets are linked.
- 3 The terminal code is generated.

Table 5: These principles apply during compilation:

If...	Then...
You select 'Compile all'	The specific terminal is compiled.
You select 'Compile terminal'	The specific terminal is compiled.
CAP 531 detects an error in the configuration or other external problem	Compilation stops, and the error list is displayed. Use this list to locate and correct errors.

9.1.1 Compile a terminal

You must compile the terminal if one or more work sheets in the terminal have been changed. Changed work sheets are marked with a star next to the work sheet name in the project tree.

'Compile terminal' command:

- 1 Select the terminal you want to compile in the project tree.**
- 2 Select the 'compile terminal' command in the make menu.**

9.1.2 Correct errors with the error list

Compilation stops and the error list with messages is displayed if:

- The compiler encounters programming, memory, or file errors.
- Compilation process is aborted by user.

All errors are linked to context-sensitive help. Select an error from the error list, press <F1>, and the help topic is displayed with an explanation of the error and different possible solutions to correct it.

To find and correct errors in the configuration after compilation:

- 1 **Double-click left mouse button on the error in the error list, the work sheet containing the error will be opened and the error is highlighted.**
- 2 **Correct the error and repeat until all errors are corrected.**
- 3 **Compile again to see if any new errors are detected.**
- 4 **Repeat until the compilation gives the text 'code generated successfully' at the status bar after compilation.**

The error list is always available in the Windows menu. The switch 'detect warnings' in the make menu is normally switched off. When all errors are detected, it is recommended to switch on 'detect warnings' and run a new compilation. The error list will now also include the warnings.

9.1.3

Common errors

Common error messages from the compilation process are:

Error message	You should...
Input parameters not connected	Connect the input to an output or to a fixed signal, such as true or false (1 or 0) defined as output variables from the function block fixed signals
Variables not connected	Type the correct name either for the input variable marked by the error list or the output variable that is to be connected to the input variable. The linker cannot find the output variable for this input. The output variable might be misprinted or forgotten.



Note!

If the compilation error comes from a misprint or a forgotten variable, it is always the input connection that is marked in the error list. The misprint might however have occurred either on the input or on the corresponding output connection.

10 On-line tasks

10.1 Introduction

CAP 531 lets you:

- Download the configuration to a specific terminal.
- Upload the terminal library contents, including information of the terminal library version and available functions in the terminal.
- Upload configuration graphics, if this is supported by the terminal
- Debug the configuration.

All on-line functions require that the PC is connected to a terminal. This is done via the serial COM-port of the PC. Connect to either the front port or a rear SPA-port of the terminal.

10.2 Communication setup

Before any communication with a terminal can start, the communication setup must be correct. This is done from CAP 540 see reference [2]. See “Reference publications” on page 167. The most important parts of the setup that the user must check are:

- Baud rate
- Slave number
- COM port

These parameters must be set in both the CAP program and in the terminal, and they must be identical. If they are different in the CAP program and in the terminal, there will be no communication.

The user selects if the PC will be using the front or the rear port of the terminal by setting the flow control parameter to ‘RTS-idle’ (for front port) or ‘None’ (for rear port). The default setting is adapted to front communication.

10.2.1 SPA emulations

It is possible to make a simple test of the communication with the terminal. You use a SPA emulator to do this:

1 Start the SPA Emulator

You find it in the start menu under Programs\CAP 531.

2 Set up your communication parameters and click Send Signal

3 Type RF in the Message to send window and click Send

If the communication works correctly, the ‘messages received’ window will show the sent out signal to the left, and the reply from the terminal to the right. The reply from the terminal will be its type designation (e.g. REL511).

If the communication doesn’t work, the slave message will be ‘time out’.

Note!

The SPA emulator does not support modem connection.



10.3

Upload options and function selectors from a terminal

To prevent from using function blocks in CAP 531 that are not available in the terminal, you can upload the list of installed functions and the function selectors from the terminal.

To upload the list of installed functions and the function selectors from a terminal:

- 1 Select a terminal in the project tree.**
- 2 Select the ‘upload options’ command in the on-line menu, and the upload will start.**

Upload procedure:

- 1 The list of functions and the terminal version number are uploaded from the terminal.**
- 2 CAP 531 checks if the version number is the same as in the configuration.**
- 3 If the version numbers don’t match, a dialog box informs you about the differences, waits for acknowledgment, and then checks if the contents are the same.**
- 4 If the contents match, you are told this, and nothing further happens.**
- 5 If the contents don’t match, then a message box appears asking you if you want to replace the list of functions in CAP 531.**
- 6 Update version starts automatically.**

If functions are included in a work sheet that are not available in the terminal, an error list appears.

10.4**Download configuration to a terminal**

After compilation the configuration can be downloaded to the terminal.

To download the new configuration to the terminal:

- 1 Select a terminal in the project tree.**
- 2 Select the 'download configuration' command in the on-line menu.**
- 3 Select the download PST configuration check box if you also want to download the parameter settings data.**

Download procedure:

- 1 The list of functions and terminal version are uploaded from the terminal.**
- 2 CAP 531 checks if the version number and the contents of the list of functions are the same as in the configuration. It is also checked that the serial number of the terminal is the same as during the last communication with this terminal.**
- 3 If the list of functions match, then the download starts.**
- 4 If the list of functions differ, a warning message is displayed and the download procedure should be interrupted with <Cancel>. Run 'upload options' first. Then you start the download procedure again, and no warning message will appear.**

Note that the program compares the list of available functions of the terminal with the complete list of function blocks of the selected terminal in the project tree. The complete list comprise not only the function that are used in the work sheets, but also the function blocks that still remains unused in the selection function list.

- 5 Uploading of the configuration for verification purpose starts automatically.**
- 6 If the download was unsuccessful, list of differences will appear. Then start the downloading process once again.**
- 7 If download PST values is selected, also all parameter setting values are written to the terminal.**

The checkbox read back all values after a write to terminal, is used as for the command `online|write|all` in the PST.

See reference [1] for further information. See "Reference publications" on page 167.

- 8 The graphics is downloaded, if the terminal supports it.**

10.5

Upload configuration

For the terminals that supports storing of the graphics in the terminal, the configuration can be uploaded to the PC.

To upload the configuration from the terminal:

- 1 In the project tree, insert a terminal of the type you want upload the configuration from.**
- 2 Set up the communication parameters for the terminal.**
- 3 Select the terminal in the project tree**
- 4 Select the 'Upload Configuration' command in the On-line menu.**

Upload procedure:

- 1 First there is a check that the terminal type is the same as in the project tree. It is also checked that the serial number of the terminal is the same as during the last communication with this terminal.**
- 2 A check is made that there is a graphical file stored in the terminal. If not, you get an error message.**
- 3 The graphical file is read. If there are errors during the reading, you get an error message and the procedure is interrupted.**
- 4 When a the graphical file is successfully read, you can start using the work sheets for the terminal in the project tree.**

11

Compare configurations

CAP 531 contains functionality to compare configurations. It is used to compare the configuration in CAP 531 with the configuration in the terminal. The result is a list of the differences between the configurations.

The terminal configuration is saved in specific files used by compare configurations, that makes it possible to check differences between the terminal and the CAP 531 configuration without having to upload the terminal configuration.

To find differences between the CAP 531 configuration and the terminal configuration:

- 1 **Select a terminal in the project tree that you want to compare.**
- 2 **Select the 'compare configurations' command in the on-line menu.**
- 3 **Select 'upload and compare' if the terminal is connected, or 'compare' if the comparison should be done off-line (if the 'upload and compare' function has been run earlier).**

Menu item	Select this command to...
Compare	Compare the configuration.
Upload and compare	Compare the configuration after upload.
Save...	Save the result of the comparison, as a text file. This command opens a standard Windows save dialog box.
Print...	Print the result of the comparison. This command opens a standard windows print dialog box.
Print setup	Setup which printer you are going to use, opens the windows print setup dialog box.
Exit	Quit configuration compare.

11.1

Compare

With the Compare command you compare the CAP 531 configuration with the latest uploaded configuration from the terminal. During the comparison the differences will be displayed. The comparison can be aborted with the <Cancel> button in the Progress box.

After compare, the number of comparisons and differences detected are displayed in a message box.

11.2

Upload and compare

With the 'upload and compare' command, the configuration from the terminal is uploaded to CAP 531, then the comparison starts.

Upload and compare will not replace CAP 531 configuration files.



Note!

You cannot upload the graphic configuration files with this command. You only upload the connections between the function blocks.

If the result of the comparison seems wrong, compile the terminal and run a new comparison.

12

Start the parameter setting tool

You can start the parameter setting tool from the project tree.

- 1 Select a terminal in the project tree.**
- 2 On the edit menu, click parameter settings.**

For using the parameter setting tool, please see reference [1]. See "Reference publications" on page 167.

Work sheet

This chapter describes the work sheets and how to operate them.

13

Introduction

The configuration is done in work sheets. Work sheets are working areas where you make your configuration.



Fig. 8 Work sheet called MMI.

14

Normal mode and debug mode

You use the normal mode when you work with the configuration in the work sheet. Then you can use all commands such as insert, connect, or delete.

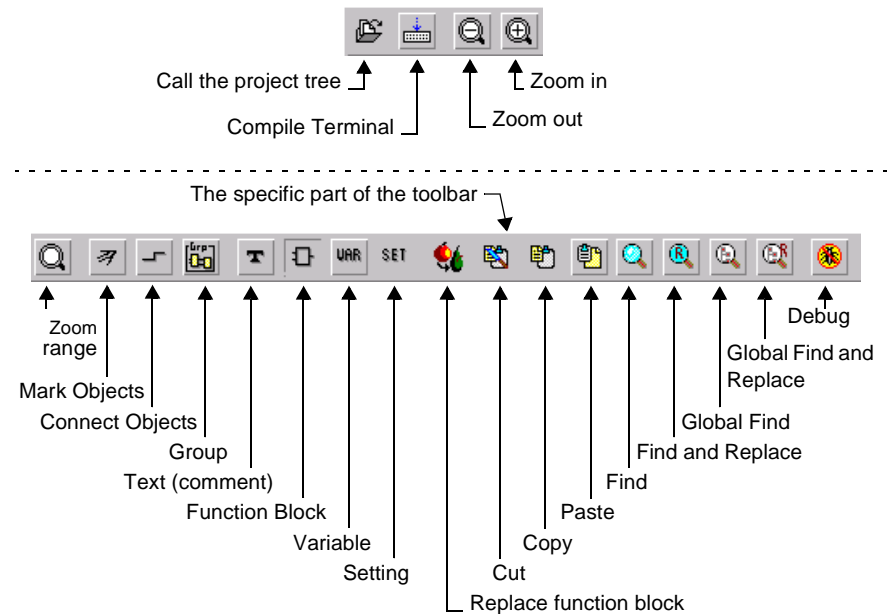
You use the debug mode to test the work sheet configuration. When you have finished preparing the configuration, you compile it. After compilation you use the work sheet in debug mode to test the configuration. In debug mode it is not possible to use the normal configuration commands.


In the debug mode you can monitor the status of every connection line in the visible part of the work sheets. The status is shown with colours.

15 Toolbar and menu bar

15.1 Toolbar seen from the work sheet view

The toolbar has icons that you use to get quick access to frequently used actions. You can also use the menus or shortcut keys.



Icon	Icon name	Select this icon to...
	Call the project tree	Get access to the project tree.

The rest of the icons are explained in the menu bar chapter.

15.2

Menu bar








15.2.1





File menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Close		<CTRL> + <F4>	Close the active work sheet.
Close all			Close all work sheets that are open.
Save all		<CTRL> + <S>	Save your changes in all work sheets.
Close terminal			Close all work sheets that are connected to the active terminal.
Save terminal			Save your changes in all work sheets that are connected to the active terminal.
Page layout			Open page layout shows the page layout of the work sheet. Use this to design drawing forms. Environment setup lets you change, for example, the date, company name, document number.
Preview			Start the page preview function, which shows you what the pages will look like when they are printed.
Print		<CTRL> + <P>	Print the current work sheet.
Printer setup			Switch to another printer or select a different format. CAP 531 supports all printer setups in the windows program manager. CAP 531 page layouts are based on the A4 size. So the results may be distorted if you use a printer with another format.
Exit		<ALT> + <F4>	Quit CAP 531. After your selection, the standard CAP 531 Exit dialog appears.

15.2.2





Edit menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Undo		<CTRL>+ <Z>	Undo the last action that you performed.
Cut		<CTRL> + <X>	Cut all selected objects from the work sheet and move them to the clipboard.
Copy		<CTRL> + <C>	Copy all selected objects to the clipboard.
Paste and replace		<CTRL> + <V>	Paste objects from the clipboard into the work sheet.
Delete		<DELETE>	Delete an object in the work sheet.
Copy to			Save the content of the work sheet or a group as a file.
Insert from			Insert the contents of a work sheet or a group which you have saved with the copy to command.
Clear work sheet			Clear the contents of the work sheet.
Find			Search for text string or a character in the active work sheet.
Find and replace			Search for text string or a character in the active work sheet, and replace it.
Global find			Search for text string or a character in all work sheets connected to the selected terminal.
Global find and replace...			Search for text string or a character in all work sheets connected to the selected terminal and replace it.
Mark all objects		<F5>	Select all objects in the work sheet.

Menu item	Icon	Short-cut key	Select this command to...
Mark object		<CTRL> + <M> or <ESC>	Switch to mark object mode, which you use to select objects and mark inserting points in the work sheet. When you select this button, the cursor appears in its normal shape.
Connect objects		<CTRL> + <L>	Switch to connection mode. Use this mode to connect objects. When you select this, the cursor turns into the connection symbol.
Group		<CTRL> + <G>	Switch to group mode. Use this mode to create a frame around objects. When you select this mode, the cursor turns into the group symbol.
Parameter settings			Start the parameter setting tool (PST).
Object properties...		Double-click on the right mouse button	Start the properties dialog box for the selected object. Different dialog boxes appears depending on the type of object.
Replace function block...			Replace the selected function block with a new function block.




15.2.3

Object Menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Function block		<F>	Insert a new function block into the work sheet.
Variable		<V>	Insert a variable.
Setting		<P>	Insert a setting onto a function block.
Text (comment)		<T>	Insert comments in the work sheet.

15.2.4

Layout menu seen from the work sheet view

Menu Item	Icon	Short-cut key	Select this command to...
Toolbar			Hide or display the toolbar. If checked, then the toolbar is displayed.
Status bar			Hide or display the status bar. If checked, the status bar is displayed.
WS size			Change the number of pages in the work sheet.
Zoom range			Select an area on the screen to see details more clearly.
Zoom in		Num <+>	Increase the scale of the active window.
Zoom out		Num < - >	Decrease the scale of the active window.
Previous view		Num < / > or Num <÷>	Switch to the previous view.
Default size		Num < * >	Switch to the default size from an increased or decreased size so that the work sheet is displayed in the default size.
Redraw		<F3>	Rebuild the content of the active window on the screen.
Grid		<F4>	Create a grid in the work sheet. The grid can help you align objects more accurately.
Page borders		<F6>	Show the page borders, which are represented by blue dotted lines. The source area in the page layout defines the size of the page borders. If you did not specify a special page layout for the work sheet from the Print options dialog box in the project tree, then the default page layout is used for the page borders.



15.2.5

Make menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Detect warnings			Display or hide warnings in the error list.

15.2.6

On-line Menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Debug on			Switch debug mode on and off for the active work sheet. Note! The 'global debug' command in the on-line menu must be active to enable any debug function.
Debug off			
Global debug			Switch on/off the possibility to set any work sheet in the entire project in debug mode.

15.2.7

Window Menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Tile			Arrange all open windows side by side.
Cascade			Arrange the windows so that they overlap (starting in the upper-left corner of the CAP 531 window). The title bar of each window remains visible.
Arrange symbols			Arrange the icons that are created if you minimize the windows.
Error list			View the error list if it is hidden. You can only show it if warnings or errors were detected.
Window list			Switch to a different open window. Select the window name that you want to be active.

15.2.7.1

Help Menu seen from the work sheet view

Menu item	Icon	Short-cut key	Select this command to...
Contents			Open the table of contents of the CAP 531 help.
Index			Open the Index of the CAP 531 help.
Current object			Provide help on a selected object.
Current window			Provide help on the active window.
About CAP 531			Read information about CAP 531 such as version number and copyright information.

15.3**Short-cut keys seen from the work sheet view**

You can perform general actions by using shortcut keys and key combinations.

To	Press
Access help	<F1>
Selecting objects	<SPACE>

16 Use work sheets

16.1 Open a work sheet

You create your configuration in work sheets.

To open a work sheet:

- 1 **Select a work sheet in the project tree.**
- 2 **Double-click the left mouse button or press < ENTER>.**

All configuration is made in work sheets. You can split the configuration on several work sheets, where each work sheet represents one or several functions.

16.2 Work sheet size

A work sheet can comprise several pages that are separated by page borders. You can set the size of the work sheet. A work sheet can comprise up to 12 pages (3*4) which is the default value.

Select this command in the layout menu	To...
WS size	Set the number of pages, in height and width.
Page border	Display the page borders.

The page size and orientation is set in the page layout with the 'paper orientation' command in the layout menu when in the page layout mode.

Note!

We recommend you to display the page borders of the work sheet so you can see where you place the function blocks in the work sheet. This is important for the print-out.



If you reduce the work sheet size, so that some work sheet objects do not fit into the new size, the check objects while changing WS size dialog box appears.

Table 6: The fields in the dialog box.

Field, button, or checkbox	Description
Delete	Immediately deletes all necessary object to change the work sheet size.
Show	Highlights the objects that have to be deleted.

16.3**Change zoom range**

Use this function to select an area on the screen to see details more clearly.

To select a zoom area:

- 1 Select the 'zoom range' command in the Layout menu.**
- 2 Press and hold the left mouse button, and drag the mouse over the area to be zoomed. A frame is drawn over the area.**
- 3 Release the mouse button when desired, and the area is zoomed.**

You can go back with 'previous view' or 'default size' in the layout menu.

16.4**Clear work sheets**

Use this function to clear the contents of a work sheet.

To clear the work sheet:

- 1 Select the 'clear work sheet' command in the edit menu, and the clear work sheet dialog box appears.**

Note!

If you have cleared a work sheet, the content of the work sheet cannot be restored.



17

Objects

Function blocks, variables, settings and text comments are considered as objects in a work sheet.

17.1

Function blocks

All functions in a terminal — basic and optional — are represented as function blocks in CAP 531. Both protection functions and pure logic are shown as function blocks.

17.1.1

Insert function blocks

Use this function to insert a new function block into the work sheet.

To insert a function block:

- 1 **Click in the work sheet where you want the new function block to be inserted.**
- 2 **Select the ‘function block’ command in the object menu, and the function block dialog box appears.**

Note!

To avoid collision, position the insertion point far away from other objects.



Table 7: The fields in the dialog box.

Field, button, or checkbox	Description
Type	Type of function block.
Help on FB type	Starts the help page for this type of function block.
Instance	The instance name of the function block. This name makes the function block unique if there are several function blocks of the same type.
Parameter settings	Starts the parameter setting tool (PST). The PST will show the parameters that corresponds to the current function block.
Height	Height of the function block. This is normally not changed. Do not set the height lower than the default one.
Formal parameters	Names and types of existing input and output parameters of the function block. This is only for information and cannot be changed.

To use this dialog box when inserting a new function block:

- 1 Select a function block from the ‘type’ listbox.**
- 2 If there are more than one function block available of the selected type, select a specific instance from the ‘Instance’ listbox.**
- 3 Select a new height of the function block, or use the default one.**
- 4 Select <OK>, and the new function block is inserted.**

Note that now the selected function block (instance) no longer appears in the selection list. If the function block is deleted in the work sheet, it will reappear in the selection list.

17.1.2

Replace function blocks

Use this function to replace the selected function block with a new function block.

To replace the function block:

- 1 Select the function block in the work sheet.**
- 2 Select the ‘replace function block’ command in the edit menu, and the replace box appears.**

Table 8: The fields in the dialog box.

Field, button, or checkbox	Description
Type	Type of function block.
Instance	The instance name of the function block. This name makes the function block unique if there are several function blocks of the same type.
Parameter settings	Starts the parameter setting tool (PST). The PST will show the parameters that corresponds to the current function block.
Formal parameters	Names and types of existing input and output parameters of the function block. This is only for information and cannot be changed.

To use this dialog box when replacing function blocks:

- 1 Select a function block type from the ‘type’ list box.**
- 2 Select a specific function block from the ‘instance’ list box, or use the default one.**
- 3 Select OK, and the new function block is inserted.**

17.2**Variables**

Variables are used in a configuration in order to increase the readability of the configuration. They provide a way of connecting signals between function blocks without drawing lines. The connection is made using variable names instead of lines. You assign the output of a function block a user-defined name (Variable), and the same name is assigned to the input of another function block. The CAP 531 program interprets this as a connection. The Variable name can have maximum 32 characters.

With the use of Variables, it is possible to connect signals to and from function blocks in different work sheets, and function blocks in different pages of the same work sheet.

Another special application of Variables is the possibility to connect function block inputs to a fixed 1 ('TRUE') or a fixed 0 ('FALSE'). This is done by using the function block called FixedSignals which have these signals as output connections. You give these output connections a name, such as TRUE and FALSE. You can then reuse these fixed signals in the entire terminal as Variables.

Input and output Variables must have identical names to be considered interconnected by CAP 531. We recommend you to use the 'Copy'/'Paste' function when typing the variable names.

17.2.1**Insert Variables**

To insert a variable:

- 1 Select an input or output of a function block, or click in the work sheet where you want the variable to be inserted.**
- 2 Select the 'variable' command in the object menu, the variable dialog box appears.**

Table 9: The fields in the dialog box.

Field, button, or checkbox	Description
Name	Name of the variable. CAP 531 recommends a name when you insert a new variable. If no variable is defined CAP 531 suggest the name "variable". If a user-defined name has been used CAP 531 suggest the latest used variable.
Link	If the variable is placed free in the work sheet and not directly to an input or an output of a function block, select if the variable is to be connected to an input or an output.

To use this dialog box:

- 1 **Type a name of the variable that you want.**
- 2 **Select Link to be input or output if necessary.**
- 3 **Select <OK>, and the variable will be inserted.**

17.3

Settings

In general, no settings are done with CAP 531. There are however a few exceptions when it comes to settings that can be considered as close to the configuration. These settings are, for example, a time delay or a name. The setting parameter name is displayed in magenta colour on a work sheet. The program uses the magenta colour to highlight a setting input. Settings can be numbers or text strings.

17.3.1

Insert settings

To insert a setting:

- 1 **Select an input setting on the function block (with magenta colour).**
- 2 **Select the 'setting' command in the object menu, and the parameter settings dialog box appears.**

Table 10: The fields in the dialog box.

Field, button, or checkbox	Description
Name	Name of the setting.
Value	Setting value.
Minimum value	Lower range of allowed value.
Maximum value	Higher range of allowed value.
Step	Allowed step rate of the value.
Default	Default value.
Description	Description of the Value.

17.4 Text (comments)

Anywhere in a work sheet you can write free text. This improves the readability and the understanding of the configuration. The comments can inform the reader about functions and signals. It can also be used as a temporary notepad for the engineer while making the configuration.

You create a Text object for each line. You can choose colour and font for each Text object.

17.4.1 Insert Text (comments)

To insert comments:

- 1 Click in the work sheet where you want the comment to be inserted.
- 2 Select the 'Text (comment)' command in the object menu, and the comment dialog box appears.

Table 11: The fields in the dialog box.

Field, button, or checkbox	Description
Comment	Specifies the text that will be inserted. You can only insert one line at a time. If the text runs over several lines, you insert one text object for each line.
Font...	Starts the font selection dialog box, from which you can change the font face, size, and so on.

17.5 Delete objects

Use this function to delete an object in the work sheet. An object can be a function block, a variable, a comment or a connection between function blocks.

To delete an object:

- 1 Select the object you want to delete.
- 2 Select the 'delete' command, and the object will be deleted.

If you try to delete a structure that will not result in a logical structure, the Delete Control dialog box appears. An example is when you try to delete only one section of a connection line between objects.

Table 12: The fields in the dialog box.

Field, button, or checkbox	Description
Delete	Deletes the smallest legal structure.
Show	Highlights the smallest structure that will not cause any illegal structure in the work sheet.

- Select Delete, and the entire structure that must be deleted to cause a logical assembly of objects in the work sheet will be deleted. In the example above of the connection line, the entire connection line between the objects will be deleted.
- Select Show, and the structure that must be deleted to cause a logical assembly of objects in the work sheet will be highlighted. In the example of the connection line, each section of the connection line will be highlighted.

17.6

Object properties

Under the 'object properties' item in the edit menu, more information is available on any object in CAP 531. The object properties can also be accessed with double-click on the right mouse button.

See also Table 7, "The fields in the dialog box.," on page 122.

18 Local find and replace

It is possible to search for text strings and objects in the project tree structure or in the active work sheet depending on which window is active when the function is activated. If the function is activated from the project tree, the entire project tree structure is searched. If the function is activated from a work sheet, only the active work sheet is searched.

18.1 Find

To search for a text string:

- 1 Select the 'find' command in the edit menu, and the local find dialog box appears.

Table 13: The fields in the dialog box.

Field, button, or checkbox	Description
Find What	Specifies the text string to search for.
Match whole word only	Requests that CAP 531 searches only for entire words.
Match case	Requests that CAP 531 search with the case sensitive option, which means that bim and BIM is different.
Direction	Specifies if the search should start from the top and go downwards, or from the bottom and go upwards in the work sheet.
Find next	Searches for the next occurrence of the text string.

18.2 Find and Replace

Use this function to search for text string or a character and replace it.

To search and replace text:

- 1 Select the 'find and replace' command in the edit menu, and the local replace dialog box appears.

Table 14: The fields in the dialog box.

Field, button, or checkbox	Description
Find what	Specifies the text string to search for.
Match whole word only	Requests that CAP 531 searches only for entire words.
Match case	Requests that CAP 531 search with the case sensitive option, which means that bim and BIM is different.
Replace with	Specifies the new text string.
Find next	Searches for the next occurrence of the text string.
Replace	Replaces the first entry.
Replace all	Replaces all entries.

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Global find and replace

It is possible to search for text strings and objects in all work sheets in a terminal. This makes it possible to search for objects such as function blocks or variables no matter if they are used in other work sheets.

All dialog boxes are the same as for the Local Find and Replace function, but with the addition of the checkbox 'Search Only In Marked Items'.

20 Copy, paste and save

20.1 Cut objects to the clipboard

Use this function to cut the selected objects from the work sheet and move them to the clipboard. This function is accessed with the 'Cut' command on the Edit menu. Several objects can be selected by dragging the mouse with the left mouse button pressed.

If you select objects to cut that will result in an illegal structure in the work sheet or in the clipboard, the Cut Control dialog box appears.

Table 15: The fields in the dialog box.

Field, button, or checkbox	Description
Cut	Extends the highlighting to a logical assembly of objects and moves it to the clipboard.
Show cut	Highlights the logical assembly of objects that will be deleted in the work sheet.
Show copy	Highlights the logical assembly of objects that will be copied to the clipboard.

20.2 Copy objects to the clipboard

Use this function to copy the selected objects to the clipboard. This function is accessed with the 'Copy' command on the edit menu.

If you select objects to copy that will result in an illegal structure in the clipboard, then the Copy Control dialog box appears.

Table 16: The fields in the dialog box.

Field, button, or checkbox	Description
Copy	Extend the highlighting to a logical assembly of objects and copies the collection to the clipboard.
Show copy	Highlights the logical assembly of objects that can be copied into the clipboard.

20.3

Paste objects from the clipboard

Use this function to paste objects from the clipboard into the work sheet. This function is accessed with the 'paste and replace' command on the edit menu.

If a function block already exists in the same terminal, the Replace dialog box appears. For example if you try to copy a function block that only exists once in a terminal (only one instance), e.g. the breaker failure protection or fuse failure function.

20.4

Group objects

Use this mode if you want to group a part of your work sheet, so you can use it in another work sheet or in the same work sheet. For example if you have a structure that you want to appear in several work sheets, you draw a group frame around the objects and save it in a file to reuse it in the other work sheets.

Note!

It is not possible to use a Copy - Paste function on a group. You always save the group in a file, and insert it again from this file.



To group objects:

- 1 Select the 'Group' command in the edit menu, and there will be a rectangle added to the pointer symbol.**
- 2 Position the pointer beside the first object.**
- 3 Press and hold the left mouse button.**
- 4 Drag the mouse, and a frame is displayed. The frame indicates how the group will look.**
- 5 Release the mouse button, and the group dialog box appears.**
- 6 Type a name for the group, press <ENTER>, and the group is created.**

When the group is selected, the border is black, and when it is not selected, the border is pink.

You can have groups with the same name in the work sheets.

To copy the group to a file you use the 'copy to' command, and to insert a group file into the work sheet you use the 'insert from' command.

20.5

Copy work sheets to a file

Use this function to save the contents of the work sheet or a group.

With this command you create a special file that lets you, for example, create a template for frequently used work sheets or groups.

You can only use this command when you have selected either the complete work sheet or a single group.

To copy the work sheet to a file:

- 1 Select the 'mark all objects' command in the edit menu, or press <F5>.**
- 2 Select the 'copy to...' command in the edit menu, and the copy to dialog box appears.**

To copy the group to a file:

- 1 Select the group that you want to copy.**
- 2 Select the 'copy to...' command and the copy to dialog box appears.**

The 'copy to...' dialog is a standard windows save to dialog box where you can change the drives, directories, and file names.

20.6

Insert work sheets from a file

Use this function to insert the contents of a work sheet or a group which you have saved with the 'copy to...' command.

To insert a saved work sheet:

- 1 Open a new work sheet.**
- 2 Click in the work sheet where you want the work sheet contents to be inserted (normally the upper left corner of the empty work sheet).**
- 3 Select the 'insert from...' command in the edit menu, and the insert from dialog box appears.**

To insert a saved group:

- 1 Click in the work sheet where you want the group to be inserted.**
- 2 Select the 'insert from...' command in the edit menu, and the insert from dialog box appears.**

The 'insert item' dialog box is a standard windows open dialog box where you can change the drives, directories, and file names.

21

On-line debug

Use the debug mode to check how the terminal configuration is working. In this mode you obtain a window into the terminal, showing the present values of all internal signals. Based on these values you can see if the logic is acting correctly.

The status of different signals is indicated by different colours on a work sheet in on-line mode. These colours represent different values:

Colour	Meaning
Red	Boolean true (high)
Blue	Boolean false (low)
Green	Present analogue values

Note!

'Global debug' must be active before you can enter debug mode in any work sheet. The connected COM port must be available when you start on-line debug.



It is necessary that the work sheets you open for debugging are compiled and downloaded into the terminal. If you have doubts whether the configuration in CAP 531 completely matches the one in the terminal, you should run 'Compare Configurations' to see if there are any differences.

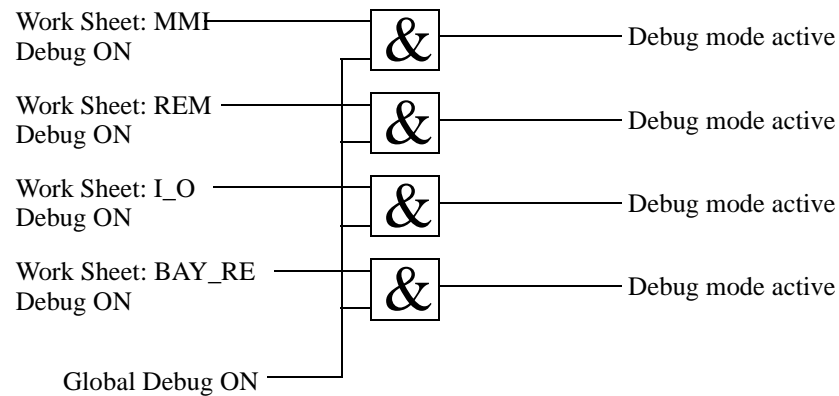


Fig. 9 Logical representation of Debug modes.

To start the debug mode, you:

- 1 **Open the work sheets of the terminal. Note that the configuration in CAP 531 must be exactly the same as in the terminal. This can be verified with the 'compare configurations' function.**
- 2 **Switch on the 'debug' mode in the on-line menu.**

22

Print

The work sheets and the project tree are printed with the page layout that are assigned to them. The page layout is the drawing form. If no new page layout is assigned to the work sheet, the program uses the default page layout, which is based on a standard ABB drawing.

22.1

Assign page layouts to work sheets or project trees

You can assign a page layout to the entire project or to individual work sheets. The default page layout is assigned to all new work sheets.

If you do not assign a page layout, the pages are printed with the CAP 531 default page layout.

To assign a page layout to a work sheet or a complete terminal, select the:

- 1 **Desired work sheet or terminal in the project tree.**
- 2 **'Object Properties' command and the properties dialog box appears.**
- 3 **<Print Options> button, and the Print Options dialog box appears.**
- 4 **Page layout that you want to assign to the work sheet, and press <OK>.**

To assign a page layout to the project tree, select the:

- 1 **Project (mark the top icon in the project tree).**
- 2 **'Object Properties' command, and the Print Options dialog box appears.**
- 3 **Page layout that you want to assign to the project, and press <OK>.**

22.2

Use the 'preview' command

The 'Preview' command lets you view the work sheet before you print it.

When you select the 'Preview' command, the page displayed is for the active window. Therefore ensure that the active window is the one you want to preview.

Table 17: The buttons on the preview toolbar:

Button	Select this button to...
Close	Exit from the preview mode.
Previous	View the previous page.

Table 17: The buttons on the preview toolbar:

Button	Select this button to...
Next	View the next page.
Layout	Select another page layout.
Print page	Print the current page.

23 Print functions

You can print after you have assigned a page layout to a work sheet or project tree. You might need to change the printer setup, so check it first.

23.1 Printer setup

Use this dialog box to change the printer, if it is necessary. CAP 531 uses the standard printer setup dialog from Windows, so the contents might differ in different versions of Windows.

The paper orientation is set with the 'Printer Setup' command in the File menu. The paper size and orientation is also affected of the setting in the Page Layout. This is set with the 'Paper Orientation' command in the Layout menu when in the page layout mode.

23.2 Print the project tree

You can print the project tree structure.

Activate the project tree window and select the 'Print' command in the File menu, and the project structure will be printed (not the work sheets in the structure).

23.3 Print terminal

You can print all work sheets in a terminal from the project tree. The pages are then numbered consecutively within a terminal or only within the work sheets.

When the pages are numbered consecutively, all pages will be numbered from 1 up to the number of pages in the terminal. In the case with separate numbering in each work sheet, all first pages of each work sheet will obtain page number 1.

If you selected Print PST Data in the Print Terminal dialog, the parameter settings will also be printed in a separate numbered series of sheets.

23.4 Print a work sheet

Note that the work sheet to be printed must be open and in the active window. It is not possible to print a work sheet from the project tree.

23.5 Cross references

All cross references can be printed (optional). Some of the cross references are printed to the left side and right side of the drawing. The remaining cross references (if any) are printed on extra pages after the last work sheet. This means that all cross references are printed and no references are left out.

The cross references printed on the configuration page come from signals that ends within the part of the source area that is specially assigned for this (the outer left and right area). The size of this area is set in the page layout.

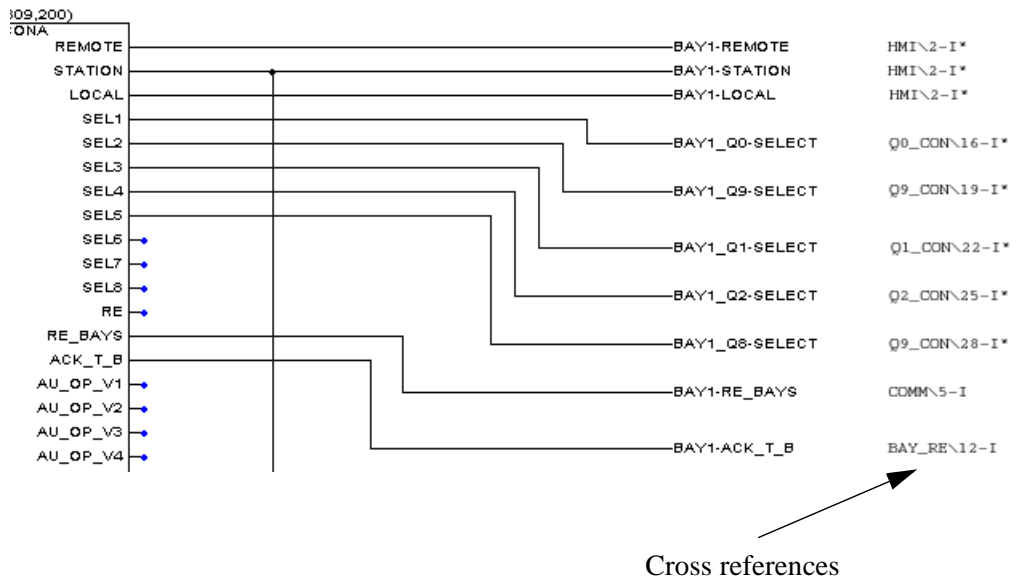


Fig. 10 Example of print-out with cross references on the configuration page.

The cross references that cannot be printed on the configuration page due to lack of space are printed on the extra pages.

The cross references that come from signals ending in the middle part of the source area are also printed on the extra pages.

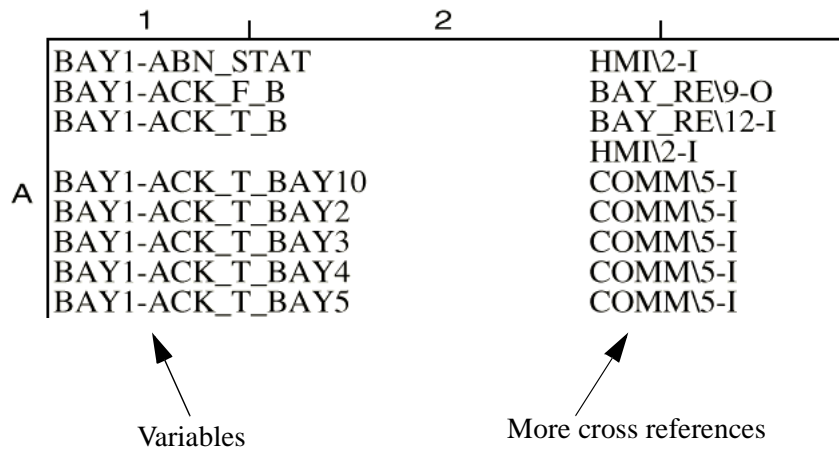


Fig. 11 Example of extra page with cross references.

The extra pages will get page numbers from the last page that was written, with the addition of a, b, c and so on. For instance if the last page is 16, the extra pages are numbered 16a, 16b, etc. These pages are not shown in the Preview. This means that the total number of pages to be printed can be more than the total number of pages stated on the drawings.

Page layout

This chapter describes how you can assign a page layout to your drawings. The chapter describes the menus available in the page layout view, how to edit layouts and how to insert objects into your drawings.

24

Introduction

The CAP 531 page layout lets you create and print your own page layouts that comply with your internal layout standards as drawing forms. It includes a set of graphical tools for inserting lines, bitmaps and text in the headers and footers of the drawings. When using environment variables on a page layout, you can reuse the page layout for the entire project. You can also assign different page layouts for different work sheets and for the project tree.

The default page layout that is included in CAP 531 uses ABB standards. When you receive the program and when you add a new terminal to a project, all work sheets have the default page layout, **default.plt**, assigned.

The page that you print contains different areas that you define with the page layout:

- Source area, which contains the configuration of the work sheet
- Left and right legend, which contains cross references
- Space for drawing illustrations

Different page layout files (*.plt) are stored in the page layout directory. You set the path to the directory during installation.

To start the Page Layout:

- 1 Select 'Page Layout' in the File menu.**
- 2 Select the 'Open Page Layout' command.**

The Page Layout can be started from the project tree and from a work sheet. Note that when you open the page layout in the project tree, you see the page layout of the project tree itself and not of any work sheets. In order to see the page layout of a work sheet, you open the page layout from the work sheet.

Note!

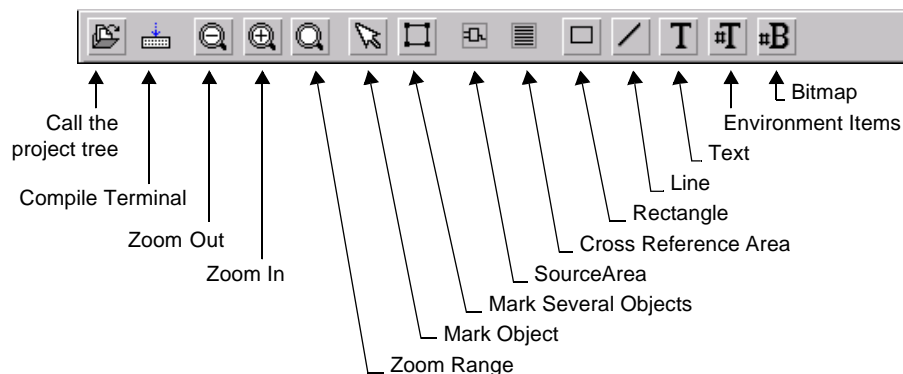
*Not all information is included in the *.plt files. Use the 'Copy To...' menu item and the 'Insert from...' menu item to move page layouts between PCs.*





25 Toolbar and menu bar

25.1 Toolbar

The toolbar has icons that you use to get quick access to frequently used actions. You can also use the menus or shortcut keys.



Icon	Icon name	Select this icon to...
	Call the project tree	Get access to the project tree.
	Compile terminal	Compile the active terminal configuration. Note! This command is only available from the project tree.

The rest of the icons are described in the menu bar chapter.

25.2

Menu bar



25.2.1

File menu seen from the page layout view

Menu item	Icon	Short-cut key	Select this command to...
New			Create a new page layout window.
Open...			Open a pre-defined page layout window.
Close		<CTRL> + <F4>	Close the active page layout.
Close all			Close all page layouts and work sheets that are open.
Save		<CTRL> + <S>	Save the active page layout.
Save as...			Save the current page layout with a new name.
Copy to...			Save the current page layout to another path so you can use the same page layout on another computer.
Insert from...			Open an already saved page layout, saved with the 'Copy to...' command.
Passwords			Change or insert password for users with a lower access level to the project.
Printer setup...			Switch to another printer or select a different format. CAP 531 page layouts are based on the A4 size, so the results may be distorted if you use a printer with another format.
Exit		<ALT> + <F4>	Quit CAP 531.







25.2.2


Edit Menu seen from the page layout view

Menu item	Icon	Short-cut key	Select this command to...
Delete		<DELETE>	Delete the selected objects. No undo facility will be available.
Clear page layout			Clear the active page layout. A dialog box will inform you that the current page layout will be deleted, and all changes will be lost.
Mark several objects			Switch to the Mark Several Objects mode. Use this mode to select more than one object.
Mark object		<CTRL> + <M>	Switch to the Mark Object mode. This is the default mode which you use to select only one object.
Object properties...		<ALT> + <ENTER>	Start the properties dialog box for the selected object. The properties are different from one object to another.

25.2.2.1




Object menu seen from the page layout view

Menu item	Icon	Short-cut key	Select this command to...
Source area		<S>	Switch to the Source Area mode. Use this mode to draw the source area.
Cross references		<C>	Switch to the Cross reference mode. Use this mode to draw the cross reference area.
Rectangle		<R>	Switch to the Rectangle mode. Use this mode to draw rectangles.
Line		<L>	Switch to the Line mode. Use this mode to draw lines.
Text		<T>	Switch to the Text mode. Use this mode to write texts directly into the page layout.
#Text#		<E>	Switch to the Environment text mode. Use this mode to use the environment items.

Menu item	Icon	Short-cut key	Select this command to...
Bitmap			Switch to the Bitmap mode. Use this mode to insert a bitmap.

25.2.3

Layout menu seen from the page layout view

Menu item	Icon	Short-cut key	Select this command to...
Toolbar			Hide or display the toolbar. If checked, the toolbar is displayed.
Status bar			Hide or display the status bar. If checked, the status bar is displayed.
Paper orientation...			Edit the Paper Orientation and size.
Environment setup...			Edit the Environment variables.
Zoom range			Select an area on the screen to see details more clearly.
Zoom in		Num < + >	Increase the scale in the active window.
Zoom out		Num < - >	Decrease the scale in the active window.
Previous view		Num < / > or Num < + >	Switch to the previous view.
Default Size		Num < * >	Switch to the default size from an increased or decreased size so that the worksheet is displayed in the default size.
Redraw		<F3>	Rebuild the content of the active window on the screen.
Grid		<F4>	Create a grid in the page layout. The grid can help you align objects more accurately. Dots are used to display the grid.

25.2.4

Window Menu seen from the page layout view

Menu item	Icon	Short-cut key	Select this command to...
Tile			Arrange all open windows side by side.
Cascade			Arrange the windows so that they overlap (starting in the upper-left corner of the CAP 531 window). The title bar of each window remains visible.
Arrange symbols			Arrange the icons that are created if you minimize the windows.
Window list			Switch to a different open window. Select the window name that you want to be active.

25.2.5

Help Menu seen from the page layout view

Menu item	Icon	Short-cut key	Select this command to...
Contents			Open the Table of Contents of the CAP 531 help.
Index			Open the Index of the CAP 531 help.
Current object			Provides help on a selected object.
Current window			Provides help on the active window.
About CAP 531...			Specifies the CAP 531 version number, copyright information, and so on.

25.3

Short-cut keys

You can perform actions by using short-cut keys and key combinations.

To	Press
Access help	<F1>
Selecting objects	<SPACE>

26

Objects in the page layout

Table 18: The objects in the page layout:

Object	Description
Source Area	The source area is the area that will be printed. It contains the configuration drawn in a work sheet. A red rectangle surrounds the source area.
Cross references	The legend area where the cross references will be printed. The cross references are automatically generated by the program.
Rectangle	For drawing rectangles in the page layout.
Line	For drawing lines in the page layout.
Text	A text can be printed on each page. It contains, for example, your company's name or other information.
#Text#	A place holder or environment variable that you insert into the page layout. This can be a text that comprise different information on different pages, such as work sheet name. This is described in a separate chapter.
Bitmap	For inserting bitmaps into the page layout. You use it, for example, to insert logos or other symbols related to you company or project, All bitmap files have the extension *.bmp.

26.1

Source area

The source area is the area where the contents of your work sheet or project tree will be printed. A red rectangle always surrounds the source area. You can only have one source area for each page layout. It is marked with a red rectangle.

To define the source area:

- 1 **Select 'Source area' in the object menu, and the pointer becomes a rectangle.**
- 2 **Press and hold the left mouse button at the point where you want a corner of the source area.**
- 3 **Drag the mouse until you have the desired size for the source area.**
- 4 **Release the mouse button, and the source area is set.**

Note!

The size of the source area affects what will be printed on each page. Some function blocks or variables might be cut off if the source area is changed after the configuration is made.

The properties ('Object properties' in the edit menu) for the source area are:

Field, button, or checkbox	Description
Top/left	Position of the upper left corner of the source area
Width	Width of the source area.
Height	Height of the source area.
Lines	Number of lines to be printed on the page from the Project Tree.
Zoom in factor	Zoom-in factor for printing of the configuration.
Left/right cross references	Width of the cross reference part of the source area. Cross references from signals ending within this part are shown on the configuration page.

Height and width values for the source area correspond to the work sheet size. So if the work sheet is, for example, 301 x 301 and the zoom-in factor is 1, then the work sheet contents is printed in a 1:1 scale. If the work sheet is larger than the source area, you can use the zoom-in factor to reduce the objects size so that they fit into the source area.

26.2

Cross reference area

Cross references for variable inputs are printed on the left side of the page. Cross references for variable outputs are printed on the right side of the page. The area for the cross references is freely drawn in the page layout. In the default page layout it covers the entire page. You can only have one cross reference area for each page layout.

To define the cross reference area:

- 1 Select 'Cross references' in the object menu, and the pointer becomes a rectangle.**
- 2 Press and hold the left mouse button at the point where you want a corner of the cross reference area.**
- 3 Drag the mouse until you have the desired size for the cross reference area.**
- 4 Release the mouse button, and the cross reference area is set.**

The properties ('Object properties' in the edit menu) for the cross reference area are:

Field, button, or checkbox	Description
Top/left	Position of the upper left corner of the cross reference area
Width	Width of the cross reference area.
Height	Height of the cross reference area.
Lines	Number of lines to be printed on the separate page of cross references.

26.3

Cross references from the source area

Some cross references are shown on the same page as the drawing with the configuration. The remaining cross references are shown on a separate page.

The cross references of the input and output signals that ends close to the left and right side of the source area will be shown on the same page. The signals that ends on the middle of the source area will be shown on the extra pages, which only are used for cross references.

The parts of the source area from where the cross references are printed on the same page, are the ones between the red dashed lines and the red continuous lines.

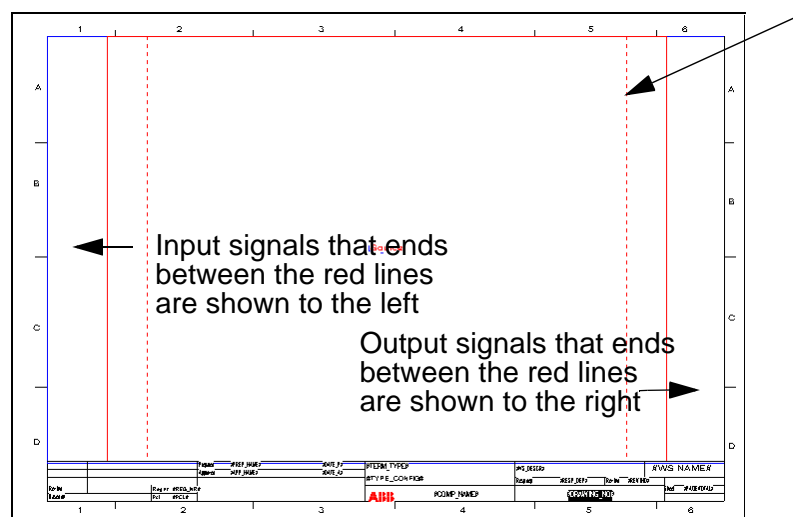


Fig. 12 Page layout with the dashed line for the described part of the source area.

The size of this area is changed in the properties of the source area:

- 1 **Mark the source area.**
- 2 **Select 'Object Properties' in the Edit menu.**
- 3 **Change the figure in 'Width of the area' in the 'Left/right cross references' section.**
- 4 **Press <OK>.**

26.4**Rectangles**

To draw a rectangle:

- 1 Select 'Rectangle' in the object menu, and the pointer becomes a rectangle.**
- 2 Press and hold the left mouse button at the point where you want a corner of the rectangle.**
- 3 Drag the mouse until you have the desired size for the rectangle.**
- 4 Release the mouse button and the rectangle is set.**

The properties ('Object properties' in the edit menu) for a rectangle includes:

Field, button, or checkbox	Description
Top/left	Position of the left corner on the top of the rectangle
Width	Width of the rectangle.
Height	Height of the rectangle.
Color	Rectangle line colour.
Width	Rectangle line width.
Style	Line style: normal, dashed or dotted.

26.5**Lines**

To draw a line:

- 1 Select 'Line' in the Object menu, and the pointer becomes a line.**
- 2 Press and hold the left mouse button at the point where you want the start of the line.**
- 3 Drag the mouse until you have the desired length for the line.**
- 4 Release the mouse button and the line is set.**

The properties ('Object properties' in the edit menu) for a line includes:

Field, button, or checkbox	Description
Start	Position of the starting point of the line in the x and y directions.
End	Position of the ending point of the line in the x and y directions.
Color	Line colour.
Width	Line width.
Style	Line style: normal, dashed or dotted.

26.6**Text**

To insert a text:

- 1 Select 'Text' in the Object menu, and the pointer becomes the letter T.**
- 2 Position the pointer at the place where you want to insert text, and the Setting Text dialog box appears.**

The properties ('Object properties' in the edit menu) for a text includes:

Field, button, or checkbox	Description
Fixed text	Text string to insert.
X-pos	Position of the text in x direction.
Y-pos	Position of the text in y direction.
Align	Text alignment: right, left or centered.
Font...	Set font. When you select this button, the Font settings dialog box appears.

26.7**Bitmaps**

To insert a graphical element such as your company logotype:

- 1 Select 'Bitmap' in the object menu, and the pointer becomes a rectangle.**
- 2 Press and hold the left mouse button at the point where you want the corner of the bitmap.**
- 3 Drag the mouse until you have the desired size for the bitmap.**
- 4 Release the mouse button and the bitmap area is set.**
- 5 The bitmap dialog box appears, and the selected bitmap will be resized to fit in the area.**

The properties ('Object properties' in the edit menu) for a bitmap includes:

Field, button, or checkbox	Description
Top/left	Position of the left corner on the top of the bitmap.
Width	Width of the bitmap.
Height	Height of the bitmap.

27 Edit the page layout

27.1 Start to work with the page layout

Open the page layout by selecting 'Page layout' in the file menu, select 'Open page layout'. This can be accessed both from the project tree and the work sheets.

New terminals and work sheets are associated with the default page layout. If you want to use any other page layout, you must associate the terminal (which includes all its work sheets) or the specific work sheet with that page layout. This is done in 'Object properties' in the edit menu, select 'Print options'.

Note!

It is very important from where you open the page layout. The page layout opened from the project tree is the one associated with the tree. The page layout opened from a work sheet, is the one associated with that work sheet.



27.2 Create a new page layout

Normally you start the page layout work by reusing an old page layout and change it. If however you want to start with a blank page, you can create a new page layout, where you can define everything from the beginning.

This is done with these steps:

- Select 'Page layout' in the file menu
- Select 'Open page layout'
- Select 'New' in the file menu

When the new page layout is saved, you must associate the new page layout with the project tree or the work sheets that you want to print with the new page layout.

27.3 Insert a page layout

If you want to reuse a saved page layout on the default page layout directory, you can select 'Open' in the file menu of the page layout.

If you want to reuse a saved page layout from another directory or a diskette, you must use the 'Copy to...' and 'Insert from...' commands in the file menu. It is not enough to copy only the page layout file since more information is required than what is stored in the file.

You use the 'Insert from...' command to insert a page layout saved with the 'Copy to...' command.

27.4 Save the page layout

You use 'Save as' in the File menu to save the page layout in to the default page layout directory.

You use 'Copy to...' in the file menu to save the page layout file including the bitmap files and environment items into the specified directory. This can then be reused by others.

27.5 Clear page layouts

You use 'Clear page layout' in the edit menu if you want to clear the whole page layout.

Note!

If you answered Yes on the confirmation question, there is no way that the content of the page layout can be restored.

27.6

Paper orientation

It is possible to change the paper orientation and the paper size with 'Paper orientation' in the layout menu. It is possible to select between:

- 'Portrait'
- 'Landscape' (default)

and it is possible to select between:

- A4 (default)
- A3

Note!

If you change the paper orientation, the page layout will be cleared

The paper orientation at printout is also controlled by the Print Manager in Windows. This is changed with the 'Printer Setup' command in the File menu.



27.7

Zoom range

It is possible to zoom a selectable area. Then you can see a certain part of the page layout more clearly.

To select a zoom area:

- 1 Select the 'Zoom Range' command in the Layout menu.**
- 2 Press and hold the left mouse button, and drag the mouse over the area to be zoomed. A frame is drawn over the area.**
- 3 Release the mouse button when desired, and the area is zoomed.**

When you go back, you can select 'Previous view' or 'Default size' in the layout menu.

28

Environment items

You can insert variables into your page layout. These are called environment items or environment variables. Examples of such environment items are page numbers, your company's name, and other text. The idea with these environment items is that information that is repeated on several work sheets, the text is only typed once and can easily be changed from one part of the project to another.

A typical example can be the drawing number, where you might want to have a certain drawing number on all work sheets for a terminal, but a different drawing number for another terminal.

Note!

Do not mix up the environment variables with the variables in the work sheets. Variables in a work sheet can be considered as connectables — i.e. name connectors.

The different types of environment items are:

- System items that come with CAP 531, such as page numbers, date, printing time. You cannot delete these items.
- User-defined items, such as project name and number, company name, drawing number etc.

Environment items can have different assignments (scopes).

All these different assignments are:

- All projects, means that assigned text for this environment item will be the same in all projects.
- Project, means that assigned text for this environment item is specific for the active project.
- Terminal, means that the assigned text is specific for the active terminal.
- Work sheet, means that the assigned text is specific for the work sheet.

This means that in the case of the drawing number, the scope would be terminal. The scope of an environment item such as *Project* (name of the project) would be project.

Example:

Assume that an environment item is called *prep_name* (i.e. the name of the engineer preparing the configuration). Let us also assume that almost all the configuration is prepared by *Smith*. The configurations in one terminal was made by *Jones* instead. The environment item *prep_name* would then be given the assigned text *Smith* with the scope *Project*. This can be done anywhere in the project. The other name must be assigned from the specific terminal. You open one work sheet in the terminal and activate *Page Layout* in the *File* menu. Select *Environment Setup*, modify the assigned text to *Jones* and change the scope to *Terminal*.

Note!

It is very important from where you open the page layout and where you activate the Environment Setup. You see the assigned text and the scope of the items from where you are. If you open the page layout or activate Environment Setup from the Project tree, you only see the layout and the setup of the tree, not of the work sheet.

Table 19: The system items.

Variable	Contains the...
Data path	Path to the project.
Date	Printing date.
File date	Date that you saved the project.
File time	Time that you saved the project.
Page	Page number.
Page/total	Page number and the number of total pages that will be printed.
Project	Project name.
Time	Printing time.
Total pages	Total number of pages.
WS name	Work sheet name.

The environment items can be accessed in a number of ways:

- 1 Select 'Page layout' in the file menu.**
- 2 Select 'Environment setup'.**

or:

- 1 Select 'Page layout' in the file menu.**
- 2 Select 'Open page layout'.**
- 3 Select 'Environment setup' in the layout menu.**

or:

- 1 Select 'Page layout' in the file menu.
- 2 Select 'Open page layout'.
- 3 Select one place holder (marker), such as #prep_name#.
- 4 Double click on the right mouse button.
- 5 Select <Config...>.

Field, button or checkbox	Description
Variable	Specifies the item name.
Assigned Text	Specifies the text to be inserted in the page layout. If you see: #System Item#, then a place holder (marker for this item) is inserted in the page layout. Select the Preview command to view the assigned text of these place holders.
Scope of the Item	Specifies the assignments of the variable. The four buttons are: <ol style="list-style-type: none"> 1. All Projects 2. Project 3. Terminal 4. Work sheet <p>You can only select one of these buttons at the time. If you have set a Text for a Variable in the Project level you can set a new Text for the same Variable in the Work sheet level and that will be used for the corresponding terminal. The Variable that was set for the Project will be used in all other terminals and work sheets connected to the Project.</p>
Add	Allows you to add new items.
Modify	Allows you to change the assigned text and the scope. This button will be disabled when you have selected a system item. They can only be modified with Copy.
Copy	Copies the selected item into the Variable and Assigned Text boxes, and enables writing these boxes, it also enables the Assignment (scope) part of the box.
Delete	Deletes the selected item in the list box. Note! It is not possible to delete a system item.

28.1 Add new items

- 1 Select <Add>, and the cursor is displayed in the Variable field.
- 2 Type a variable name and press <ENTER>.
- 3 Type an assigned text.
- 4 Select one of the buttons in the assignment (scope) part to make the item active for the Project, Terminal or only the Work sheet.
- 5 Select <OK> and the item is set.

28.2 Add items similar to existing ones

- 1 Select the item that you want to change from the list box.
- 2 Select the <Copy> button, and the contents of the selected item will be copied into the Variable and Assigned text fields.
- 3 Type a new Variable for the item.
- 4 Type a new Assigned text for the item if desired.
- 5 Change the Assignment (scope) for the item if desired.
- 6 Select <OK> and the item is set.

28.3 Change items

- 1 Select the item that you want to change from the 'Environment items' list box.
- 2 Select the <Modify> button, and the cursor is displayed in the 'Assigned text' field.
- 3 Type an Assigned text or change the text.
- 4 Change the scope if necessary.
- 5 Select <OK> and the item is changed.

Note that system items can only be changed with the Copy function (See 'Add items similar to existing ones').

28.4 Delete items

- 1 Select the item you want to delete from the list box.
- 2 Select <Delete>, and the environment delete message dialog box appears.

System and error messages

The following messages are sorted in alphabetical order.

Message	Explanation	Action
Assignment wrong.	A variable in a work sheet is not connected.	Connect the variable.
Bitmap file too large for page layout.	The bitmap file that you tried to insert into the page layout is too big.	Insert a smaller bit map file.
Cannot change directory	The directory change could not be proceeded.	Close all other programs, and try again.
Cannot change drive.	CAP 531 couldn't change the drive.	Make sure to have access to the requested drive e.g. insert the diskette.
Can close only all terminal work sheets. Use Close Terminal	An attempt to close only one work sheet from a terminal that has more than one work sheet opened.	Use 'Close Terminal' or 'Close All' to close all work sheets that belong to the terminal.
Cannot connect an output to an output.	You tried to connect one output to another output.	Connect an output to an input.
Cannot delete object name.	When using Local Replace, a word must be specified to replace the existing word.	Type a word in the Replace field.
Cannot replace. New expression exceeds range.	The text string in the Replace field is too long.	Type a shorter text string in the Replace field.
Can't create project.	No space left on drive.	Create space.
Can't divide file in token.	Can't divide file in token.	Call technical support if the error remains.
Can't get current directory.	The default current directory was not found.	Save all worksheets and restart CAP 531. Call technical support if the error remains.
Can't insert object.	An attempt to insert an object has failed. Only certain numbers of each object can be inserted in a work sheet.	Split the work sheet, and continue working in the new one.
Can't open another instance of this editor.	Internal error.	Call technical support for CAP 531.
Can't open file SELUPL.MFU.	The file doesn't exist.	Run 'Upload Options' in the On-line menu.
Can't open file REx5xx.SEL	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.
Can't open file SELECT.MFU.	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.

Message	Explanation	Action
Can't open work sheet: <i>filename</i> .	The file is deleted or corrupt. Too many files are open. The disk might be defective.	Restore the file from the backup disk and compile the terminal. Close some files or change the <i>FILES=X</i> in <i>Config.sys</i> to a higher value. Check the disk and if necessary, get it fixed.
Cannot open terminal data.	An error occurred when trying to open the data of the terminal.	Make sure that the correct terminal is installed. Call technical support if the error remains.
Can't process file.	The disk is write protected. The file is deleted. The disk might be defective. Not enough free disk-space.	Remove the write protection. Restore the file from the backup. Check the disk and if necessary, get it fixed. Free some disk-space.
Can't process file completely.	The disk is write protected. The file is deleted. The disk might be defective. Not enough free disk-space.	Remove the write protection. Restore the file from the backup. Check the disk and if necessary, get it fixed. Free some disk-space.
Can't save work sheet: <i>filename</i> .	The disk is write protected. The disk might be defective. Not enough free disk-space.	Remove the write protection. Check the disk and if necessary, get it fixed. Free some disk-space.
Can't upgrade lock.	An internal error occurred during file handling.	Save all work sheets and restart CAP 531. Call technical support for CAP 531 if the error remains.
Channel number out of range.	There is an error in the CAP/REx5xx program module. The channel number is greater than 255.	Call technical support for CAP 531.
Collision.	An object was moved to another object, and the objects overlap.	Move the objects so that they do not overlap.
Compile Status Error! Unknown variable: x, in file TOC.DEF.	The file is corrupted.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.

Message	Explanation	Action
Compress file invalid or insufficient memory.	The compressed file has been damaged. There is not enough user memory.	Copy your compressed file from your backup. Restart your decompressing. Close all other Windows applications. Check the dimension of your virtual memory in MS-Windows.
Connection already exists.	You tried to connect a line to a point where all possible connections are used.	Try to connect the line beside the desired connection.
Connection input to input.	You tried to connect one input to another input directly.	Connect an input to an output.
Connection invalid.	You tried to connect a setting to an output. Settings can only be connected to setting parameters.	Connect the setting to a setting parameter.
Connection missing.	Some connections between object are not optional. A required connector is missing.	Connect the connector to a desired connection.
Connection only horizontal possible.	You tried to connect a vertical line to an input or output.	Connect the line horizontally.
Connector connected to connector.	A connector is connected to a connector. The same connector cannot have two names.	Correct as necessary.
Connector defined more than once.	A connector is connected to an output parameter more than once.	Use another connector.
Connector is connected to an output without access right.	An output parameter is connected to a connector, but the output parameter is not in the specific terminal library.	Run 'Update Version' in the Make menu.
Connector not found.	A connector is connected to an input parameter but is not connected to an output parameter. Example: a variable connected to an input that has no match on an output.	Connect the connector to an output parameter.
Couldn't find a match for <i>data-module</i> in CHOICES.DSC	The <i>data-module</i> name is missing in the CHOICES.DSC file.	Call technical support for CAP 531.
Couldn't find corresponding Spa Code: x in VALUES.VAL.	Spa Channel Code for x can't be found in any VALUES.VAL file	Call technical support for CAP 531.
Couldn't find Spa Code x in file T2.DAT.	The Spa Code value x doesn't exist in the T2.DAT file	Call technical support for CAP 531.
Couldn't find Signal Value x in file T3.DAT.	The Signal Value x doesn't exist in the T3.DAT file	Call technical support for CAP 531.
Couldn't open file CHOICES.DSC.	The file doesn't exist.	Call technical support for CAP 531.
Couldn't open file CONTENTS.MFU.	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.

Message	Explanation	Action
Couldn't open file LDTRM2.LST.	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.
Couldn't open file T2.DAT.	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.
Couldn't open file T3.DAT.	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.
Couldn't open file T4.DAT.	The file doesn't exist.	Install CAP/REx5xx program module or run 'Copy CAP module from SMS structure'.
Couldn't open file VAL-UES.VAL.	The file doesn't exist.	Call technical support for CAP 531.
Data corruption: can't recover.	A file is missing. CAP 531 tried to restore the data in this file. Some parts of the project are damaged.	Restore the configuration from the backup.
Data from an element could not be loaded from file.amt	The function block isn't in the .amt file The .amt file is corrupt.	Use another function block. Restore the .amt file from the backup.
Data type wrong.	The configuration contained a function block without parameter, where the data type is changed in the new library.	Replace the function block.
Different cycle times.	A connection occurred between function blocks that have different cycle times.	Check if the function is valid.
Different data types.	The connection between different types of data cannot be made.	Connect input and output of the same type.
Disk full.	There is not enough memory on your floppy or on your hard disk.	Insert an empty floppy disk. Remove old, unnecessary files from your hard drive.
Disk not ready.	There is no floppy disk in your drive. The floppy disk in your drive is write protected.	Insert a floppy disk in the corresponding drive. Remove the write protection.
End of zoom range.	You have reached the end of the zoom range.	Stay within the zoom range.
Empty or invalid compress file.	You have entered a wrong path or a wrong filename and then started the compressing process.	Enter a correct path or file name.
Error reading Table.	The table is corrupted.	Restore the file from the backup. Call technical support if the error remains.
Expected comment end.	The end of the file is maybe a comment.	Ensure that there is a correct end of the file.

Message	Explanation	Action
Feature is not available.	This function is not implemented in this version.	Call technical support for CAP 531.
File error.	The file is deleted. This file is write protected. Not enough free disk-space.	Restore the files from the backup, and compile all. Check the write protection. Free some disk-space.
File header error.	An internal error occurred during file handling.	Save all work sheets and restart CAP 531. Call technical support if the error remains.
File is no bitmap file.	You selected a file that is either not a bitmap file or corrupt.	Select a file with a bmp extension, or fix the bitmap file.
Function block already used.	A function block is used more than once in this terminal.	Replace the function block.
Function block deleted.	The configuration contains an function block that is not in the new library.	Replace the function block.
Function block has unconnected parameters.	All input parameter must be connected.	Connect the input parameter that is not connected.
Function block not found.	A function block, which is used, is not found in the library.	Run 'Update Version' in the Make menu.
Function Block not in library.	The function block you tried to insert belongs to another library.	Use the function block in the proper terminal.
Function not connected.	A function is inserted but not connected to other function blocks.	Delete the function or connect it.
Illegal constant.	A value for a constant is incorrect.	Correct the programming error.
Illegal direct represented variable.	Illegal direct represented variable or multi element variable.	Call technical support if the error remains.
Inconsistency between terminal options and tool used options!	The flag for the used function block is not set.	Run 'Upload Options' in the On-line menu.
Initialization not possible.	A file is missing or is damaged after a system crash.	Restore the files from the backup. Call technical support if the error remains.
Instance could not be loaded.	The function block instance can't be found in the present library.	Use another library where the function block instance exists.
Instance missing.	The configuration contains an function block that is not in the new library.	Replace the function block.

Message	Explanation	Action
Instances would be used more than once.	The instances are used more than once in this terminal which is not allowed, you must delete the duplicated instances.	Delete the duplicated instances.
Insufficient memory.	There is not enough user memory.	Close all other Windows applications. Check the dimension of your virtual memory in MS-Windows.
Internal error.	This message usually appears after another error message. It means that something did not work properly during compilation.	Save all work sheets and restart CAP 531. Call technical support if the error remains.
Invalid access level.	You have specified an access level outside the limits(1..20) or lower than the level of your password.	Specify a new access level.
Invalid connection.	It is not possible to connect: Connector variable to SETTING parameter. Connector variable to connector variable. SETTING value to connector variable. SETTING value to non SETTING parameter.	Make a valid connection.
Invalid connector name.	The variable name you have entered starts with a #.	Remove the #.
Invalid current parameter.	There is a connection between two outputs or two inputs.	Connect the input with an output.
Invalid password	The password is wrong.	Type another password. Check with the creator of the project.
Invalid variable name.	The name you have entered contains invalid characters or no characters at all.	Enter a valid name for the variable.
Invalid WS size.	The work sheet size that you have entered is too big.	Change the width and/or height values. Max.size is 3 x 4 pages.
Invalid name.	You have specified an illegal name for an item. The name can only consist of letters and digits, beginning with a letter.	Specify a new legal name.

Message	Explanation	Action
Library not found.	Cannot link the terminal because of missing library.	Install the required CAP/ Rex5xx program module. If the error remains, call technical support for CAP 531.
List of contents have changed.	The library must be updated.	Run Update Version in the Make menu.
Maximum objects per work sheet: x used.	Too many objects are used in the work sheet. The object cannot be inserted.	Continue working in a new work sheet.
Maximum number of windows exceed. Please close a window.	Too many windows are open.	Close one or more windows.
Missing cross-reference area in pagelayout.	You have tried to print a work sheet with a page layout that don't has a cross reference area.	Add the cross reference area in the page layout.
Missing insert position.	No insert position is set in the work sheet.	Click in the work sheet where you want the object to be inserted.
Missing name.	There is no name specified for the item.	Specify a name.
Name already exists.	There is already a work sheet in this terminal with the name you have specified.	Specify another name.
Name is too long.	You have specified a name for an item in the insert dialog that is too long.	Specify a name with less characters than 50.
No access for parameter.	An input parameter, which is not in the specific terminal library, is being used.	Run 'Update Version' in the Make menu.
No access right, Editor will be started in VIEW mode.	The access rights (according to the used password) are too low. You are not allowed to change anything in the work sheet that you have opened.	Change to another password or see to that the work sheet gets another access level.
No blanks allowed in text.	You have used blanks in the replace field.	Delete the blanks or replace them with underscores (_).
No group name specified.	You have not entered a name for the group.	Type a name for the group.
No page layout assigned for work sheet.	There is no Page Layout assigned to the work sheet that you are trying to print. There is no source area in the assigned Page Layout.	Assign a Page Layout to the work sheet. This is done in 'Object Properties' in the Edit menu. Select <Print Options>. Insert a source area in the Page Layout.
No project name.	No project name was given during startup.	Restart CAP 531 with the correct project name.
Object not processed.	An internal error occurred during compilation of the work sheet. A structure in a work sheet is not compiled.	Save all work sheets and restart CAP 531. Call technical support if the error remains.

Message	Explanation	Action
Object type not supported.	Some types of objects may be used in the work sheet. But they cannot be compiled.	Change the structure and use a different object type.
Objects out of work sheet.	One or more objects are positioned out of the work sheet.	Move them inside the borders of the work sheet.
On-line debug can't be started.	An internal error occurred when starting the editor in debug mode.	Save all work sheets and restart CAP 531. Call technical support if the error remains.
On-line debug can't be stopped.	An internal error occurred when closing the work sheet in debug mode.	Save all work sheets and restart CAP 531. Call technical support if the error remains.
Out of memory.	Not enough memory to execute command.	Close all other Windows applications. Check the size of the virtual memory in Microsoft Windows.
Output line not found.	An internal file is corrupt.	Run 'Generate Template' from the Edit menu with the current configuration. Insert a new terminal in the tree and run 'Insert Template' to insert the configuration again.
Parameter deleted.	The configuration contains a function block with a parameter that is not in the new library.	Replace the function block.
Parameter is connected to an output without access right.	An output parameter is in use which is not in the specific terminal library.	Run 'Update Version' in the Make menu.
Parameter possible was inserted.	The configuration contains a function block without a parameter, which is in the new library.	Replace the function block.
Password already exists.	You have tried to create a password that already exists.	Create another password.
Printing aborted.	The printout was aborted.	Check the installation of the printer.
Printer error! Not enough memory.	Not enough memory to complete the printout.	Free more memory.
Printer error! Not enough disk space.	Not enough disk space to complete the printout.	Free more disk space.
Printer error! Please control printer installation.	Problems while printing.	Check if the printer is ON, online, and connected.
Printer not valid.	A standard printer for CAP 531 was not specified in the printer setup dialog box.	Select from the Printer Setup list box, the printer that you want to use.

Message	Explanation	Action
Project doesn't exist.	No project is stored at the selected path.	Select another project.
Project structure could not be saved.	No space left on drive.	Create space.
Recursion.	The structure that you created forms a closed loop. The beginning is connected with the end of the same line.	Create a structure where the line is not connected to itself.
Terminal could not be appended.	A terminal could not be inserted in the project tree since no terminal type was selected.	Select a terminal type. If no terminals are available, install CAP/REx 5xx program module or run 'Copy CAP modules from SMS structure'.
There are more than one line.	There is more than one line where you are trying to connect the line.	Connect the line to a single line.
The complete work sheet or only one group has to be marked.	You have not selected a group nor the whole work sheet.	Select either the whole work sheet ('Mark All Objects') or just one group ('Group').
There is an object but not a link.	You have tried to connect a line to an object that doesn't have connections available at that specific point.	Connect the line to a different position.
There is no CAP module installed in the <i>path</i> .	You have not marked a terminal type while running 'Copy CAP modules from SMS structure'.	Mark a terminal type in the modules-library of SMS.
Too many connectors.	The maximum number of connectors in the work sheet is 2048.	Adjust accordingly.
Too many error messages.	Too many error messages appeared during compilation.	Correct the visible errors in the list and recompile.
Timeout error.	The communication with the terminal is not working.	Check the communication setup and physical connection.
Too many entries in VALUES.VAL.	The number of entries in the VALUES.VAL file is limited to a maximum of 1024.	Call technical support for CAP 531.
Too many libraries	The maximum number of available libraries is 200.	Call technical support for CAP 531.

Message	Explanation	Action
Too many locks.	An internal error occurred during file handling, which might be caused by too many open files.	Save all work sheets and restart CAP 531. Call technical support if the error remains.
Unable to decode Spa Channel Code x in file T4.DAT	Spa Channel Code for x is missing in the T4.DAT file	Call technical support for CAP 531.
Unable to determine desired connection.	You have tried to connect a line equidistant between two close objects.	Make the connection point closer to the object you want to connect to.
Unexpected:	An unexpected error occurred.	Call technical support if the error remains.
Unknown error object.	The jump (link) from the error list to the error is not available.	Restart CAP 531 and compile all again. Call technical support if the error remains.
Variable name has to be entered.	A name for the variable is not inserted.	Insert a variable name.
Version numbers differs.	The version differs from each others.	Install the correct version of CAP/Rex5xx program module. Call technical support if the error remains.
Work sheet not changed.	An internal error occurred in CAP 531.	Save all work sheets and restart CAP 531. Call technical support if the error remains.
Wrong I/O type.	The configuration contains a function block without a parameter, where the I/O type (input, output, or setting) definition is changed in the new library.	Replace the function block.
You have to update your version.	The library must be updated.	Run 'Update Version' in the Make menu.

Reference publications

- [1] PST, Parameter Setting Tool, User's Manual
- [2] CAP 540 Navigator, User's Manual

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