CAP 501

User's Guide

Contents

1. About this manual

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1.4. General

This manual provides thorough information on the CAP 501, Relay Setting Tools software and its applications. This document complies with the CAP 501 version 2.4.0.

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

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

1.6. Abbreviations

HSB	Hot Stand-By
HSI	Human System Interface
IRQ	Interrupt request line
SPA	Data communication protocol developed by ABB
UNC	Universal Naming Convention
TCP/IP	Transport Control Protocol/ Internet Protocol; de facto communication protocol standard for data transmission over networks

1.7. Related documents

Name of the manual	**Document ID**
CAP 501 Installation and Commissioning	1MRS751899-MUM
LIB, CAP and SMS, Tools for Relays and Terminals, User's Guide	1MRS752008-MUM

1.8. Document revisions

Version	SW Revision number	Date	History
F	2.3.0	12.12.2003	Windows XP updates Using USB ports STA object amount updated
G	2.3.0-4	05.01.2005	Maintenance updates
H	2.3.0-5	01.03.2005	Event Log Viewer
K	2.4.0	07.02.2006	-SPA TCP/IP protocol added -New chapter "Gateway object types (COM 610)" -Maintenance updates

2. Introduction

About this chapter

This chapter introduces CAP 501, its base system, operational features, user interface and functional description.

2.1. General

CAP 501, the **Relay Setting Tools** software, is a **C**omputer **A**ided **P**rogramming system for medium voltage relays in the RED 500 and SPACOM series.

CAP 501 provides you with the following tools:

- The Project Structure Navigator for handling relays and tools.
- The RED Relay Setting Tool for parametrization of RED 500 series of relays.
- Graphical I/O Setting Tool for setting I/O related parameters of the REX 521 relays.
- The SPACOM Relay Setting Tool for parametrization of SPACOM series of relays.
- The Project Export/Import Tool for project management.
- The Communication Configuration page for setting communication parameters of the device objects.
- The Disturbance Recorder Collector Tool for uploading of disturbance records from the RED 500 series of relays.
- The System Configuration Tool for configuring the projects' system configuration.
- Event Log Viewer for uploading and viewing event logs from the RED 500 terminals.

CAP 501 is mainly used as a local system near the relay. Communication with the relays is mainly done through the relay's front panel connector or in case of the SPA TCP/IP protocol through the rear connector.

2.2. Operational features

This is a summary of functions provided by CAP 501 provides:

- On-line and off-line parametrization
- Framework for relay tools
- Project management
- Object oriented project data management
- Loading of parameters to the relay
- Loading of parameters from the relay
- Loading of recorded values from the relay

- Edit history of parameters
- Comparison of present and saved values
- Uploading of disturbance records from the relay
- Uploading of event logs

2.3. User interface

The user interface of the CAP 501 system consists of the following components:

- Project Structure Navigator for tool selection and object management
- Project Export/Import Tool for archiving and transfering projects

2.4. Base system

The CAP 501 system contains a base system and a communications system.

Supported communication protocols are:

- SPA, through serial ports to relay's front or rear panel interface
- SPA TCP/IP, through Ethernet adapters to relay's rear panel interface

2.5. Applications

CAP 501 provides tools for parametrization and disturbance record upload from protection relays in the RED 500 and SPACOM series.

2.6. CAP 501 tools

Project Export/Import Tool

The Project Export/Import Tool is used for project management purposes like deletion, duplication, and creation of projects. In addition to this, the tool is used when a project is to be transferred to another system or brought into the current collection of projects.

This tool is documented in Chapter 5. Project Export/Import Tool.

Relay Setting Tool

The Relay Setting Tool is used for parameterizing the protection relays. The parameters can be set off-line in a PC and downloaded to the relay or uploaded from the relay over a communication port.

The Relay Setting Tool menu structure including views for parameterization are the same as the views on the technical level of the local HSI (Human System Interface) for the relays in the RED 500 series.

It is also possible to set parameters in relays in the SPACOM series.

The Relay Setting Tools for RED 500 and SPACOM are documented in the *Tools for Relays and Terminals* manual.

Graphical I/O Setting Tool

The Graphical I/O Setting Tool is used for graphical setting of digital inputs, digital outputs and alarm LED signals of the REX 521 relays. These I/O related parameters can be set off-line in a PC, and downloaded to the relay or uploaded from the relay.

The Graphical I/O Setting Tool is complementary to the RED Relay Setting Tool; a change of parameter setting in the Graphical I/O Setting Tool will be visible in the RED Relay Setting Tool, and vice versa.

This tool is documented in the *Tools for Relays and Terminals* manual.

System Configuration Tool

The System Configuration Tool is used for configuring the projects' system configuration to enable communication with the relays.

This tool is documented in Chapter 10. System Configuration Tool.

Disturbance Recorder Collector Tool

With the DR-Collector Tool, disturbance records can be uploaded from the RED 500 and SPACOM series of relays. The supported recording file format is COMTRADE.

This tool is documented in the *Tools for Relays and Terminals* manual.

Event Log Viewer

The Event Log Viewer is used for uploading and viewing event logs from the RED 500 terminals. An event log is a snapshot of the current events in the event view of the connected terminal.

This tool is documented in the *Tools for Relays and Terminals manual.*

3. Quick start example

About this chapter

This chapter discusses the basic steps for getting started with CAP 501 and is intended to serve as an introductory reading to users not familiar with CAP 501.

The quick start example:

- Guides you through the process of constructing a representation of a simple station with three bays with RED 500 and SPACOM relays, familiarizing you with basic functions such as adding, configuring and moving objects in a project.
- Illustrates one solution to organize the project by means of user views.

3.1. Projects

CAP 501 supplies an initial empty project titled SOST. Initially, the SOST project is set as the default project, meaning that this project will contain the new objects unless another project is explicitly created and opened, using the Project Export/Import Tool. For detailed information on working with CAP 501 projects, see Chapter 5. Project Export/Import Tool.

3.2. Views

The Project Structure Navigator provides the possibility to define different view contexts. This feature makes it possible to group the inserted objects arbitrarily, which is a useful feature when the number of inserted objects is large. For detailed information on working with project views, see Section 4.9. Views menu.

3.3. Object types

There are three main categories of object types, i.e. level object types, device object types and compound object types.

The level object types are used for building the structure of the projects and their views.

The device object types are used when a physical device shall be used. For example, REF54x is a device object type.

Compound object types combine the behaviour of both the level and device object types. In essence, compound object types participate in a project's structurization but they also have configurable properties, similar to the device object types. For instance, you can use *Station* and *Bay* objects to build a representation of a station and its bays.

3.4. Object type groups

Each object type belongs to one named object type group, which provides similar functionality.

Four object type groups are available:

User Structure	Object types of this group serve the purpose of project structurization.
Gateway	Object types of this group serve the purpose of project structurization and representation of communication gateway devices.
Plant Structure	Object types of this group serve the purpose of project structurization.
Protection & Control	Object types of this group serve the purpose of representing protection and control devices.

3.5. Starting CAP 501

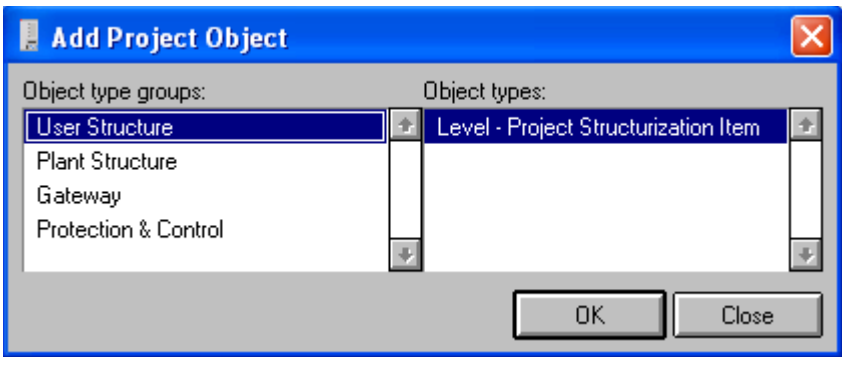
To start CAP 501, select the Start CAP 501 icon from the program folder created by the CAP 501 installation program. The Project Structure Navigator with the default project opened in the Master Design View mode appears.

3.6. Insertion of objects

In this section, begin by inserting four RED 500 device objects and one SPACOM device object to the project. Then, add a simple representation of a station with three bays.

Device object insertion

At this point, your project contains only the abstract root node, which is titled 'Root'. Click on the root node with the mouse, so the navigator knows where to insert the new object in the project structure. Next, choose Insert Object on the navigator's Edit menu, after which the Add Project Object dialog appears on the screen.



qs1_1

Fig. 3.6.-1 Adding a new object to the project

This dialog displays the object type groups and the object types present in the system. As you are now inserting a device object, the interest group is Protection & Control, which groups the RED 500 series and SPACOM series object types.

To insert a device object representing a REF54x relay terminal of the RED 500 relay series, click on the Protection & Control list item. As the result, you are viewing the list of Protection & Control object types. The first available object type is automatically selected, as shown in Fig. 3.6.-2.

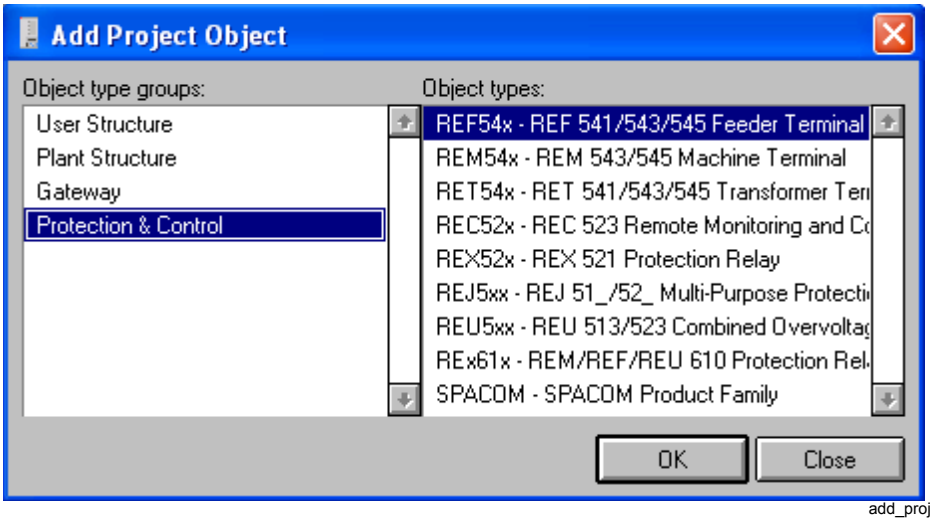
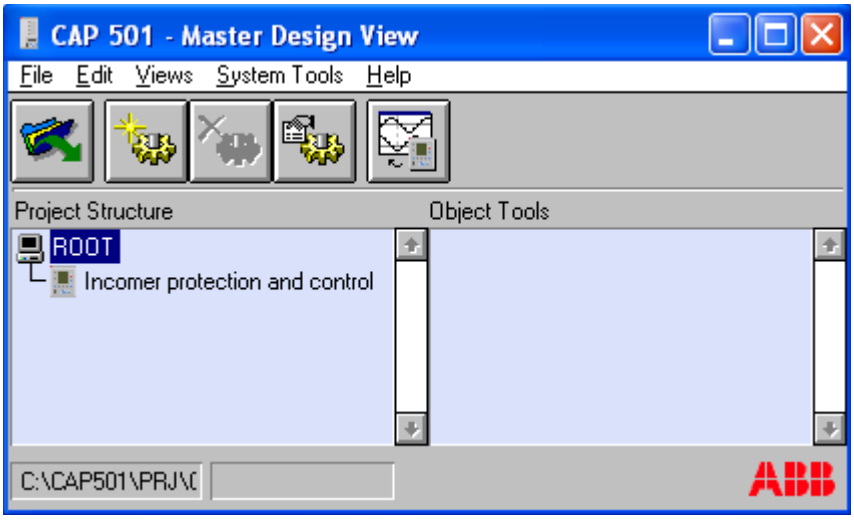


Fig. 3.6.-2 Selecting the type of the object

The appropriate object type (REF54x) is already selected. To insert it, click OK, which opens the New Object's Properties dialog for entering the object's name and title.

Fig. 3.6.-3 Entering the name and title for the object

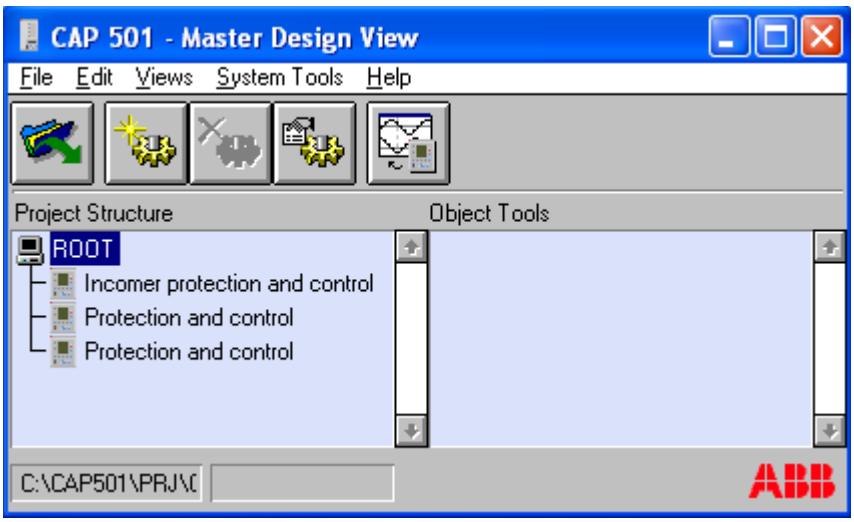
Type in the name and title and click OK. The dialog closes and the object is inserted under the root node. The object's title is displayed in the project views. Now your project should look like the one shown in Fig. 3.6.-4.



qs3_1

Fig. 3.6.-4 The inserted REF54x device object in the project's view

Repeat this insertion procedure twice, specifying 'OUT1' and 'OUT2' as the names and 'Protection and control' as the title for both of the objects. These new REF54x objects will also be inserted under the project's root node, since the project does not yet contain any compound objects being able to host the device objects. Your project should now look like the one shown in Fig. 3.6.-5.



qs4_1

Fig. 3.6.-5 Three REF54x device objects in the project

Now you have three REF54x device objects in the project. As you may recall, the aim is to insert also a device object of the SPACOM type.

To accomplish this, repeat the insertion procedure with the exception: select the SPACOM object type from the Protection & Control group. For the object's name and title, specify 'INCOMER2', 'Differential protection'. When you are ready, the project should look like the one shown in Fig. 3.6.-6.

Fig. 3.6.-6 Four device objects in the project's view

Notice that, in terms of usability, these newly inserted device objects are somewhat abstract, since they lack essential information about the physical relay terminals they represent. In practice, these objects need to be configured before they can be used (the configuration procedure is explained later).

As you now have some device objects, you can advance to add compound objects to the project to organize the contents of the project.

Compound object insertion - Plant Structure

Next, you will build a simple representation of a station with three bays.

Start by selecting the project's root node that will be the insert-location for the Station object. In fact, the only location where you can insert a Station object is the project's root node.

In the Edit menu, choose Insert Object to bring up the Add Project Object dialog. Since the Station object type belongs to the Plant Structure group, select the Plant Structure group as shown in Fig. 3.6.-7.

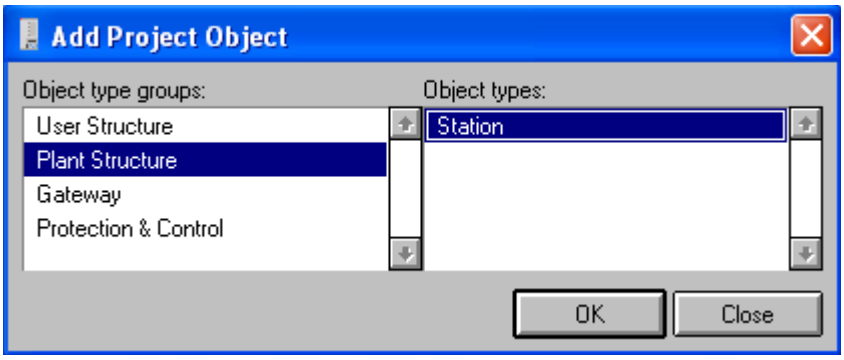


Fig. 3.6.-7 Selecting a Station object

To have the Station object inserted, click OK. The dialog which now appears for entering attributes for the object, is specific for insertion of Plant Structure objects, as illustrated in Fig. 3.6.-8. Enter 'Eastwick' as the object's title and 'STA1' as its name.

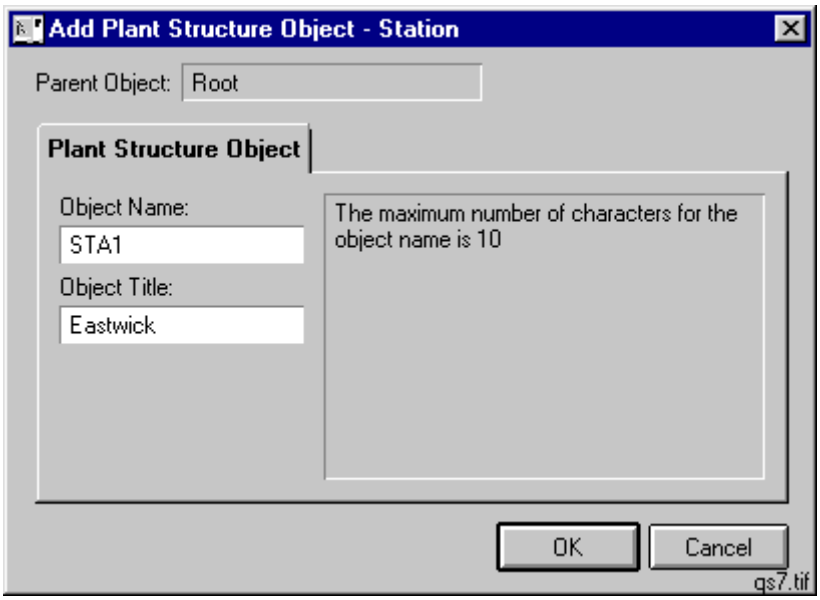


Fig. 3.6.-8 Inserting a Plant Structure object - Station

Click OK to insert the station object. Now your project should look like the one in Fig. 3.6.-9.

qs8_1

Fig. 3.6.-9 The new Station object in the project's view

Now you have a Station object capable of hosting the bays. Next, you will insert three Bay objects under the station. Eventually, the project's device objects will be moved under these bays.

As the station will be the parent for the bays, select the Station object to set the correct insert-location.

Invoke the Add Project Object dialog. The navigator is aware of the currently selected object's type (Station) and displays the available object groups and types accordingly (see Fig. 3.6.-10).

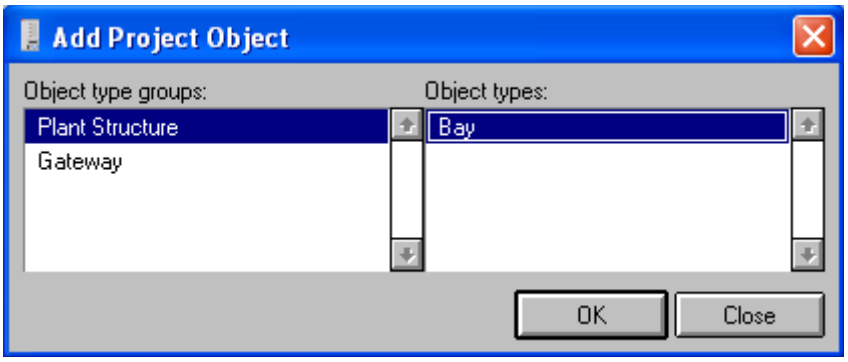


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Fig. 3.6.-10 Selecting the Bay object type

To insert the object, click OK and specify the name and title as in Fig. 3.6.-11.

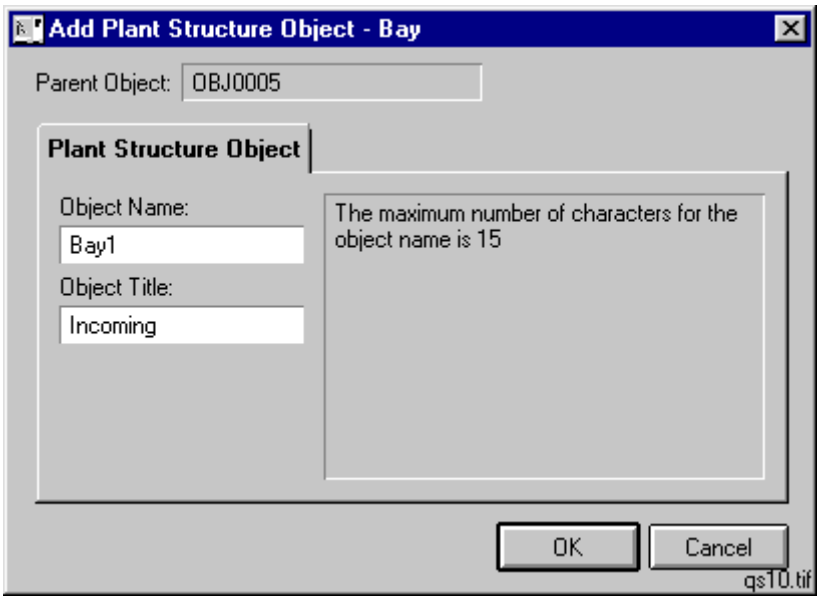


Fig. 3.6.-11 Specifying the name and title for the Bay object

Next, add two bays similarly, specifying 'Bay2', 'Bay3' and 'Outgoing 1', 'Outgoing 2' as their names and titles. Now your project should look like the one shown in Fig. 3.6.-12.

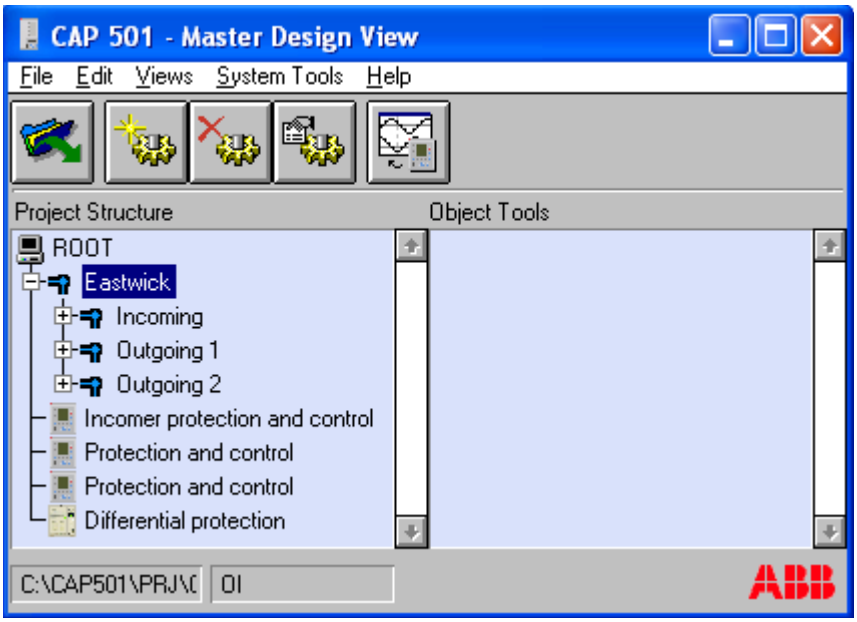


Fig. 3.6.-12 The station hosting three bays

Now you are ready to organize the project further by moving the device objects to more appropriate locations in the project structure.

3.7. Moving objects in the project

In this section, the existing device objects are moved to a new location in the project structure.

Fig. 3.7.-1 illustrates the intended final organization of the device objects in the Master Design View.

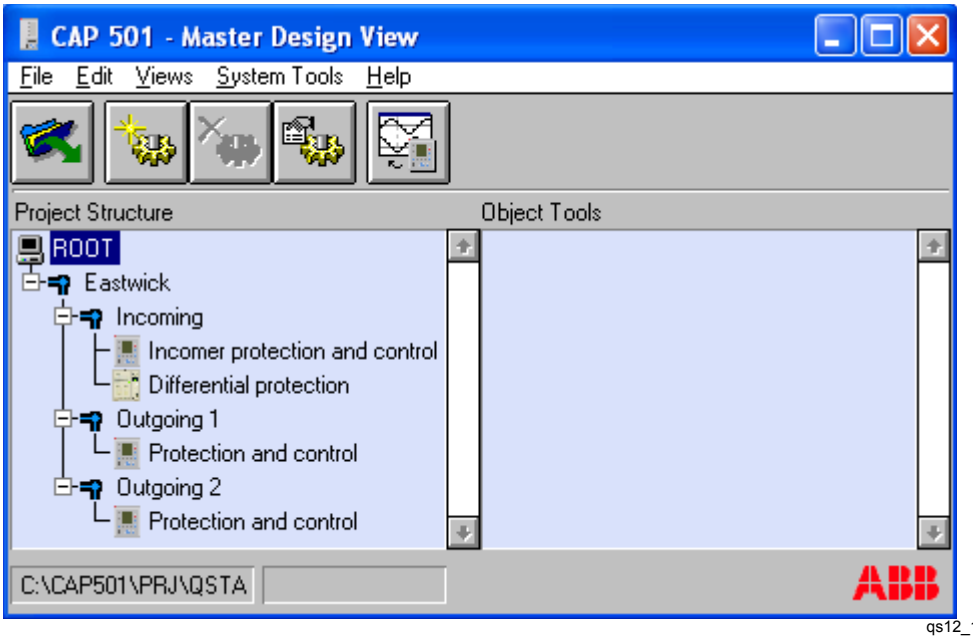


Fig. 3.7.-1 Objects in their final locations

The procedure for moving objects in the project's views consists of the following steps:

1. Select the object you intend to move by clicking on it with the mouse.
2. On the Project Structure Navigator's Edit menu, select the Object Properties to bring up the General Object Attributes dialog.
3. Click Move on the General Object Attributes dialog to bring up the Move Object dialog.
4. From the project structure, select the target compound object, which will host the moved object.
5. Click Move Here on the Move Object dialog to move the object to the selected target location.

Following this procedure, move the objects one at a time to the locations shown in Fig. 3.7.-1. Notice that moving a device object under a bay object, causes the station node to collapse. A collapsed node is expanded by either double-clicking on it or by clicking on the plus sign (+) on the node's left hand side.

3.8. System configuration

The system communication should also be configured at some point. It has to be done before you configure the communication settings on device (relay) level, see Fig. 3.9.2.2.-3. You need to make the basic communication definitions for the serial ports. From the **System Tools menu**, select item **System Configuration** and page **Communication**, see Fig. 3.8.-1.

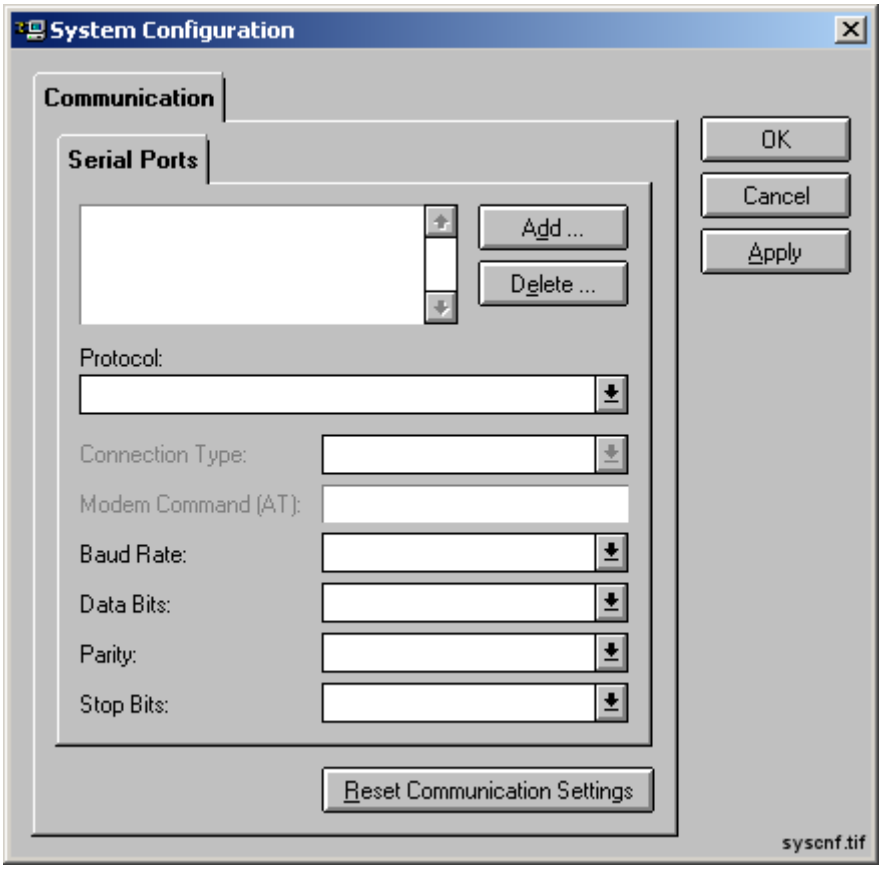


Fig. 3.8.-1 Setting up the serial ports

Use the Add button to add serial port. Usually the default settings are sufficient. Press OK to save and to exit

Next, we will advance by configuring the project's device objects.

3.9. Configuration of device objects

3.9.1. General

Before using an inserted device object, the object must be configured. Otherwise, attempts to launch an object tool result in notifications requesting you to configure the object.

For instance, configuring a REF54x device object means that the object is assigned:

1. The software configuration (SW), which is a set of hardware dependent files. The software configurations are supplied solely by ABB.

2. The application (Apl) configuration, which is a set of application dependent files. An application configuration is either supplied by ABB or created within the CAP 501/505 environment, which is why it has been saved into the application library of the object's object type.

3.9.2. Relay configuration procedure

A device object is configured in the Master Design View by means of a dialog, which is dependent on the device object's type. The configuration procedure comprises the following steps:

1. Select the device object in the project structure.
2. Select Object Properties on the Edit menu to open the General Object Attributes dialog for the object, or press <Alt>+<Enter> on the keyboard. You can use the Properties button as well, see Fig. 3.9.2.-1.

Fig. 3.9.2.-1 The Properties button

3. Click Attributes to open the object's configuration dialog, see Figure 2.8.2.-2.

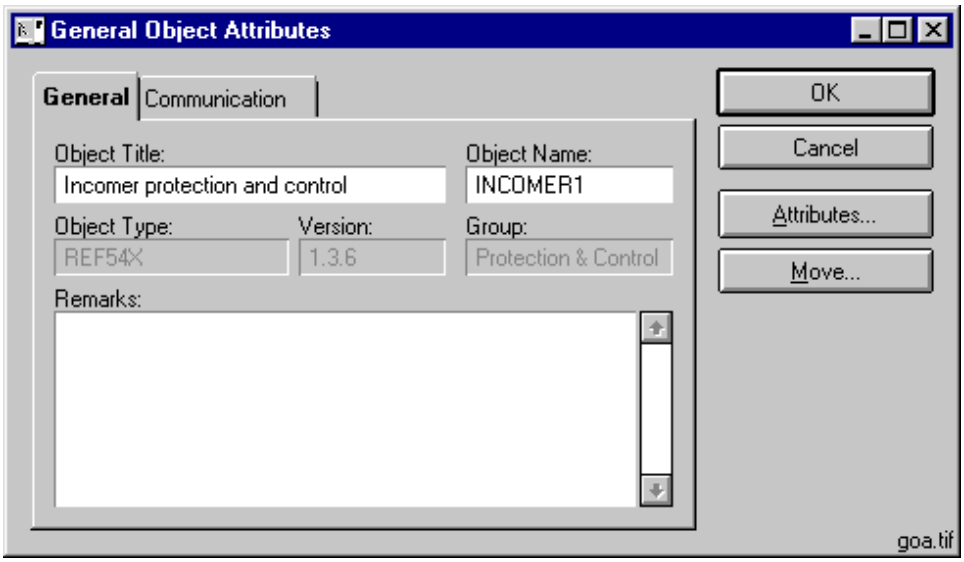


Fig. 3.9.2.-2 General page for INCOMER1

3.9.2.1. RED 500 relay object types

1. In the **SW library**, select the **SW configuration** that matches the relay terminal that shall be used.
2. **Select an application** in the Apl library, or if the application is unknown, some of the RED object types allow **uploading of the configuration** from the relay terminal. The uploaded configuration is available for selection in the Apl library list.

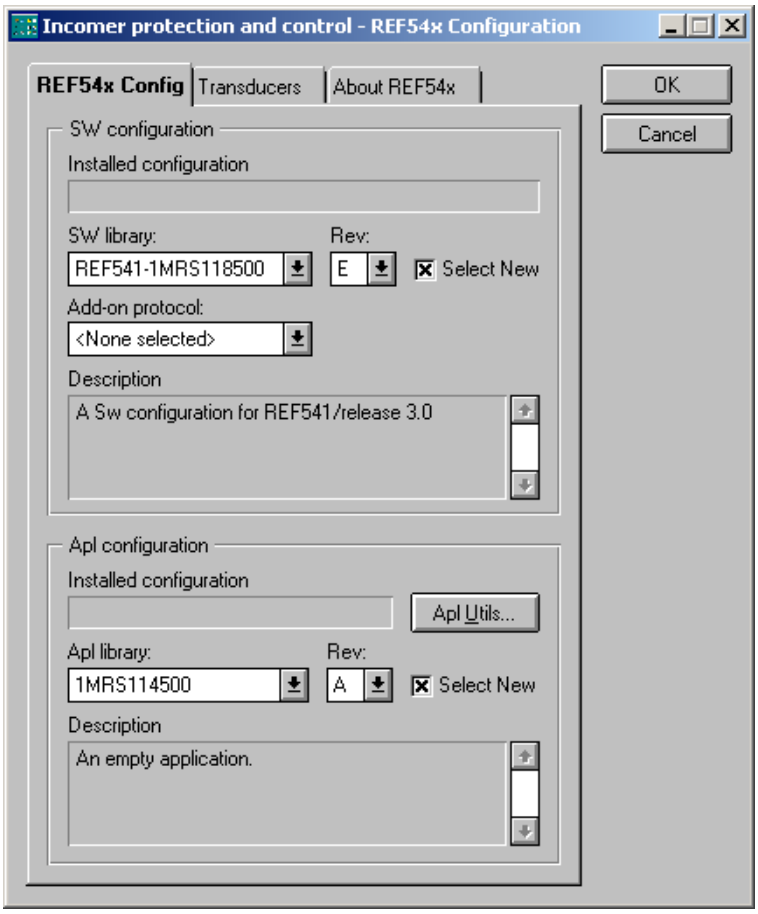
Close the object's configuration dialog by clicking OK to return to the General Object Attributes dialog. For more information on configuring device objects, see the *Tools for Relays and Terminals* manual.

Configuring the quick start device objects

To proceed with the sample, you need to configure the device objects in the order they appear in the project. Once you are done, the objects are configured as shown in Table 3.9.-1.

To proceed, select the device object INCOMER1 which is titled 'Incomer protection and control.' On the Edit menu, select Object Properties to bring up the General Object Attributes dialog. The tabbed page titled General is active, displaying general information on the object. Notice that on this dialog you can change some of the object's attributes in the Master Design View. Which attributes are changeable, depends on the object's type.

To configure the REF54x device, click Attributes and you enter the REF 54x Configuration dialog (shown in Fig. 3.9.2.1.-1).



qs13

Fig. 3.9.2.1.-1 The configuration dialog for REF54x device objects

Assigning the software configuration

As stated in Table 3.9.-1, this object's software configuration should be REF543-1MRS118501 rev. F, thus the software configuration suggested by default, has to be changed. In the dialog's upper area, the Select New check box is checked, allowing you to select the appropriate software configuration.

To change the configuration, select the configuration named REF543-1MRS118501 from the list titled SW library and select revision F from the list titled Rev.

Assigning the application configuration

To complete this object's configuration, you need to assign the intended application configuration for the object, in this sample it is 1MRS114502 revision A.

To assign it, select the application configuration 1MRS114502 from the list titled Apl library and the revision A from the list titled Rev. Next, click OK to apply the configuration, saving it to the project database. Now you returned to the General Object Attributes dialog, close it by clicking OK.

Uploaded application configurations in REF54x, REM54x, REC52x and RET 54x object types

The REF54x, REM54x, REC52x and RET 54x object types provide an alternative of using an application configuration, which you can uploaded from the relay terminal. Upon completion of the upload, you save the uploaded configuration into the object type's user application library. These application configurations are stored without revision information and are available through the Apl library list, shown in Fig. 3.9.2.1.-1. The use of uploaded application configurations is outlined below:

1. Insert the device object to the project.
2. Configure the object as explained above, assigning an empty application configuration, eventually you will replace it with the uploaded configuration. Apply the configuration normally and then return to the Project Structure Navigator.
3. Open the General Object Attributes dialog selecting the Communication page to provide communication settings for the object. Select the communication protocol and enter the value for the SPA address. Connect the communication cable, if it has not been done yet.
4. Reopen the object type's configuration dialog. Click Apl Utils… and you enter the dialog for maintaining the user application library.
5. By clicking Receive, the upload starts bringing up a progress indicator dialog. Upon completion of the upload, you provide the name for the uploaded configuration. This name will appear in the Apl library list.
6. Close the user application library management dialog by clicking Close. Now, to assign the newly uploaded application configuration, check the Select New check box and select the configuration from the Apl library list.
7. Close the object type's configuration dialog by clicking OK. You are prompted to confirm the replacement of the application configuration. Click Yes to enforce the new configuration.

To proceed with the sample, configure the other two REF54x device objects (OUT1 and OUT2) using Table 3.9.-1 as reference.

3.9.2.2. SPACOM relay object types

At this point, the SPACOM device object (INCOMER2) is still not configured. To configure it, enter the object's configuration dialog as you did with the REF54x objects. The configuration dialog that appears on the screen, differs from the one you used for the REF54x objects (see Fig. 3.9.2.2.-1).

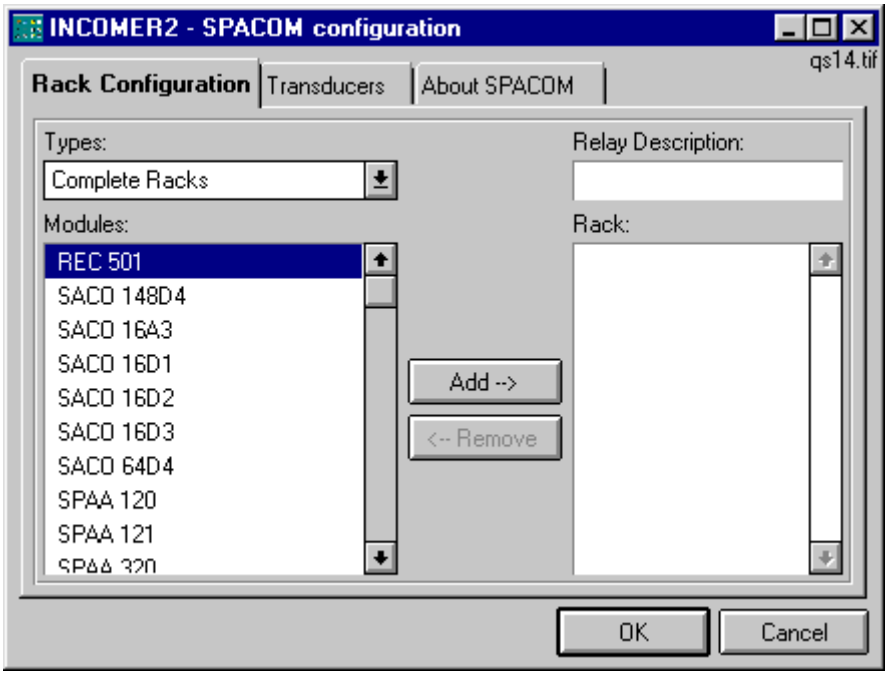


Fig. 3.9.2.2.-1 The configuration dialog for SPACOM device objects

Now, locate the module named SPAD 346 from the Modules list and click Add –> when you have selected the module. The dialog should look like the one shown in Fig. 3.9.2.2.-2.

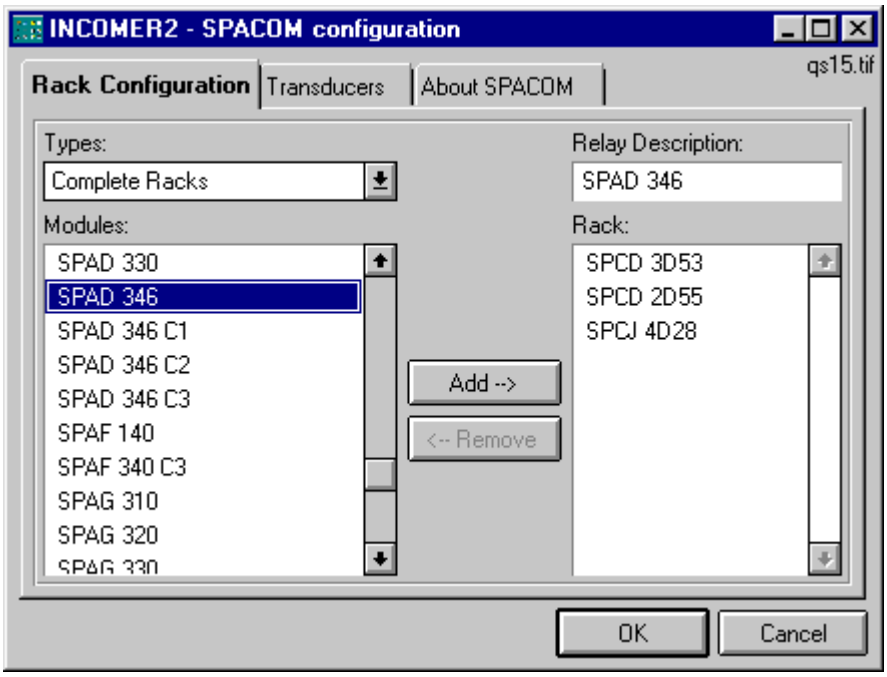


Fig. 3.9.2.2.-2 The selected SPACOM configuration

To apply the configuration, click OK and you return to the General Object Attributes dialog.

Before you can make the communication setup for the individual objects, you have to set up the system configuration as described in Section 3.8. System configuration Alternatively, you can click the **System Configuration** button in the General Object Attributes dialog (see Fig. 3.9.2.2.-3), which brings up the System Configuration dialog (see Fig. 3.8.-1).

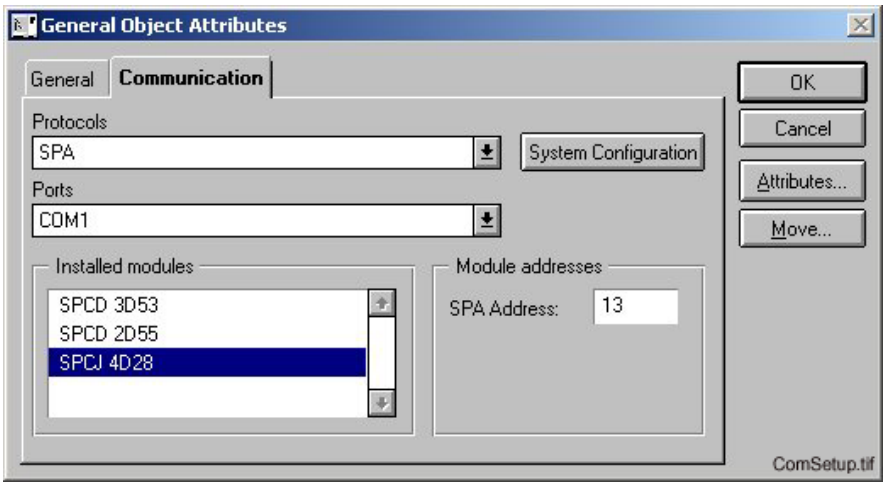


Fig. 3.9.2.2.-3 Communication addresses for some modules using SPA protocol

After having configured the system, you can make the communication setup for the devices. The presentation may vary depending on the selected device.

3.9.3. Summary

For example, the following devices with the following configuration have been added to the project:

Table 3.9.-1 Example device configuration

REF54x device	SW Configuration	Apl Configuration
INCOMER1	REF543-1MRS118501 rev. F	1MRS114502 rev. A
OUT1	REF541-1MRS118500 rev. C	1MRS114501 rev. A
OUT2	REF541-1MRS118500 rev. C	1MRS114501 rev. A
SPACOM device	**Relay Description**	
INCOMER2	SPAD 346	

At this stage, you have almost completed the example. Next, you can familiarize yourself with the use of user views in projects. Remember that regarding views, this project contains only the Master Design View, which is the only view allowing you to insert device objects to the project and configure them.

3.10. Using user views

General

No specific rules for the use of user views exist in regard to their logical contents or amount.

Creating user views

In this example, you will create two rather self-explanatory user views: one named Outgoing and another named Incoming. You will also populate these views with the previously inserted device objects appropriately.

To proceed building the sample project, select Create view on the Views menu of the Project Structure Navigator. This opens the Project View Properties dialog shown in Fig. 3.10.-1.

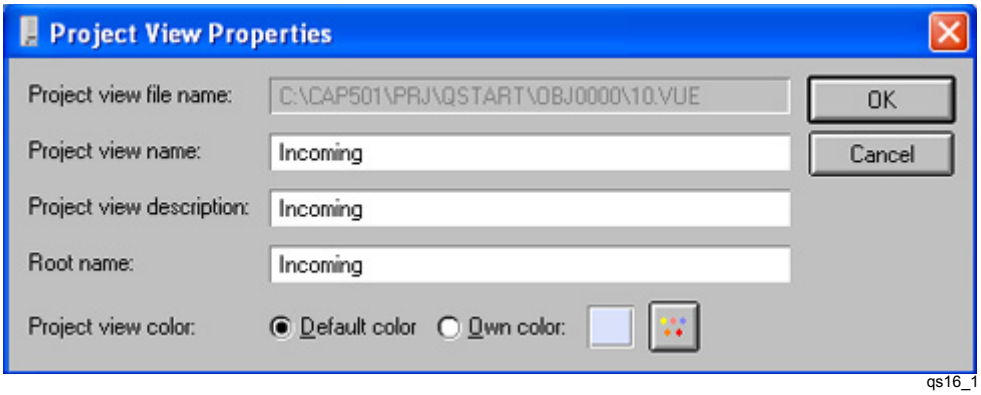


Fig. 3.10.-1 Entering information for the new user view

Specify the information for the view as shown in the above figure. You can later change these properties of views, by selecting the View Properties menu item on the Views menu. Click OK to create the view. The Navigator opens the view immediately. Notice that the Views menu now contains this newly added view below the Master Design View menu item.

Next, add the other user view similarly and specify Outgoing for the view's properties. Now your Views menu should contain the menu items shown in Fig. 3.10.-2.

Fig. 3.10.-2 User view menu items in place

Adding objects to a user view

Final step of this example is to populate the user views with the device objects.

The procedure for adding objects to user views is simplified compared to Master Design View, since the objects have already been assigned names and other basic information.

If the Outgoing view is not currently active, activate it by selecting the Outgoing menu item on the Views menu. Now, select Insert Object on the Edit menu to bring up the Add object from Master Design View dialog (see Fig. 3.10.-3). The dialog lists all the device objects that exist in the project, displaying both the titles and the names of the objects (in parentheses).

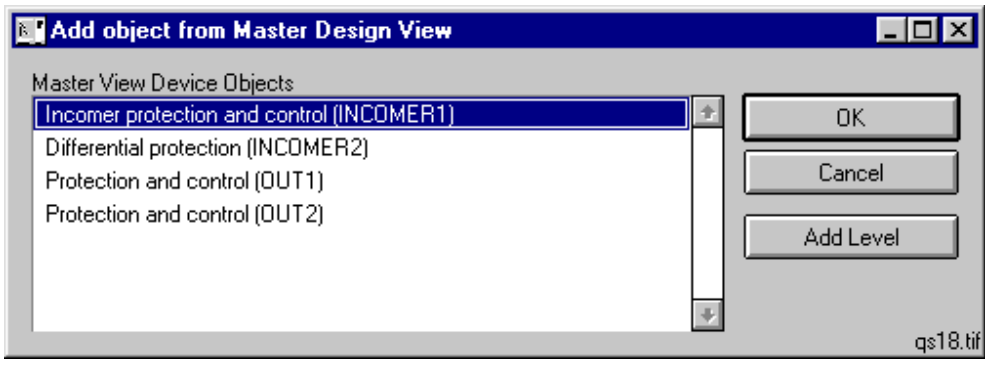


Fig. 3.10.-3 List of objects in Master Design View

Notice the Add Level button on the dialog. By clicking this button, you can add Level objects to the user view for organizing the view's contents.

The intention is to add the objects OUT1 and OUT2 into this view. Select the object named OUT1 from the list and click OK to add the object closing the dialog. The contents of the view should now be as shown in Fig. 3.10.-4.

qs19_1

Fig. 3.10.-4 Object OUT1 in place

Similarly, add the object named OUT2 to this view.

Next, switch the view by selecting the Incoming menu item on the Views menu. Add the remaining device objects INCOMER1 and INCOMER2 to this view.

3.11. Launching object tools

Object tools are launched as follows:

1. Select the target device object in the project. Object tools are available in all views of a project.
2. Double-click on the object tool on the Object Tools list or
3. Select the tool from the Object Tools list and press <Enter> on the keyboard.

The Project Structure Navigator allows a single object tool to be used at a time. Documentation for each CAP 501 tool is supplied; the documentation is listed in the Release Note.

4. Project Structure Navigator

About this chapter

This chapter describes the elements and functionality of the Project Structure Navigator.

4.1. General

The Project Structure Navigator is your workspace for managing data and tools during relay parametrization. It provides you with access to the CAP 501 tools and project-based object-oriented data management.

4.2. Projects

In CAP 501, projects are the containers for object-oriented data management and storage. Projects allow you to build representations of power stations and their protection and control devices. The Project Structure Navigator supports the maximum of 10 000 projects in the CAP 501 environment. In practice, the limit set by the amount of available disk space is more likely to be encountered.

The Navigator allows you to build projects and operate these by means of a hierarchical tree structure. The structure comprises of nodes where each node is an instance of an object type. Initially, all projects are empty, meaning that the project tree contains only one node (root level) that gives a starting point to build the project upon.

The Project Structure Navigator works in one of two modes, the Master Design View mode, or the User View mode.

4.2.1. Master Design View

The Master Design View allows insertion of all available object types in CAP 501. It is the only view, in which you can:

- Insert objects to the project
- Configure the objects
- Configure the communication settings of the objects

The device objects are also available for use in the user views. The Master Design View is a built-in view meaning that it is always available in every project and cannot be deleted.

4.2.2. User Views

User views are intended for designing browsable operator views, e.g. for showing only objects with importance to the user. The object hierarchy in a user view may differ from the one in the Master Design View. Object types of the User Structure object types group provide you with the means of arranging the hierarchy of user views. The device objects, that are available in the Master Design View, can be inserted into the user views.

4.3. Object types

The Project Structure Navigator handles three types of objects:

Level object types	Level object types function as structurization items in a project. A level object type does not set restrictions on what object types can be inserted underneath it. In many respects, levels behave like directories in a file system since directories may contain files and subdirectories. An example of level object type is the Level type.
Device object types	Device object types control physical devices. A device object stores parameters about physical hardware, e.g. a REF 541 terminal.
Compound object types	Compound object types combine the behaviour of level and device object types. In a project, a compound object has both object properties and structurization properties. As the result, a compound object has private object settings and a view level, under which it is possible to insert objects of object types allowed by the object type. The main difference between views of a level object type and a compound object type is that compound object types set restrictions on what object types can be represented in its views. Examples of compound object types are plant structures and communication gateways.

4.4. Object type groups

Each object type belongs to one named object type group, whose member types provide common functionality.

Four object type groups are available:

User Structure	Object types of this group serve the purpose of project structurization. Contains level object types only.
Plant Structure	Object types of this group serve the purpose of MicroSCADA compatible project structurization. Contains compound object types only.
Gateway	Object types of this group serve the purpose of project structurization and representation of communication gateway devices. Contains compound object types only.
Protection & Control	Object types of this group represent protection and control devices. Contains device object types only.

4.5. User interface

Access to the various tools and functions is provided by means of a toolbar, menus and keyboard shortcuts. Fig. 4.5.-1 illustrates the Navigator's user interface and its elements.

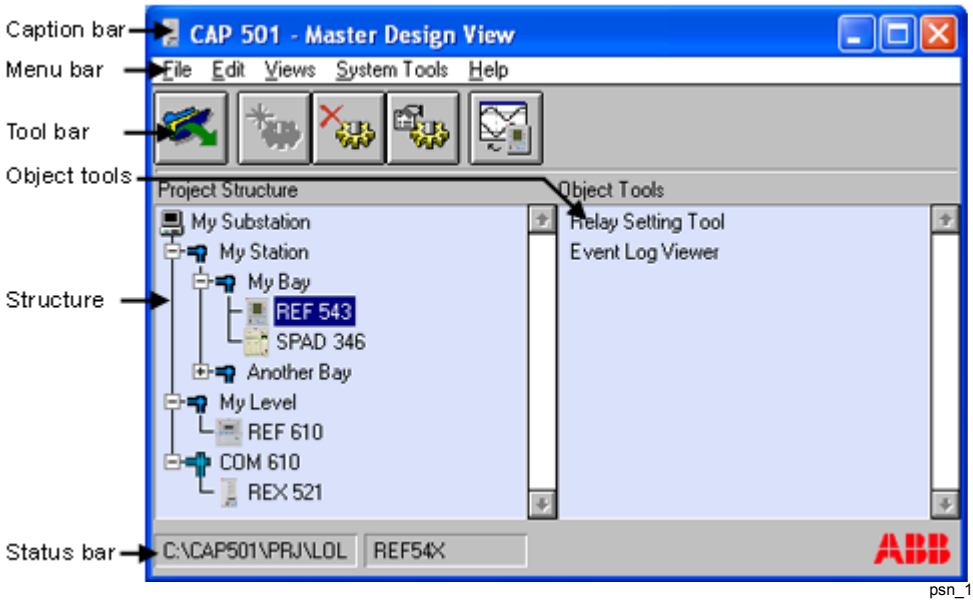


Fig. 4.5.-1 The user interface of the Project Structure Navigator

User interface elements

Caption bar	Displays the name of the current view. In Fig. 4.5.-1, it is the Master Design View. It also contains the standard operating system's window management commands for minimizing, maximizing and closing the window.
Menu bar	File, Edit, Views, System Tools and Help menu.
Tool bar	The tool bar contains shortcuts for quick access to the frequently used functions.
Object tools list	An object selection sensitive list of object tools that are available for the object currently selected in the project structure.
Structure	Displays the objects in the current project view for object selection and navigation.
Status bar	Displays the path of the current project and the type of the object, currently selected in the project structure.

The following icons are used for different object type groups in the project view:

Table 4.5.-1 Symbols for different object type groups:

	User Structure or Plant Structure
	Gateway
etc.	Protection & Control

4.6. Entering the Project Structure Navigator

To start CAP 501, select the shortcut "Start CAP 501" from the CAP 501 program folder and press <Enter> or double-click the shortcut. This starts the MicroSCADA service bringing up the Project Structure Navigator window.

Notice that if you attempt to start a second instance of CAP 501 which is not allowed, you are notified that CAP 501 is already running (see Fig. 4.6.-1).

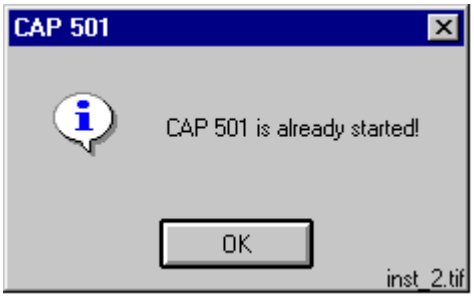
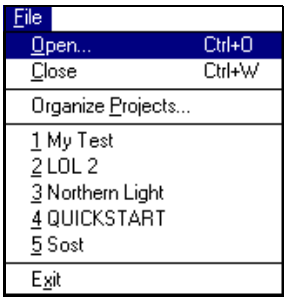


Fig. 4.6.-1 Notification that CAP 501 is already running

Dismiss the notification by clicking OK.

4.7. File menu

The file menu contains the project handling functions and Exit.



File_menu

Fig. 4.7.-1 The File menu

4.7.1. File Open

Keyboard entry: <Ctrl>+<O>

Tool bar entry:

By selecting this menu alternative, the currently open project is closed and the Open Project dialog is opened.

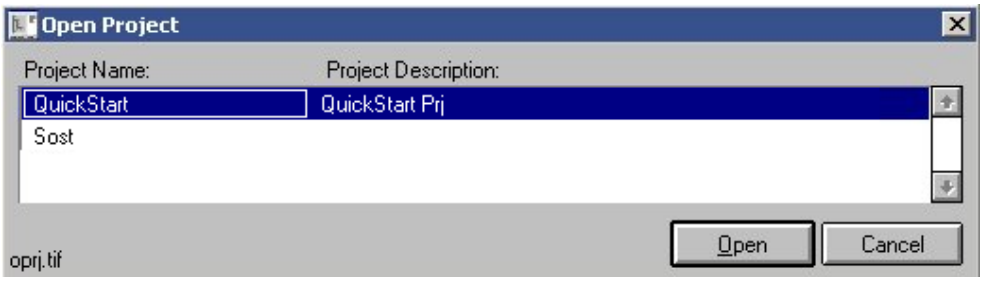


Fig. 4.7.1.-1 The Open Project dialog

To open a project into the Navigator view, first select the project and then click Open. This also enforces the project's system configuration, which you can view and modify by means of the System Configuration Tool.

4.7.2. File Close

Keyboard entry: <Ctrl>+<W>

This alternative closes the currently open project.

4.7.3. Organize Projects

By selecting this alternative, the Project Export/Import Tool is started. For more information on the tool, see Chapter 5. Project Export/Import Tool.

4.7.4. File History List

The File menu includes a file history list of the previously opened projects. It helps to quickly open recently used local project.

The five last opened projects (if any) are listed and sorted so that the last used project is the first name on the list. By clicking the project name or by entering the order number, the currently open project is closed and the requested project is opened.

4.7.5. Exit

Keyboard entry: <Alt><F4>

By selecting this alternative, CAP 501 is closed and the MicroSCADA service is stopped.

4.8. Edit menu

The edit menu contains functions for adding and deleting objects and for invoking the General Object Attributes dialog for the currently selected object.

Accessibility to the menu items depends on the currently selected object. For instance, the Delete Object item in Fig. 4.8.-1 is disabled, indicating that the currently selected object cannot be deleted.

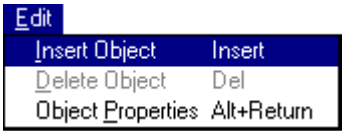


Fig. 4.8.-1 The Edit menu

4.8.1. Insert Object

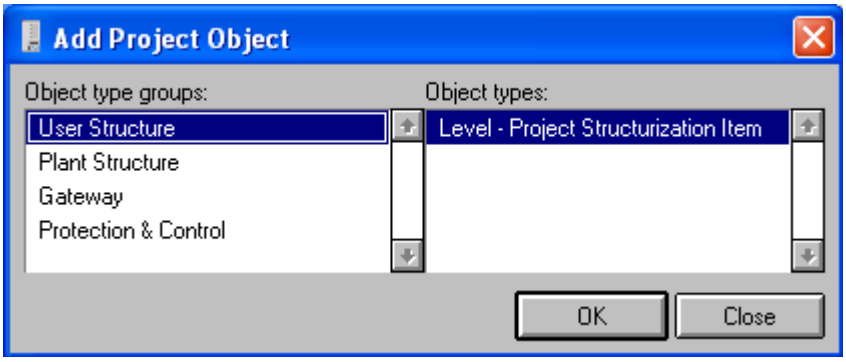
Keyboard entry: <Insert>

Tool bar entry:

By clicking this menu alternative you initiate the insertion of objects in the project.

Insert Object in the Master Design View

When you select the Insert Object function in the Master Design View, the Add Project Object dialog (shown in Fig. 4.8.1.-1), appears on the screen allowing you to specify the type of the object to be added to the currently selected location.



qs1_1

Fig. 4.8.1.-1 Insertion of an object

The Project Structure Navigator displays all the object type groups currently available in the CAP 501 environment. However, the object types of these groups are filtered according to the currently selected object, which will host the new object.

To insert the object, first choose the appropriate object type group. Select the type for the new object and click OK to enter the dialog, where you give the basic properties for the new object (see Fig. 4.8.1.-2). Notice that this dialog varies according to the type of the new object.

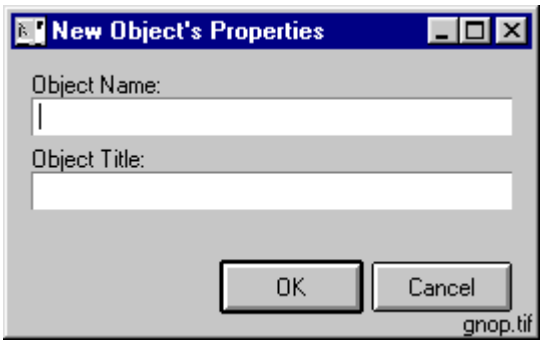


Fig. 4.8.1.-2 Provide properties for the new object

Type in the title and the name for the object and click OK to complete its insertion.

If you omit the name, the Project Structure Navigator uses a generated name. You can change both of these properties later by means of the General Object Attributes dialog. The title is a property by which you will identify the object in the project views.

The maximum number of STA objects in a CAP 501 project is limited to a total of two hundred (200). One object instance can reserve more than one STA object, so the actual maximum object count in a project may be smaller than 200. If you try to add more than 200 objects, the following notification dialog will be shown:

Fig. 4.8.1.-3 The limitation of project object instances is exceeded

Insert Object in the user views

When you select the Insert Object function in a user view, the 'Add object from Master Design View' dialog appears on the screen, allowing you to select the object to be added to the currently selected location.

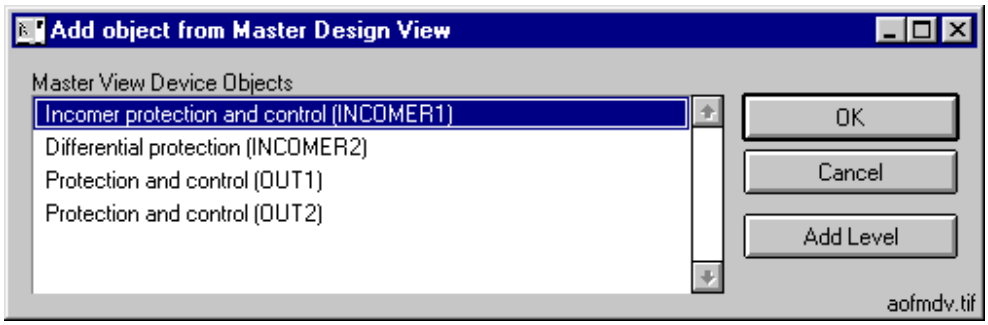


Fig. 4.8.1.-4 Inserting a device object to a user view

To insert a device object, first choose it from the object list and click OK to close the dialog.

All device objects that you have inserted in the Master Design View are available for selection. However, you can insert a device object only once to a given user view.

This dialog also allows you to insert Level objects, which you can use for organizing the contents of the user view. This is accomplished by clicking the Add Level button (see Fig. 4.8.1.-4).

To insert a Level object, either select the root node of the view or another Level object. Then, click Add Level to enter the dialog for providing the title of the object (see Fig. 4.8.1.-5).

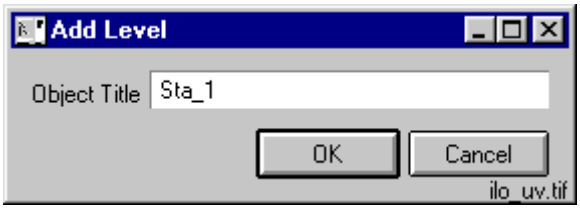


Fig. 4.8.1.-5 Inserting a Level object to a user view

Provide a unique title in the view's scope and click OK to close the dialog.

4.8.2. Delete Object

Keyboard entry: <Delete>

Toolbar entry:

To delete the currently selected object, use this function. You can delete only such objects, which do not contain any subordinate objects.

If you are working in a user view, the deleted object remains in the project database and it can thus be re-added to any user view in the project. However, deleting an object from the Master Design View permanently removes the object from the

project database, which in essence means erasing the object's file storage from the hard disk. Regarding device objects, deletion automatically causes the object to be silently removed from any user views.

4.8.3. Object Properties

Keyboard entry: <Alt>+<Return>

Tool bar entry:

To bring up the General Object Attributes dialog for the currently selected object, use this menu item.

Notice that if you select the root node, this function brings up the dialog for changing and viewing properties of the project (in the Master Design View) or properties of a user view (in a user view).

4.8.3.1. General Object Attributes dialog

The General Object Attributes dialog is a central tool for project object management. The dialog contains two tabbed pages: General and Communication for setting/ viewing object's attributes. The General page is available for all objects in all views, whereas the Communication page is displayed only in Master Design View for objects that require communication settings. With the dialog's buttons, you invoke the object's configuration dialog, if supported by the object type, and the dialog for moving the object in the project hierarchy.

The Communication page is not documented here. For detailed information on configuring the communication settings, refer to the respective object type's configuration guide (e.g. the Tools for Relays and Terminals manual.

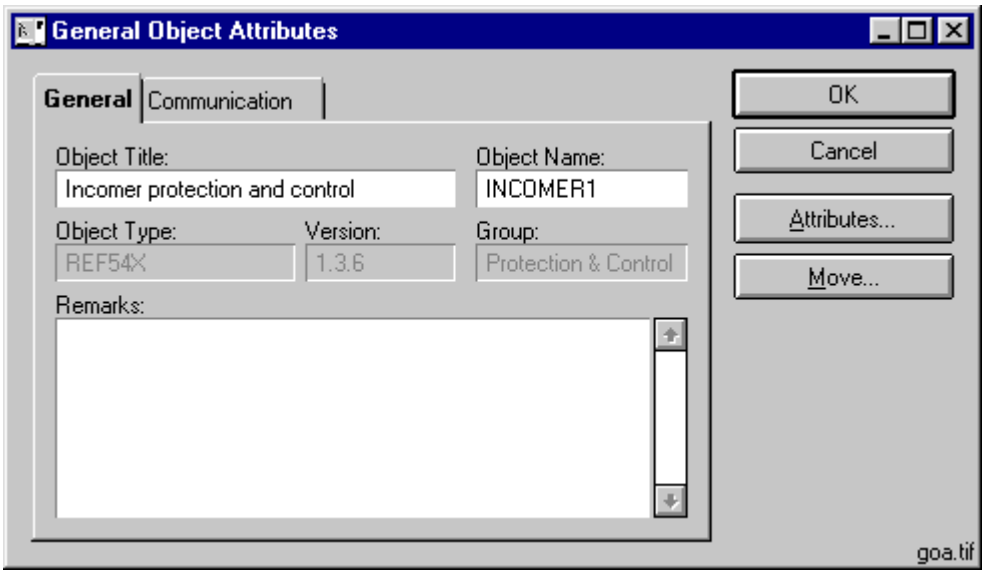


Fig. 4.8.3.1.-1 The General Object Attributes dialog

Table 4.8.3.1-1 General Object Attributes dialog items

General page	
Object Title	A read/write attribute in the Master Design View, read-only in user views.
Object Name	A read/write attribute in the Master Design View, read-only In user views.
Object Type	The type of the object, read-only in all views.
Version	The version of the object's type, read-only in all views.
Group	The group of the object's type, read-only in all views.
Remarks	Remarks on the object. A read/write attribute in the Master Design View, read-only in user views. **Note!** Data is automatically truncated to 253 characters without notice.
Buttons	
OK	Closes the dialog saving the changes to the object's general attributes.
Cancel	Closes the dialog discarding the changes to the object's general attributes. **Note!** This button does not have any impact on changes to the object's configuration.
Move	If the object's type supports moving objects, this button invokes the dialog for moving the object within the current view. Otherwise this button is disabled. For details on moving objects, see Section 4.8.3.2. Moving objects.
Attributes	Invokes the dialog for configuring the object. Enabled in Master Design View only, on condition that the object's type supports object configuration. Otherwise this button is disabled.

4.8.3.2. Moving objects

Objects can be moved only within the current view. The procedure involves using the Move Object dialog (see Fig. 4.8.3.2.-1). The dialog is invoked using the General Object Attributes dialog by means of the Move button, which is available only if the currently selected object's type supports moving objects.

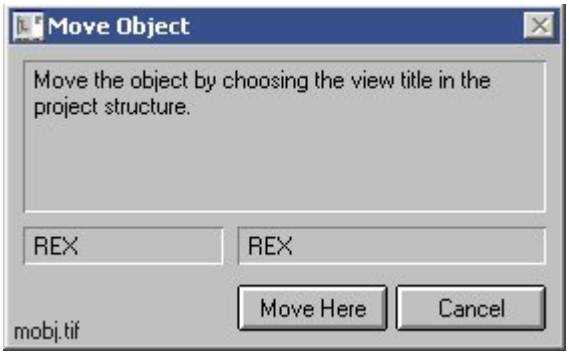


Fig. 4.8.3.2.-1 The Move Object dialog

To move an object:

1. Select the object you intend to move.
2. From the Edit menu select Object Properties to open the General Object Attributes dialog.
3. Click Move to open the Move Object dialog.
4. In the project structure, select the node, which will host the moved object. Notice that you can work with the project tree in a normal manner, i.e. expand and collapse nodes.
5. On the Move Object dialog, click Move Here to move the object. The Move Object dialog closes causing the project structure to collapse. Notice that if the Project Structure Navigator detects that the currently selected target node cannot host the object you are about to move, you are not allowed to perform the move operation. This means that clicking Move Here has no effect.

To cancel moving the object, click Cancel in the Move Object dialog.

4.9. Views menu

The Views menu contains view manipulation functions and the list of user views, if such have been created in the current project. For example, in Fig. 4.9.-1 below, the project contains one user view, titled User view 1.

Fig. 4.9.-1 The Views menu

4.9.1. Create View

With this menu option it is possible to create new user views.

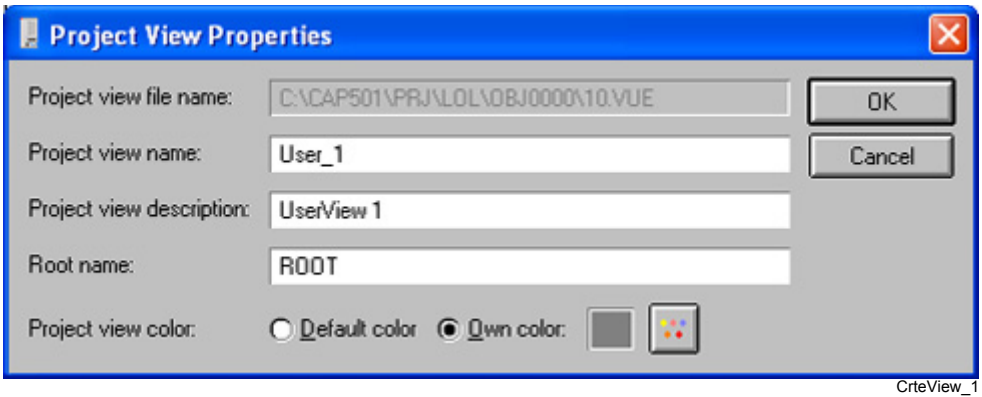


Fig. 4.9.1.-1 The Project View Properties dialog

New user views are created by defining the view name, that is the instance name, and the view description that is a logical name for the view. The root name is the name of the root node in the new view.

Different view colors can be used to differentiate projects and/or separate views of a project. By clicking the button next to the "Own color" sample color box, a Color Chooser dialog opens where you can select a color. The "Default color" option reverts the view to the default light blue color.

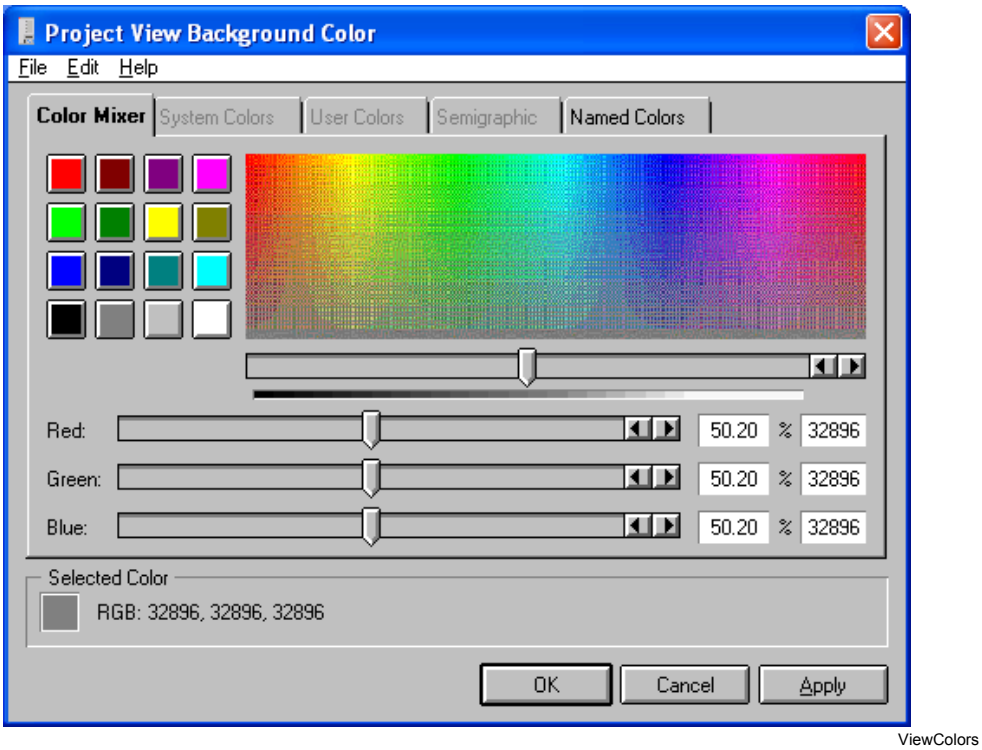


Fig. 4.9.1.-2 Defining own view color

4.9.2. Delete View

This option deletes the current view. Only user views can be deleted meaning that you can not delete the Master Design View.

4.9.3. View Properties

Select this option to view or change the current view's properties.

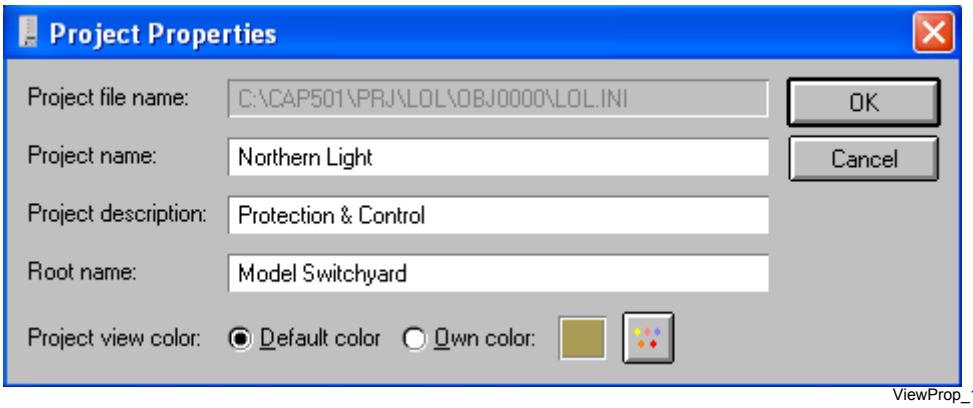


Fig. 4.9.3.-1 The Project Properties dialog

Project properties are the project name, that is the instance name, and the project description that is a logical name for the project. The root name is the name of the root node in the project view.

The background color for the view can be changed by clicking the button next to the "Own color" sample color box. To change back to the default light blue color, select the "Default color" option.

4.9.4. View List

The View List is a list of all views defined for the project. By selecting one of the views, the navigator changes the active view. Only the Master Design View is always available, user views are optional.

4.10. System Tools menu

The System Tools menu contains the tools that are available for use at the CAP 501 system level.

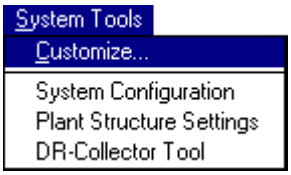


Fig. 4.10.-1 The System Tools menu

This menu is customizable. You can modify the contents of this menu by selecting the Customize… option, see the next Section 4.10.1. Customize.... By default, menu items for invoking the System Configuration Tool, Plant Structure Settings Tool and the DR-Collector Tool are available.

For detailed information on the System Configuration Tool, refer to Chapter 10. System Configuration Tool.

For detailed information on the Plant Structure Settings Tool, refer to Chapter 6. Plant Structure Settings.

For detailed information on the DR-Collector Tool, refer to the *Tools for Relays and Terminals* manual.

4.10.1. Customize...

The Customize… menu alternative, see Fig. 4.10.1.-1, makes it possible to add and remove tools to and from the System Tools menu.

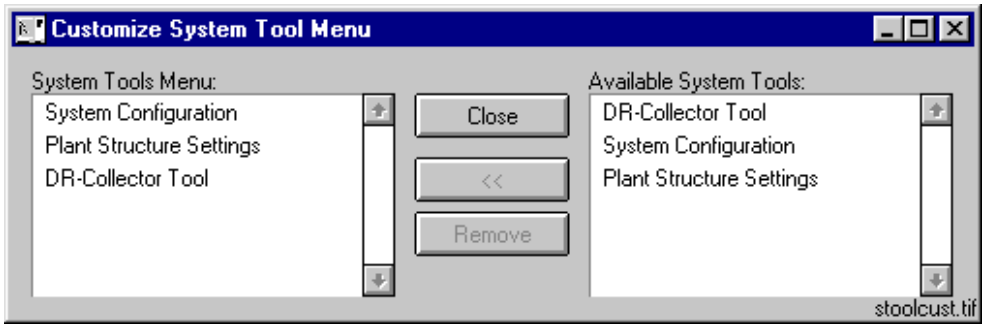


Fig. 4.10.1.-1 The Customization dialog

By selecting a system tool from the right hand list and clicking <<, the tool is added to the System Tools menu. And by selecting a tool from the left hand list and clicking Remove, the tool is removed from the System Tools menu.

4.11. Help menu

This menu contains the function for invoking the About dialog of the Project Structure Navigator and CAP 501.

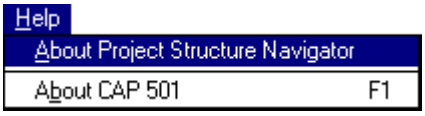


Fig. 4.11.-1 The Help menu

4.11.1. About Project Structure Navigator

This About dialog contains information about the current version of the Project Structure Navigator and the Project Manager.

4.11.2. About CAP 501

Keyboard entry: <F1>

This About dialog contains information about the current version of CAP 501.

The information presented in the About CAP 501 dialog should be available when contacting your local support. It can be copied to the Windows clipboard in a textual format by clicking the Copy button in the About dialog.

5. Project Export/Import Tool

About this chapter

This chapter describes the Project Export/Import Tool.

5.1. General

The Project Export/Import Tool is used when a project is to be transferred to another system or brought into your CAP 501 projects collection, which comprises all the projects stored under the directory \CAP501\PRJ.

5.2. Starting the Project Export/Import Tool

The Project Export/Import Tool is started from the File menu by selecting Organize Projects..., see Figure 4.2.-1.

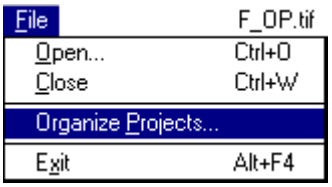


Fig. 5.2.-1 File menu with Organize projects...

The user interface of the Project Import/Export Tool is shown in Fig. 5.2.-2

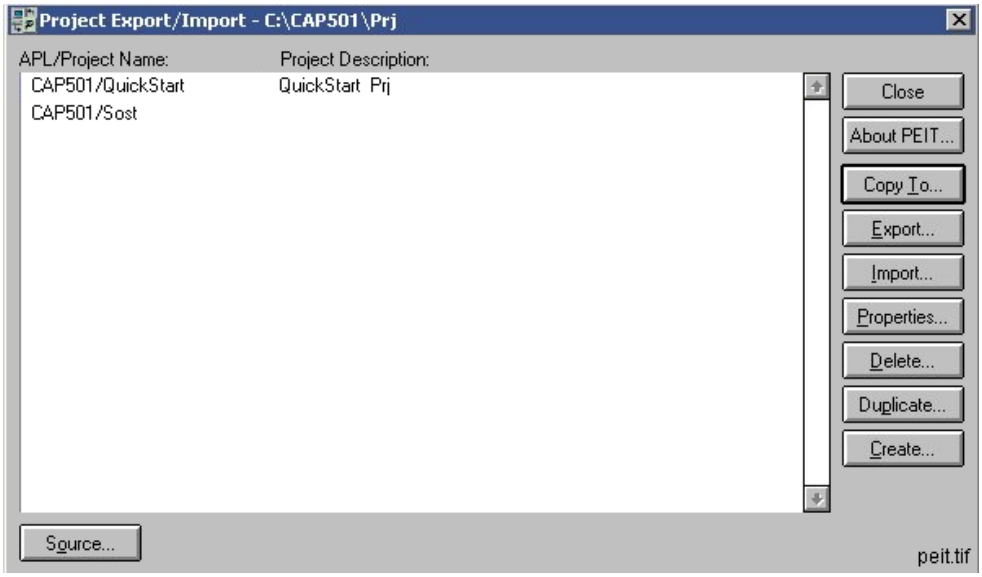


Fig. 5.2.-2 The user interface of the Project Export/Import Tool

Table 5.2.-1 presents the project-management functionality provided by the Project Export/Import Tool (see also Fig. 5.2.-1.)

Table 5.2.-1 Description of the Project Export/Import dialog buttons:

Close	For closing the dialog.
About PEIT...	Provides additional information about the tool and System Information.
Copy to...	For copying projects.
Export...	For exporting projects from the CAP 501 project collection to an arbitrary user-defined location.
Import...	For importing projects from an arbitrary user-defined location to the CAP 501 project collection.
Properties...	Provides information about the project folder.
Delete...	For deleting projects from the CAP 501 project collection.
Duplicate...	For duplicating projects in the CAP 501 project collection.
Create...	For creating projects in the CAP 501 project collection.
Source	For defining the Project Source Directory. It can be the computer you are using or the MicroSCADA environment. You can also define the path manually.

5.3. Features

5.3.1. Updating the project list

The operating principle of the Project Export/Import Tool is first to select a project collection to the list view. The project list is updated by choosing the Source button shown in Fig. 5.2.-2). The project list can be one of the following:

- Your CAP 501 project collection. By default, the project list displays this selection.
- MicroSCADA application projects on a logical drive, either a local or a network drive.
- Projects stored in an arbitrary user-specified directory.

The project list displays project names in the format APL/ProjectName. When APL is CAP 501, it means that the project is in the CAP 501 project collection. Any other APL indicates the MicroSCADA application and project name.

The Source button invokes the following dialog for choosing one of the alternatives above:

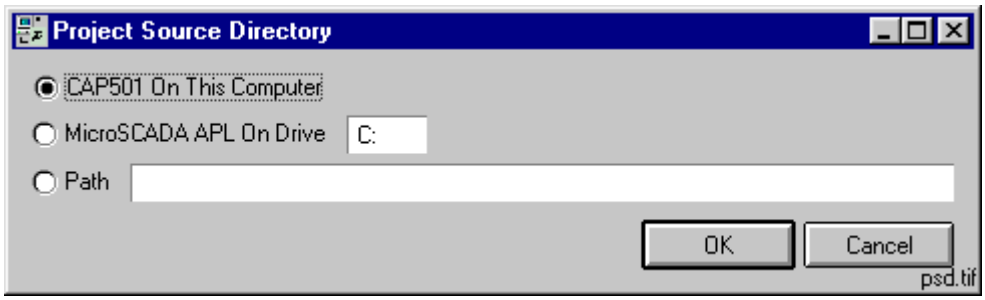


Fig. 5.3.1.-1 The Project Source Directory dialog

The MicroSCADA APL On Drive and the Path entries allow you to access both the local and network computers.

To use the MicroSCADA APL On Drive option, specify the drive letter followed by a colon (:), for example 'R:'. The Path entry allows using the Universal Naming Convention (UNC) file format in addition to the standard format: <drive:>\<directory path>. Sample UNC entries are provided below:

Using a share name

```
\\WORKSTA\Backup\CAP501\Projects
```

where;

WORKSTA	is the name of the target computer.
BACKUP	is a share name on the target computer.
CAP501\PROJECTS	is a directory path under the share name.

Using the operating system's administrative share name

```
\\WORKSTA\C$\Backup\CAP501\Projects
```

where;

WORKSTA	is the name of the target computer.
C$	is the operating system's administrative share name on the target computer, the root directory of the drive C.

BACKUP\CAP501\PROJECTS'
is a directory path under the share name.

5.3.2. Project storage

Projects are stored in the PRJS directory in earlier CAP 501/505 releases, for example:

```
<DRIVE:>\SC\CAP501\PRJS
```

In later CAP 501/505 releases they are stored in the PRJ directory, for example:

```
<DRIVE:>\CAP501\PRJ
```

The MicroSCADA application projects are stored under the directory:

<DRIVE:>\SC\APL\aplname\PROTECTION\PRJ

where;

APLNAME is the name of the MicroSCADA application.

5.3.3. Copying projects between network computers

In network environments, projects can be copied from the local computer to/from other computers in the network. Other computers are referred to by using their computer name, which is a feature of the operating system. You should be granted full access to the share name, if the intention is to copy projects to the network computer's project database collection.

The destination can be one of the following alternatives:

- The CAP 501 project collection on the local computer
- A MicroSCADA library application on a drive letter
- A network directory
- A MicroSCADA library application on a network computer

Notice that, it is up to you to verify before the project is copied that, object types and tools in the project are compatible or equal on the remote system. If the project contains objects of greater or foreign object types, the remote system may encounter problems if the project contains object types of other versions than what is expected by the object types and tools. Copying a project does not include the object types.

In Hot Stand-By systems (HSB) it is important that MicroSCADA is shut down while the project is being copied.

When a project is copied to a MicroSCADA application, it is copied to the application's PROTECTION\PRJ directory. For example, when the application is named PKS, the destination would be \SC\APL\PKS\PROTECTION\PRJ. Since a MicroSCADA library application can process one project only, it is named PRJ. For example, when a project is copied from a CAP 501 project collection to a MicroSCADA library application, it is renamed to PRJ during the copying process.

If a project already exists in the destination directory, you are prompted to replace the project or abort the operation. Also, if you enter a destination directory which actually is the same as the source directory, you will be notified that the copying cannot continue.

Copy To... button brings up the Copy Project dialog (shown in Fig. 5.3.3.-1), for choosing a destination for the selected project in the project list view.

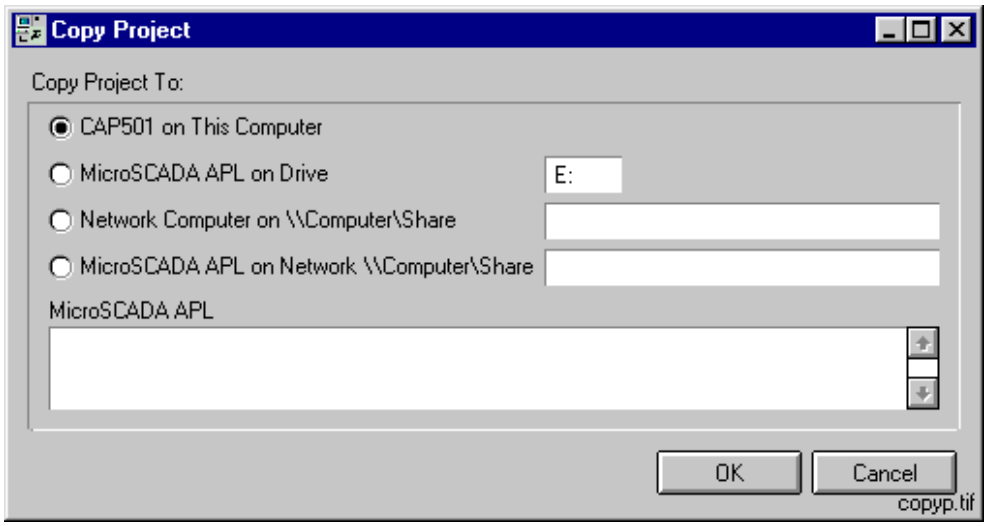


Fig. 5.3.3.-1 The Copy Project dialog

Enter the drive designation for the option MicroSCADA APL on Drive in format <drive letter><colon>, for example 'C:'. Use the letter of the drive on which MicroSCADA has been installed.

Enter a network computer name in UNC format, for example '\\L40017\MYPRJ'. In this example, the computer name is L40017 and MYPRJ is the share name. The option MicroSCADA APL on Network \\Computer\Share refers to the APL directory on the MicroSCADA computer, for example '\\L40017\D_root\SC\APL'. Press <Enter> when your option is either MicroSCADA APL on Drive or MicroSCADA APL on Network \\Computer\Share to update the MicroSCADA APL list with the desired MicroSCADA applications.

When you have selected the desired destination, click OK to copy the project to the selected destination.

5.3.4. Choosing storage location for temporary projects

Temporary projects mean the compressed projects that have been exported from CAP 501 or other product. It is recommended to save such projects in a special-purpose directory outside the directory structure of CAP 501, for example C:\EXPORTS.

Especially, avoid using the directory \CAP501\TEMP for such purpose, since the CAP 501 kernel may choose to erase its contents at any time.

5.3.5. Exporting projects

Exporting a project means that all associated object entries in a project are duplicated to some other location specified by you. The destination location can be on the local system or on a network drive: the destination location is specified as a directory path, for example C:\EXPORTS. The directory path must exist at the time you issue the export command.

The output result, in the specified directory, is a compressed archive file with the file extension .AR. For example, if the project filename (which is also the actual directory name for the project) is KRISTIINANKAUPUNKI, then the compressed archive file name is truncated to KRISTIIN.AR.

When the project is later imported, the full project name must be used, although its compressed project filename is only eight (8) characters in length.

The object types used in the project are not exported along with the project. Hence the functionality in this sense is the same as with copying the projects, as described in Section 5.3.3. Copying projects between network computers.

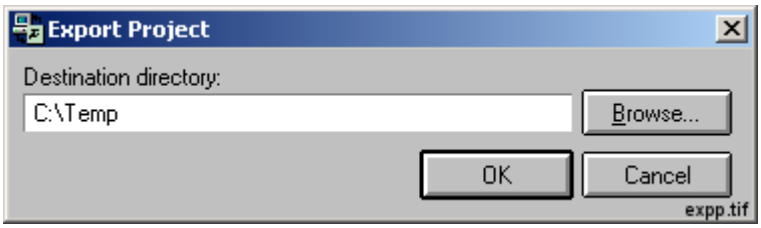


Fig. 5.3.5.-1 The Export Project dialog

5.3.6. Importing projects

Importing a project is done in a similar way to exporting, except for the directory entry: the source directory is the location from where the project is copied to your project collection. The source directory can be a directory on your local computer system or on a network drive. The directory entry must be the full directory path to the project, for example C:\EXPORTS\KRISTIINANKAUPUNKI means that a compressed project archive file KRISTIIN.AR is in the directory C:\EXPORTS.

Notice that the project must be specified using its complete project filename, although its compressed archive filename is only eight (8) characters in length.

If the compressed archive was distributed to you on several diskettes, you must first copy the contents of all the diskettes to a common directory on a hard disk drive and import the project from there (see the note in Fig. 5.3.6.-1 below).

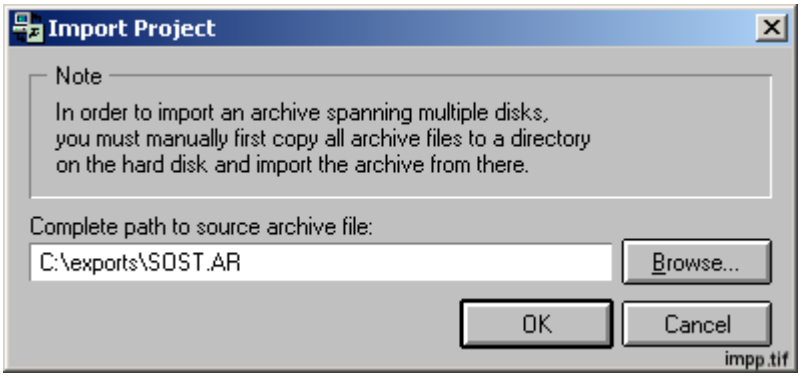


Fig. 5.3.6.-1 The Import Project dialog

The complete filename path is the full path of the exported project archive. For example, if a project DEMO was exported to directory X:\EXPORTS, then the complete filename path would be X:\EXPORTS\DEMO.AR (if the drive letter X: is mounted to the same location on both systems).

The system configuration of the project (i.e. the communication settings in the System Configuration and the object level addresses) is preserved when the project is imported. If the communication settings are obsolete or the current communication environment differs too much from the source environment, the communication settings of the project can later be reset from the System Configuration dialog (see Section 3.8. System configuration in this manual). The applicable settings are automatically converted, if the source project is detected to have been exported from another compatible tool product.

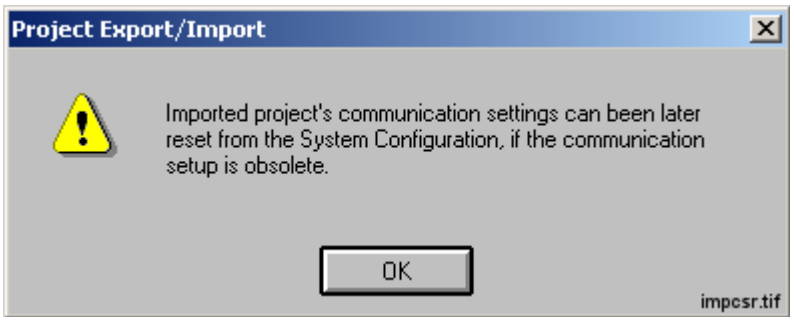


Fig. 5.3.6.-2 The communication settings reset dialog

5.3.7. Project properties

The following dialog shows the filename of the selected project:

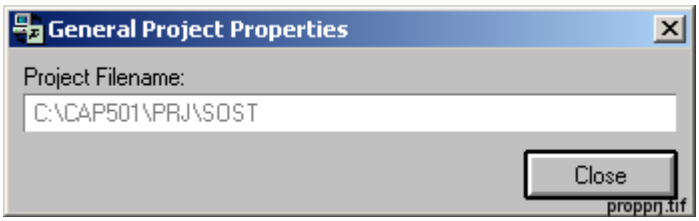


Fig. 5.3.7.-1 The General Project Properties dialog

5.3.8. Deleting a project

Deleting a project is an irreversible operation that cannot be undone.

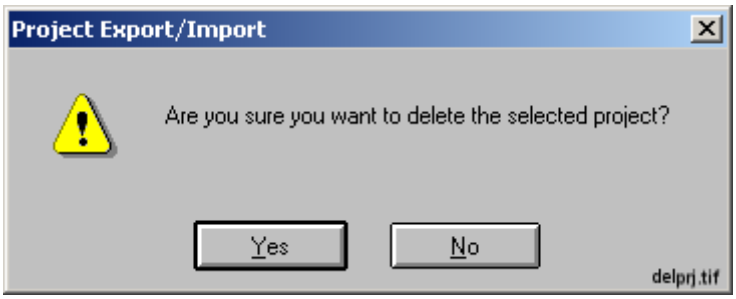


Fig. 5.3.8.-1 Once you delete a project, you cannot undo it

5.3.9. Duplicating a project

Duplicating a project means that an exact copy of the selected project is copied to your CAP 501 project collection. During the process of duplication, you can specify a different project name and description. The project filename is actually a folder name (directory name), which then will become the project's home directory. The project filename must not already exist.l

The Project Filename must be a single-word name without spaces or characters other than:

A through Z and

0 through 9

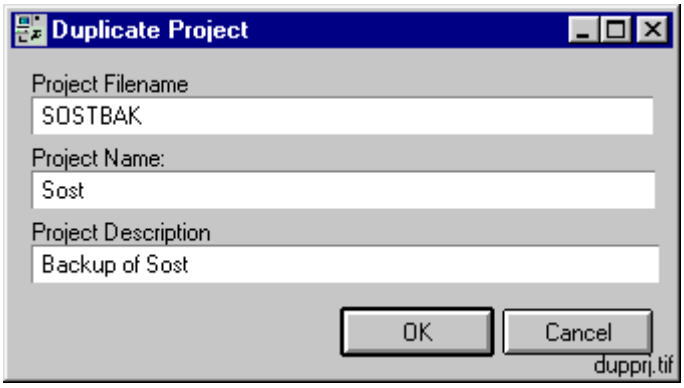


Fig. 5.3.9.-1 The Duplicate Project dialog

Maximum length of the Project Filename is eight (8) characters.

5.3.10. Creating a new project

Creating a new project is done in a dialog similar to duplicating a project. The newly created project is assigned an empty system configuration, i.e. no serial port communication channels exist in the project's system configuration. Regarding project creation, the same restrictions that apply to the project duplication apply also here (see Section 5.3.9. Duplicating a project).

5.3.11. Errors accessing remote disk resources

If you attempt to read/write access to a disk resource on a remote computer, which does not contain matching MicroSCADA user account, you will receive error notifications illustrated in Fig. 5.3.11.-1 and Fig. 5.3.11.-2.

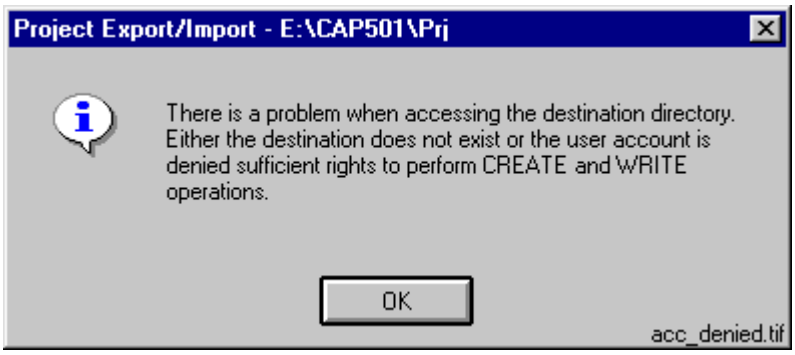


Fig. 5.3.11.-1 Notification about a failed export operation

Fig. 5.3.11.-2 Notification about a failed import operation

The notification in Fig. 5.3.11.-2 appears on the screen also if the specified project does not exist.

In order to recover from such a situation, ensure that the target computer's MicroSCADA user account is assigned the same password as your local computer.

6. Plant Structure Settings

About this chapter

This chapter describes the functionality of the Plant Structure Settings Tool.

6.1. General

In order to be able to define the attributes for the plant structure object types that are applicable to the whole project, this system level tool is available. This tool provides the possibility to modify the predefined attributes and define the properties of the undefined levels in the object type. For more information on the plant structure object types, see Chapter 7. Plant Structure object types.

The lowest three levels are disabled because there are no use for them in the CAP 501/505 environment.

6.2. Starting the Plant Structure Settings Tool

Start the tool by selecting the Plant Structure Settings on the System Tools menu in the Project Structure Navigator (see Fig. 6.2.-1).

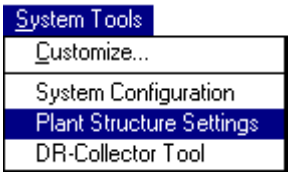


Fig. 6.2.-1 Starting the Plant Structure Settings Tool

6.3. Attributes of plant structures

The attributes of the plant structure are applicable to the whole project, i.e. there cannot be several definitions of the plant structure's attributes in the same project.

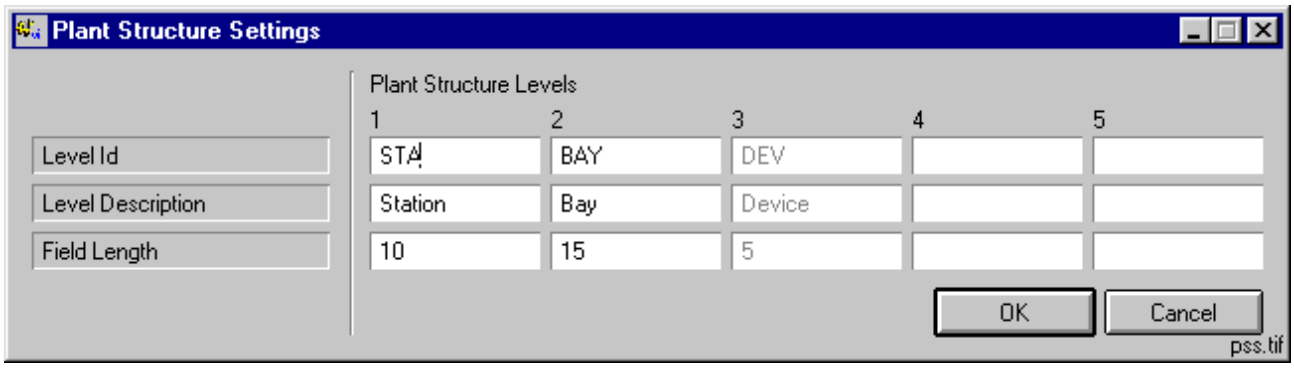


Fig. 6.3.-1 Plant Structure Settings dialog

The attributes that can be modified by means of this tool are:

- Level Id
- Level Description
- Field Length

These attributes are described in more detail in the following chapters.

The default values have been chosen on the basis of the corresponding functionality in the MicroSCADA Network Control system.

It is not recommended to change the default values as it would probably cause compatibility problems when e.g. exporting projects to MicroSCADA.

6.3.1. Level Id

The Level Id attribute defines what the identifier is for recognizing a certain level in a plant structure.

The defaults are:

- STA that is used for recognizing station level objects
- BAY that is used for recognizing bay level objects
- DEV that is used for recognizing device level objects

6.3.2. Level Description

The Level Description attribute is used for describing the different levels in the Add Object dialog, when an object is inserted.

The defaults are:

- Station
- Bay
- Device

6.3.3. Field Length

The Field Length attribute defines the maximum possible length of the instances' names, when adding an object of the plant structure type to the project.

The defaults are:

- 10
- 15
- 5

7. Plant Structure object types

About this chapter

This chapter describes the object types included in the plant structure object group.

7.1. Overview

The Plant Structure object types are intended to be used, when building MicroSCADA compatible project structures. It is possible to define five structure levels, although three of them are predefined. For more information on structure level definition, see Chapter 6. Plant Structure Settings.

7.2. General

The plant structure object types are level sensitive. This means that it is only possible to insert predefined objects under each level of the structure. For example, it is not possible to insert a bay object under the root level, while it is possible under the station level.

7.3. Field length

The length of the instance name in the Plant Structure object type is restricted to the value defined for the level in the Plant Structure Settings. See Chapter 7. Plant Structure object types for more information.

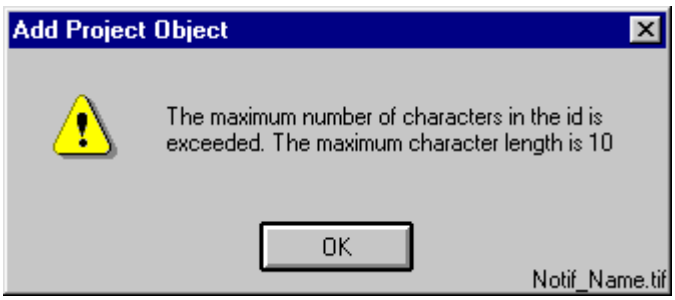


Fig. 7.3.-1 Notification about the instance name length

If the instance name is longer than defined in the Plant Structure Settings, the notification shown in Fig. 7.3.-1 appears on the screen. When this happens, the correct thing to do is to shorten the instance name to the maximum number of characters indicated by the notification.

7.4. Station

The station level is intended to be used in conjunction with a subsequent bay level. Highlight the project's root node and select Insert Object from the Edit menu to open the Add Project Object dialog (see Fig. 7.4.-1).

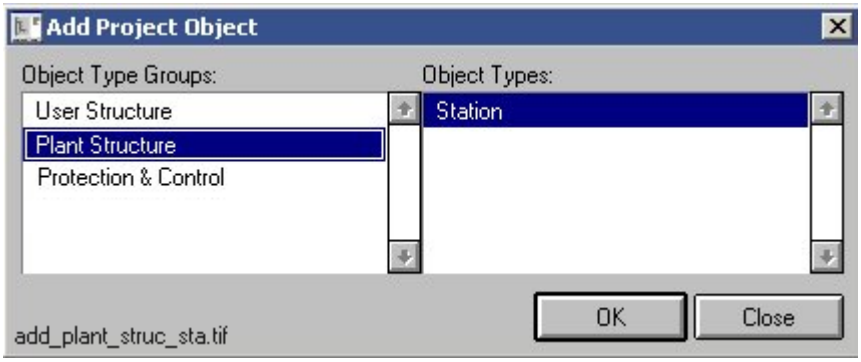


Fig. 7.4.-1 Adding a station level object

Insert the station object by selecting the Plant Structure object group and the Station object type. Then, click OK to open the station level object dialog (see Fig. 7.4.-2).

(Notice that in the Project Structure Navigator's status bar, the displayed object type is OI for objects of type Station).

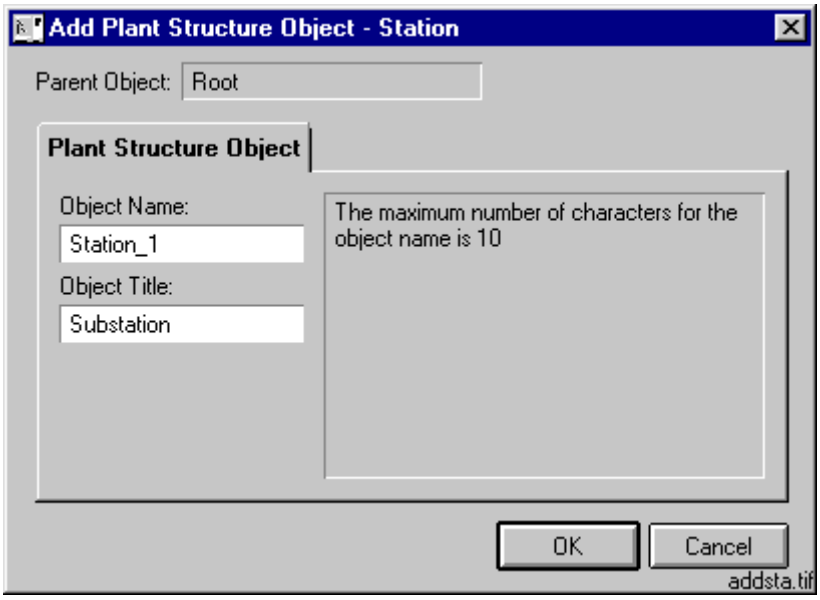


Fig. 7.4.-2 Adding a Station level object

Type in an appropriate name and title for the object and click OK to have the station level object inserted.

The name of the object identifies the unique instance as the structure is built up. The instance name length is restricted to the number of characters defined in the Plant Structure Settings. The maximum length of the name is also displayed on the dialog.

The title of the object is a symbolic description and it is visible in the Project Structure Navigator.

7.5. Bay

Highlight a station level object of a Plant Structure and select Insert Object from the Edit menu to open the Add Project Object dialog (see Fig. 7.5.-1).

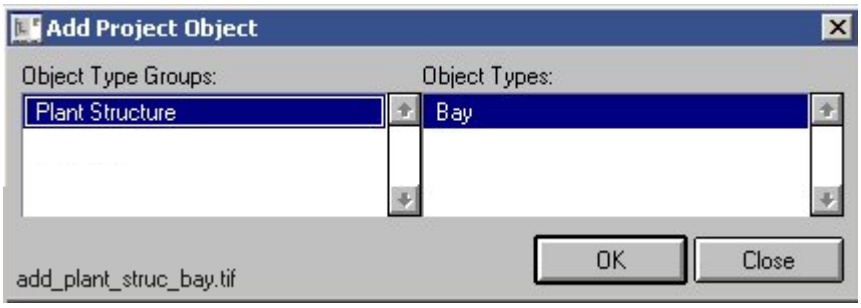


Fig. 7.5.-1 Adding a Bay level object

Insert the bay object by selecting the Plant Structure object group and the Bay object type. Then, click OK to open the bay level object dialog box (see Fig. 7.5.-2).

(Notice that in the Project Structure Navigator's status bar, the displayed object type is OI for objects of Bay type).

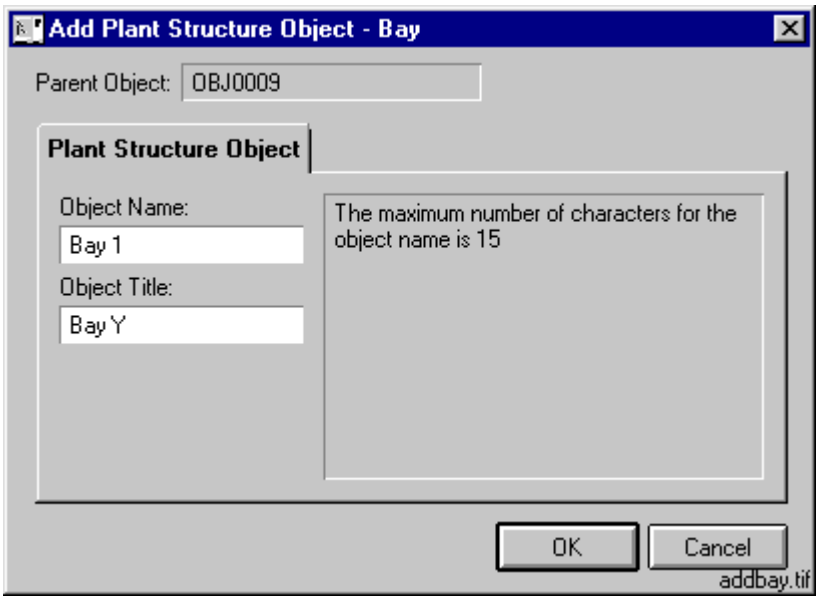


Fig. 7.5.-2 Adding a Bay level object

Type in an appropriate name and title for the object. Then, click OK to have the bay level object inserted.

The name of the object identifies the unique instance in the structure. The instance name length is restricted to the number of characters defined in the Plant Structure Settings. The maximum length of the name is also displayed on the dialog.

The title of the object is a symbolic description and it is visible in the Project Structure Navigator.

8. User Structure object types

About this chapter

This chapter describes the object types included in the User Structure object group.

8.1. Overview

User Structure object types are intended to serve as structurization objects for structures that have some other structurization requirements than MicroSCADA compatibility. The level structure can be built as deep as is required for the purpose intended.

8.2. General

The User Structure object types can be used both in the Master Design View and in the user views.

The main difference between the User Structure object types and the Plant Structure object types is that the User Structure does not have the guided insertion order, which means that the levels and their purposes are defined by the user.

8.2.1. Inserting Level objects

Highlight a level object and select Insert Object from the Edit menu to open the Add Project Object dialog shown in Fig. 8.2.1.-1. Notice that in every view, the root node is also a Level object.

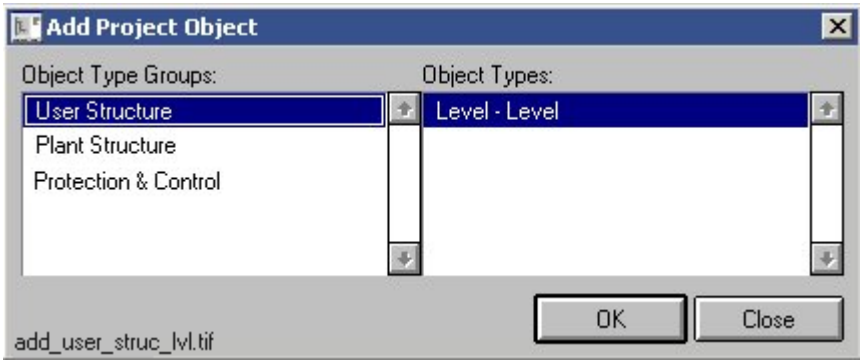


Fig. 8.2.1.-1 Adding a User Structure object

To insert the level object, select the User Structure object group and then the Level object type. Click OK to open the Add Level dialog shown in Fig. 8.2.1.-2.

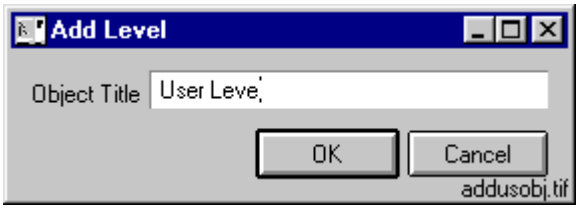


Fig. 8.2.1.-2 Adding a Level object

Enter a title for the object and click OK to insert it into the tree structure. The title is visible in the Project Structure Navigator and it must be unique in the scope of its view, i.e. you cannot have two Level objects having the same title in a single view.

9. Gateway object types (COM 610)

CAP 501 supports the following gateway:

- COM 610 communication gateway

9.1. General

In CAP 501, the COM 610 communication gateway can be used as a SPA router for the following relays and terminals:

- RED 500 series
- SPACOM family

Being a communication gateway, the task of COM 610 is to make protocol conversions between process communication and remote communication. The protocol used in process communication is called the master protocol (protocol between COM 610 and the relay/terminal), and the protocol used in remote communication is called the slave protocol (protocol between CAP 501 and COM 610). In general, the master protocol can be selected irrespective of the selected slave protocol.

For the protocol conversions to be possible, cross-references between different protocols must be done with the engineering tools provided by COM 610. The engineering also includes mapping of the protocol addresses.

Installation, configuration and usage of a COM 610 communication gateway itself is not described here. The documentation and tools delivered with the gateway must be utilized.

9.2. Supported protocols

The following master/slave protocols supported by COM 610 can be used in CAP 501.

Slave protocol:

- A COM 610 object can be connected to CAP 501 via a SPA router or a SPA TCP/IP protocol.

Master protocols:

- A COM 610 object allows SPA or SPA TCP/IP protocols to be defined as the master protocol for the RED 500 series.
- A COM 610 object allows SPA or SPA TCP/IP protocols to be defined as the master protocol for the SPACOM family.

The SPA TCP/IP master protocol refers to the usage of a SPA-ZC 400/402 Ethernet adapter and an IEC 61850 OPC server in COM 610.

9.3. Insertion

Adding and using a COM 610 object in a CAP 501 project is not mandatory. The device objects can be added to the project with or without a COM 610 object, if defining the device communication settings properly.

COM 610 objects can be inserted only in the Master Design View mode of the Project Structure Navigator, and cannot be used in a project's user views. However, the device objects hosted by a COM 610 object are normally visible also in the user views.

You can insert COM 610 objects into the following locations of a project:

- under the root node of the project
- under a Station object
- under a Bay object
- under a Level object

In contrast to other objects, COM 610 objects are non-movable. This means that once inserted, a COM 610 object cannot be moved elsewhere in the tree structure.

The modifiable attributes of COM 610 objects are the same as for the other object types (see Fig. 9.3.-1).

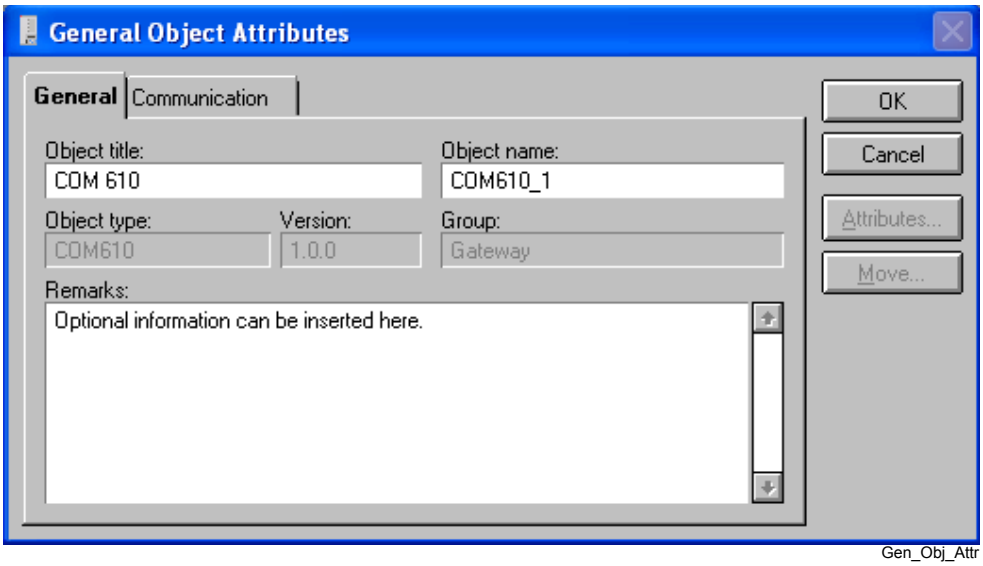


Fig. 9.3.-1 General object attributes for COM 610 objects

9.4. Communication settings

Due to the nature of a communication gateway usage, the communication settings for both the master and the slave protocol must be defined separately. These settings together define the complete communication settings of a single relay/terminal.

Since the cross-reference tables between the master and slave protocols must have been done for COM 610, also the protocol addresses are mapped. In other words, the SPA address of a relay/terminal to be used in CAP 501 is not necessarily the same as defined in the physical relay/terminal.

SPA addresses behind a COM 610 object must be unique in CAP 501.

9.4.1. Communication settings of COM 610 object

The communication settings of the COM 610 object can be configured only if the project's system configuration contains one or more serial ports or TCP connections.

The communication settings of COM 610 objects are configured on the Communication page of the General Object Attributes dialog in the Project Structure Navigator (see Fig. 9.4.1.1.-1 and Fig. 9.4.1.2.-1).

9.4.1.1. SPA protocol settings of COM 610 object

When the SPA protocol is used to connect the COM 610 to CAP 501, the only required definition is the serial port to be used. The SPA address is not applicable for the gateway itself.

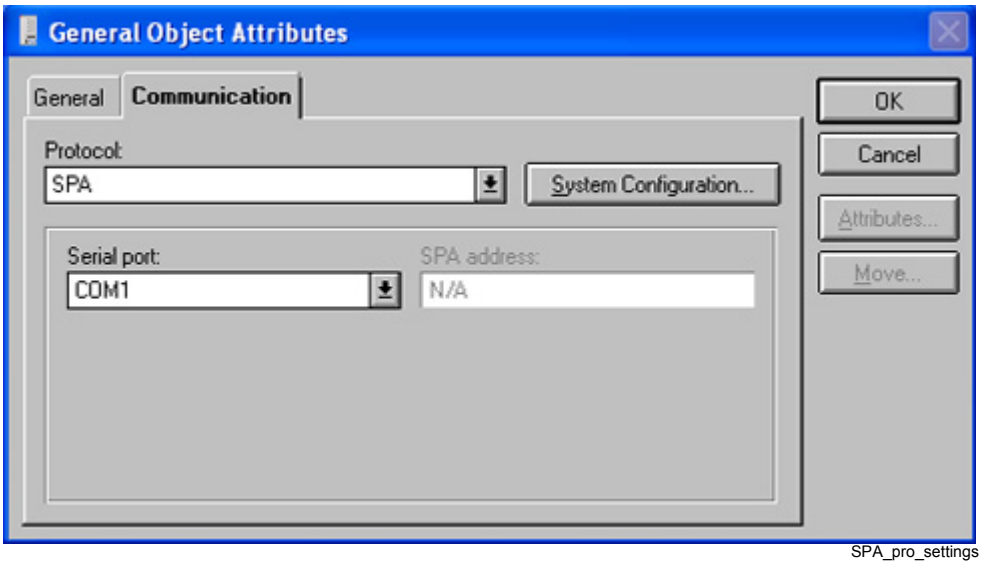


Fig. 9.4.1.1.-1 SPA protocol settings for COM 610 objects

9.4.1.2. SPA TCP/IP protocol settings of COM 610 object

When the SPA TCP/IP protocol is used to connect COM 610 to CAP 501, two definitions are required:

- TCP connection on the local computer to be used
- IP address of the COM 610 gateway

The SPA address is not applicable for the gateway itself.

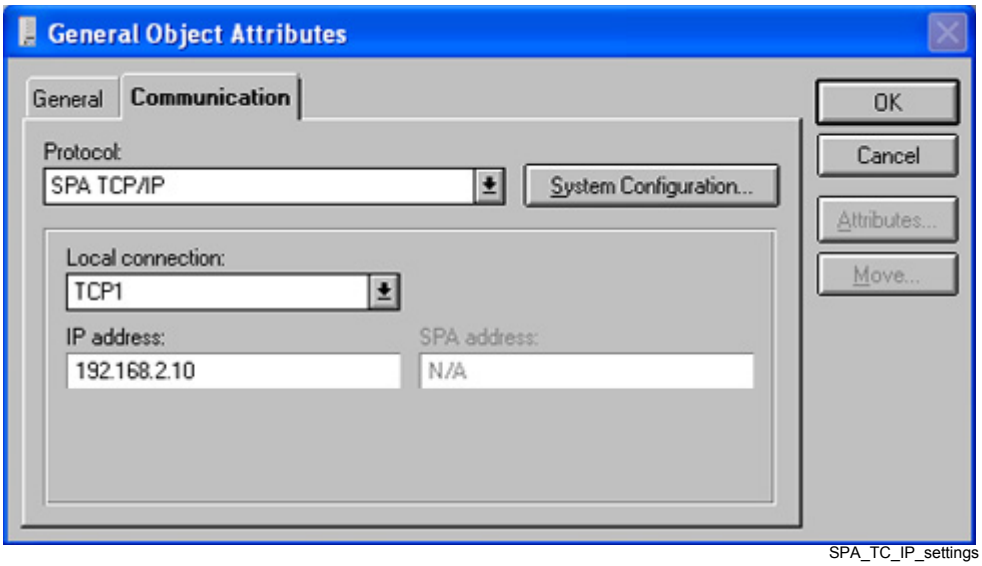


Fig. 9.4.1.2.-1 SPA TCP/IP protocol settings for COM 610 objects

9.4.2. Communication settings of device object

The communication settings of the device object can be configured only if the parent COM 610 object's communication settings have been defined first.

The communication settings of device objects are configured on the Communication page of the General Object Attributes dialog in the Project Structure Navigator (see Fig. 9.4.2.-1).

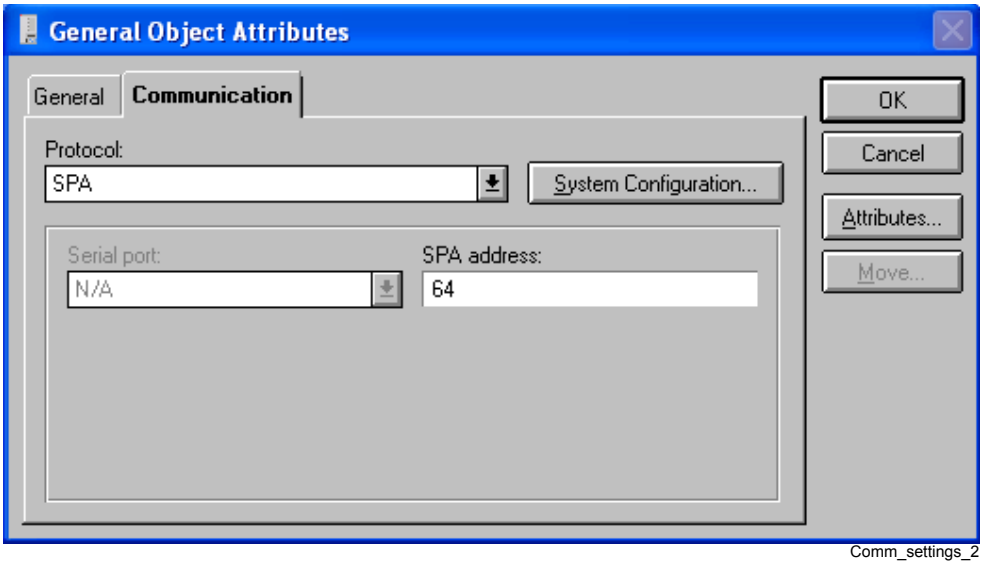


Fig. 9.4.2.-1 Communication settings for RED 500 series terminal with COM 610 as master.

Irrespective of the protocol to be selected (SPA or SPA TCP/IP), the only required definition is the SPA address. Other port/connection/address definitions are not applicable for the device objects connected to COM 610.

Address mappings between CAP 501 and COM 610 are based on SPA addresses with all the master protocols.

9.5. Using COM 610 object

Here is an example of a configured COM 610 object:

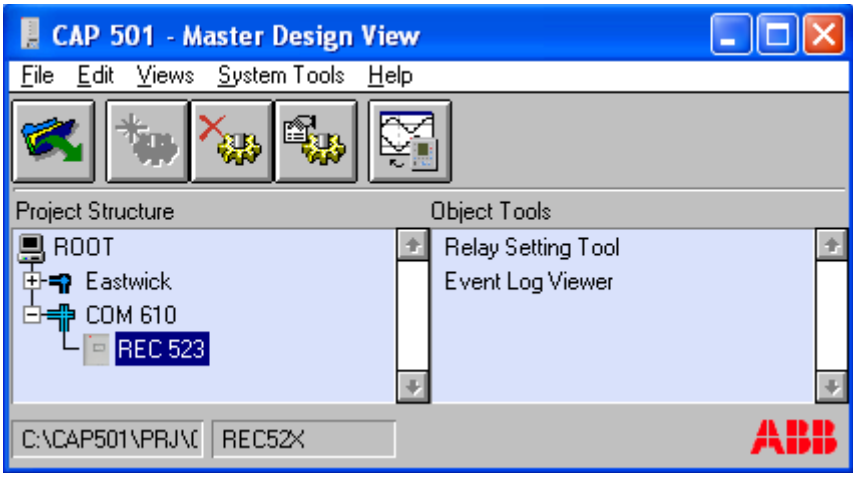


Fig. 9.5.-1 COM 610 object hosting a REC52X object

10. System Configuration Tool

10.1. General

The System Configuration Tool is intended for setting up the project's system configuration, to enable communication with the relays in CAP 501. Every project has its own copy of the system configuration, which is enforced when the project is opened into the Project Structure Navigator. Likewise, when a project is closed, its system configuration is stored with the project.

10.2. Target project

The System Configuration Tool automatically edits the system configuration of the project that is being opened into the Project Structure Navigator. If there is no project open in the Project Structure Navigator, the System Configuration Tool will not execute.

10.3. Communication protocol support

Supported communication protocols are:

- SPA
- SPA TCP/IP

10.4. Serial port configuration

10.4.1. Serial ports

Each serial port defined for use in CAP 501 must also exist at the operating system level. For example, if you define serial ports COM1 through COM4 in CAP 501, you must also define them under the operating system. For detailed information on configuring the serial ports under the operating system, refer to the Windows Help or other applicable source of information.

CAP 501 supports a total of 8 serial ports (COM1 through COM8) in a system configuration.

10.4.2. Advanced serial port settings

Advanced serial port settings are defined only at the operating system level. Therefore, you do not have to define them in CAP 501. These settings include:

- Interrupt request line (IRQ)
- Input/output (I/O) addresses
- Data buffering settings

10.4.3. Basic serial port settings

The basic serial port settings that are defined at the operating system level are overridden by the settings you specify in CAP 501. These settings include:

- Baud rate
- Data bits
- Parity
- Stop bits

10.4.4. Using USB ports

In order to utilize a USB port with CAP 501, you need to use a USB to serial adapter. You also need to install the driver software for it (this software is distributed by the adapter). The adapter can be set to a serial port in the range within COM 1 to COM 8. You need to check your operating system setup for a free COM-port.

In the CAP 501 system configuration setting of serial port you select the serial port you have assigned to be provided by the converter. No further settings are required in CAP 501 for using a USB port since the USB looks to a serial adapter like a genuine serial port to CAP 501. USB ports are not applicable in Windows NT.

10.5. SPA TCP/IP communication

Using the SPA TCP/IP protocol requires an Ethernet network adapter to be installed on the computer. It can be any device supported by the operating system. For detailed information on configuring the network adapters under the operating system, refer to the operating system Help or other applicable source of information.

Using the network adapter in CAP 501 does not require any additional installation or configuration in addition to the definitions made in CAP 501 System Configuration Tool.

10.6. Starting

In order to access this tool, two entry points are provided:

- System Tools menu in the Project Structure Navigator
- The Communication page of the General Object Attributes dialog

The System Configuration Tool edits the system configuration of the project that is currently being opened into the Project Structure Navigator. If there is no project opened in the Project Structure Navigator, the System Configuration Tool refuses to execute.

10.7. System Configuration Tool dialog

The System Configuration Tool dialog is shown in Fig. 10.7.-1.

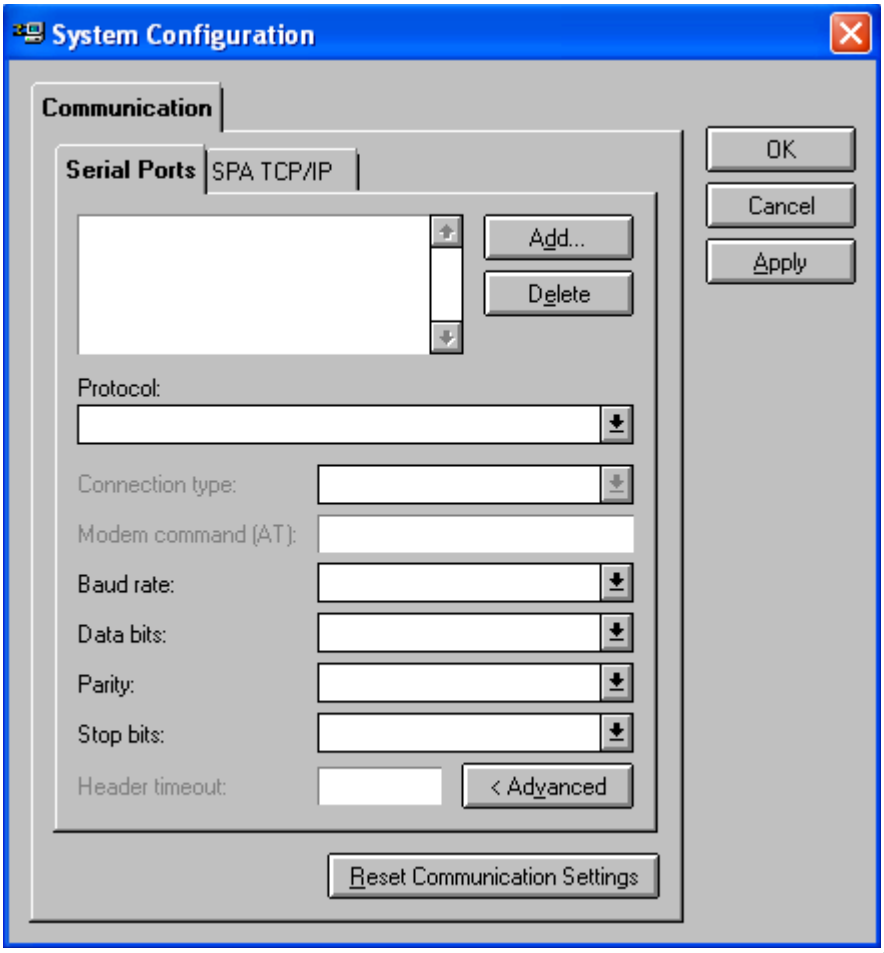


Fig. 10.7.-1 System Configuration Tool dialog

The Communication page contains two pages:

- Serial Ports
- SPA TCP/IP

Table 10.7.-1 System Configuration Tool items

Communication configuration pages	
Serial Ports	For managing serial port configuration, see Section 10.7.1. Serial Ports page.
SPA TCP/IP	For managing the SPA TCP/IP configuration, see Section 10.7.2. SPA TCP/IP page.
Communication configuration buttons	
Reset Communication Settings	For resetting the communication settings, see Section 10.9. Resetting communication settings.

Table 10.7.-1 System Configuration Tool items

Common dialog buttons	
OK	For closing the System Configuration Tool and saving the configuration. For more information, see Section 10.8.1. Save configuration - close tool.
Cancel	For closing the System Configuration Tool without saving the configuration. For more information, see Section 10.8.3. Discard configuration changes.
Apply	For saving the configuration without closing the System Configuration Tool. For more information, see Section 10.8.2. Save configuration - proceed configuration.

10.7.1. Serial Ports page

Fig. 10.7.1.-1 displays the Serial Ports page of the System Configuration Tool. Initially the configuration is empty, as illustrated in the figure below.

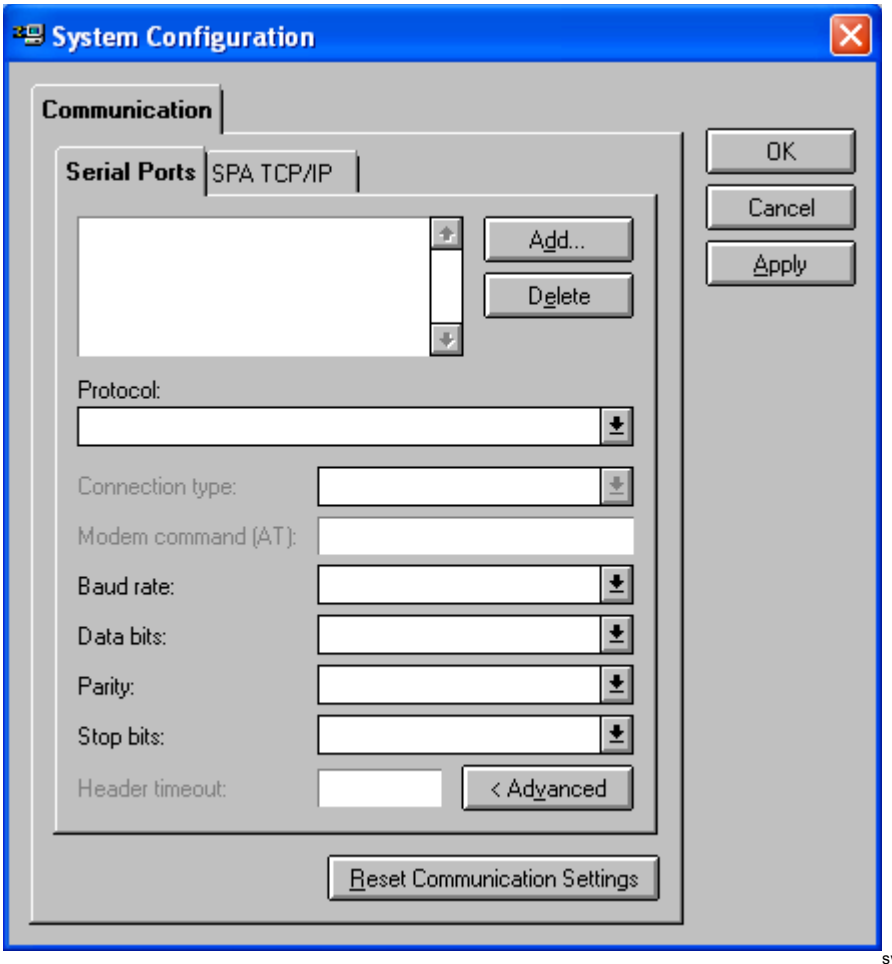


Fig. 10.7.1.-1 The Serial Ports page

Table 10.7.1-1 Serial Ports page items

Serial Ports page items	
Serial Ports	For selecting a serial port. Displays all the currently defined serial ports.
Protocol	For assigning the communication protocol to the currently selected serial port.
Connection type	This list is not used in CAP 501 and is always disabled.
Modem command (AT)	This field is not used in CAP 501 and is always disabled.
Baud rate	For assigning the baud rate to the currently selected serial port.
Data bits	For assigning the data bits setting to the currently selected serial port.
Parity	For assigning the parity setting to the currently selected serial port.
Stop bits	For assigning the stop bits setting to the currently selected serial port.
Header timeout	Field for defining the Header Timeout attribute for the currently selected serial port. Enabled only after clicking the "<Advanced" button.
< Advanced button	For enabling the editing of the Header timeout field.
Add … button	For adding a new serial port. For more information, see Section 10.7.1.1. Serial ports - Adding.
Delete button	For deleting the currently selected serial port. For more information, see Section 10.7.1.3. Serial ports - Deleting

10.7.1.1. Serial ports - Adding

To add a serial port:

1. Click Add … to bring up the dialog shown in Fig. 10.7.1.1.-1.
2. Enter the serial port number, which must be in range of 1 through 8. If you enter an out-of-range value, or a value which is already in use, you are requested to enter a proper value.

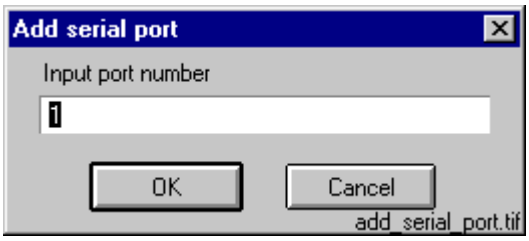
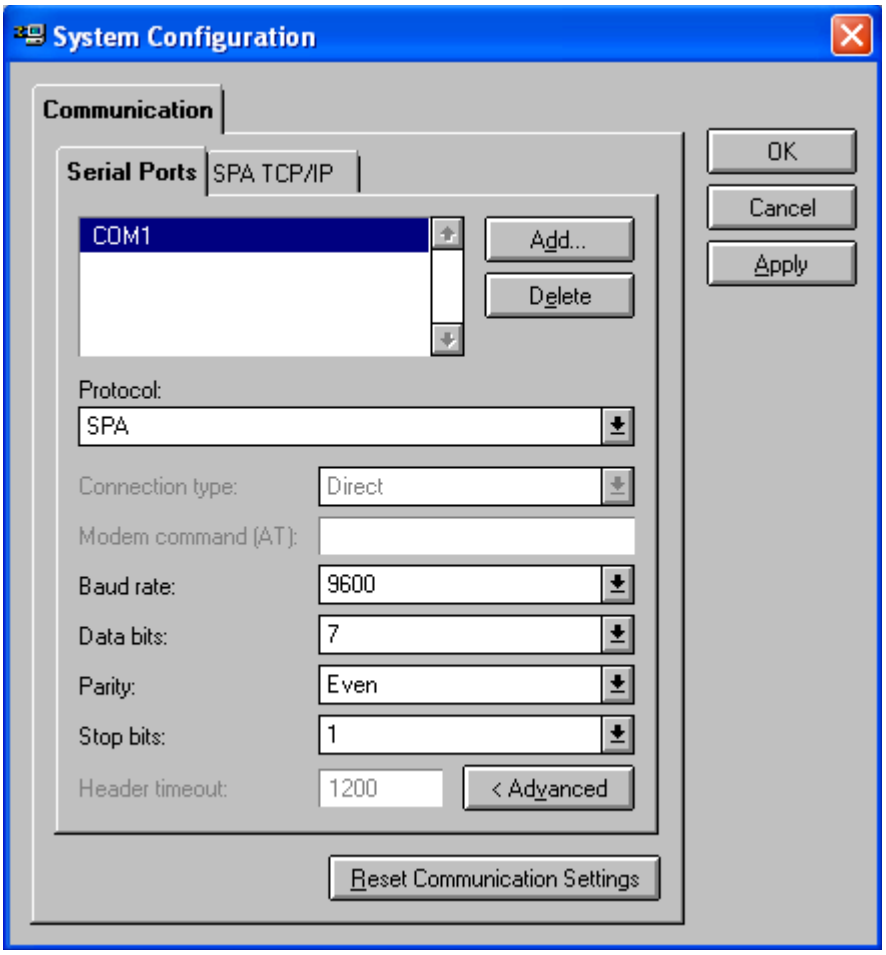


Fig. 10.7.1.1.-1 Define the port number for the new COM port

3. Click OK to add the new port, which appears in the Serial Ports list (see Fig. 10.7.1.1.-2). Otherwise, click Cancel to keep the configuration unchanged.



new_port_1

Fig. 10.7.1.1.-2 A new serial port COM1 added with default values

The newly added port's basic settings and communication protocol are assigned default values. If you wish to use other than the default values, you can configure them as described below.

10.7.1.2. Serial ports - Configuring

The following table displays serial port properties, which you can configure on a per-serial port basis.

Table 10.7.1.2-1 Configurable properties of serial ports.

Property	Available values
Protocol	SPA
Connection type	Direct
Baud rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600
Data bits	5,6,7,8
Parity	None, Odd, Even
Stop bits	1,2
Header timeout	0 - 65535 (ms)

To configure a serial port property:

1. Select the serial port from the Serial Ports list.
2. Configure the item by selecting the desired value from the appropriate list or by entering the value manually.

The Header Timeout attribute of the SPA lines defines the maximum waiting time in milliseconds within which the first byte of a response from the slave should be received after the transmission of a message. By default, the "Header timeout" field is disabled to indicate that normally the value should not be modified. When the "<Advanced" button is clicked, a warning message is shown before the value can be changed. The default value for a direct SPA connection is 1200 ms.

10.7.1.3. Serial ports - Deleting

Any serial port, defined in a project's system configuration, can be deleted at any time.

To delete a serial port from the configuration:

1. Select the serial port from the Serial Ports list.
2. Click Delete ….
3. When prompted to confirm the deletion, click Yes to delete the serial port (see Fig. 10.7.1.3.-1). Otherwise click No to leave the serial port intact.

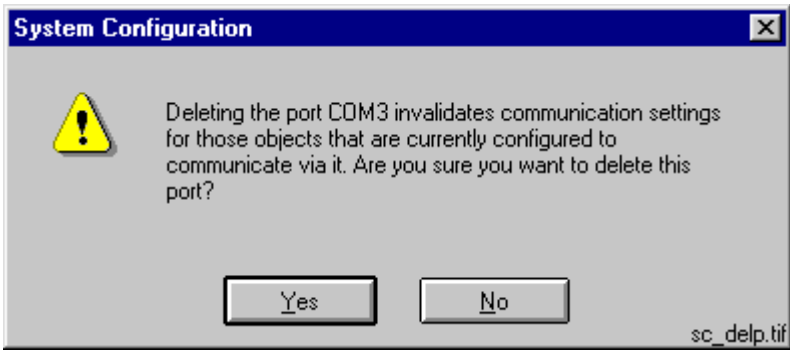


Fig. 10.7.1.3.-1 Confirm to delete the selected serial port

The deletion invalidates the communication settings of any device objects, which has been configured to use the port you are about delete.

If you accidentally delete ports, you can revert to the most recently saved system configuration by clicking Cancel (see Section 10.8.3. Discard configuration changes).

10.7.2. SPA TCP/IP page

The SPA TCP/IP page of the System Configuration Tool is shown in Fig. 10.7.2.-1. Initially the configuration is empty, as illustrated.

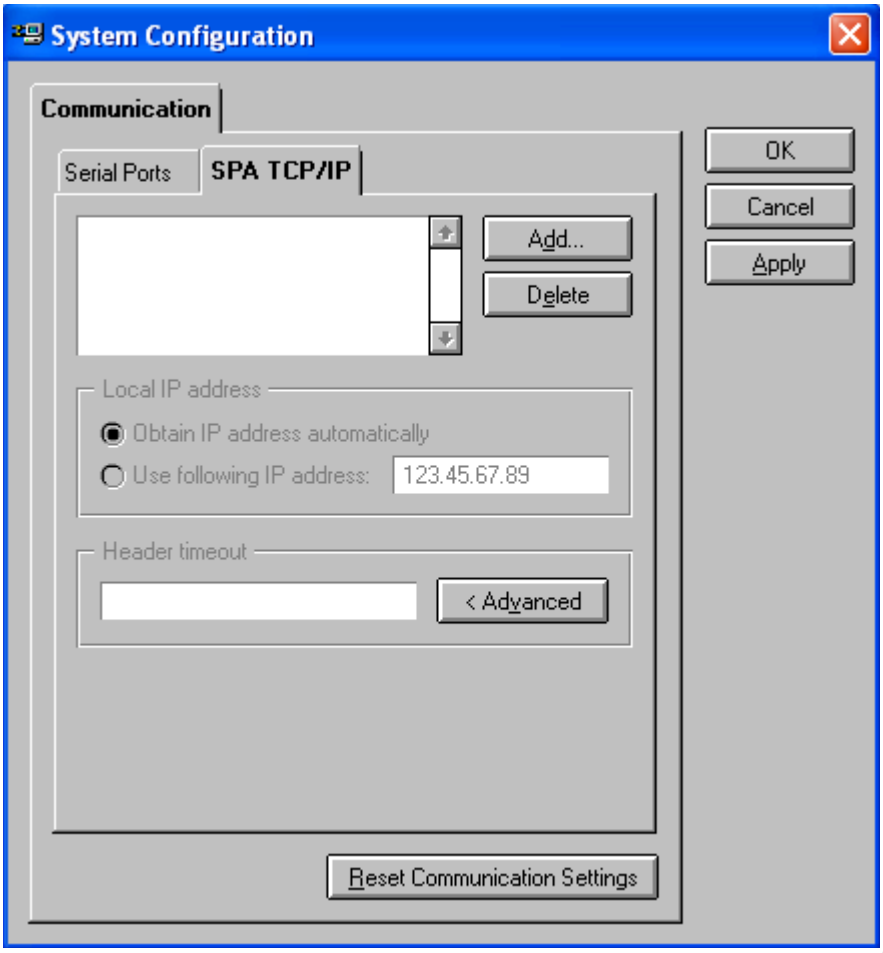


Fig. 10.7.2.-1 The SPA TCP/IP page

Table 10.7.2-1 SPA TCP/IP page items

TCP connections	List for selecting a TCP connection port. Displays all the currently defined TCP connections.
Local IP address	Selection of the IP address for the currently selected TCP connection
Header timeout	Field for defining the Header Timeout attribute for the currently selected TCP connection. Enabled only after clicking the "<Advanced" button.
< Advanced button	For enabling the editing of the Header timeout field.
Add... button	For adding a new TCP connection, see Section 10.7.2.1. TCP connections - Adding
Delete button	For deleting the currently selected TCP connection, see Section 10.7.2.3. TCP connections - Deleting.

10.7.2.1. TCP connections - Adding

To add a TCP connection just click the Add... button. A new TCP connection with automatic numbering is added to the TCP connections list.

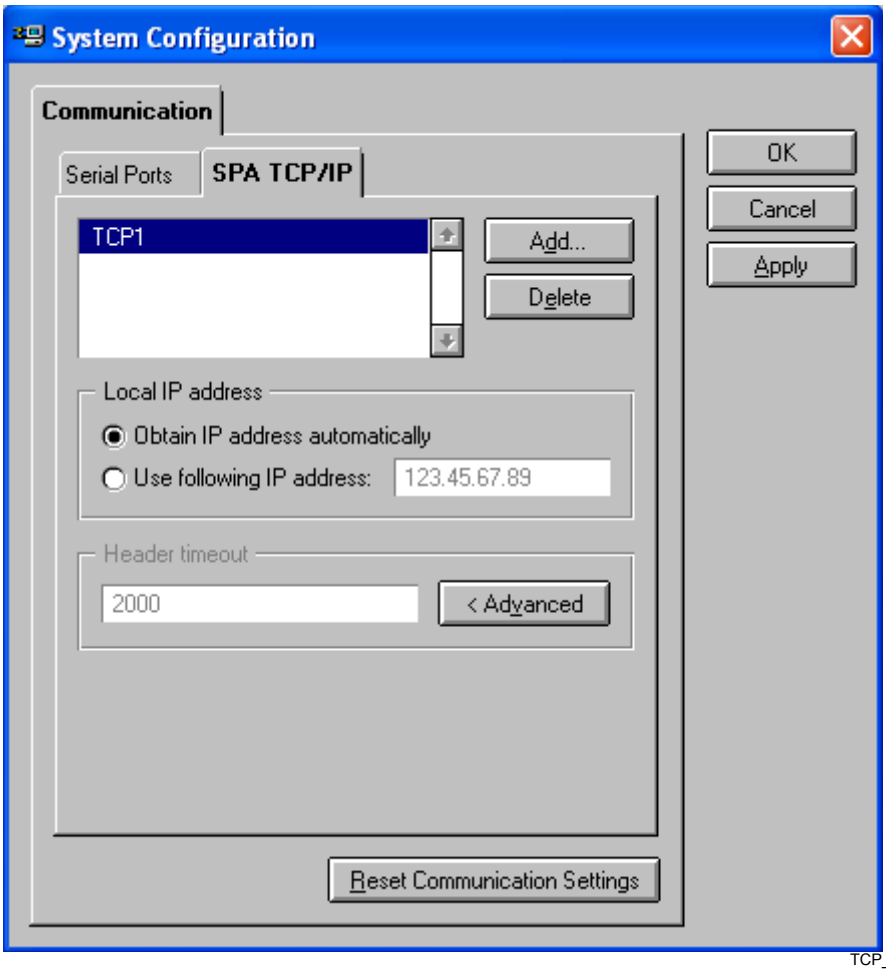


Fig. 10.7.2.1.-1 A new TCP connection TCP1 added with default values

Default values are assigned to the newly added connection. If you wish to use other than the default values, you can configure them as described below.

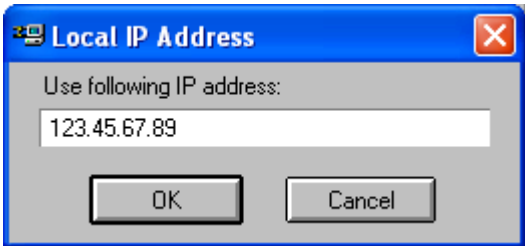
10.7.2.2. TCP connections - Configuring

The following properties can be configured by first selecting the desired TCP connection from the list.

Local IP address

The Local IP address is the IP address of the CAP 501 computer. It can be either manually given or automatically solved. The only reason for giving the IP address manually is the case when the computer has multiple IP addresses, and one of those is specified.

By selecting the default "Obtain IP address automatically" option, the address of the computer needs not to be specified. By selecting the "Use following IP address" option and entering the IP address field, a dialog for typing the address is opened:



Local_IP_address

Fig. 10.7.2.2.-1 Input dialog for local IP address

Header timeout

The Header Timeout attribute of the SPA lines defines the maximum waiting time in milliseconds within which the first byte of a response from the slave should be received after the transmission of a message.

By default, the "Header timeout" field is disabled to indicate that normally the value should not be modified. When the "< Advanced" button is clicked, a warning message is shown before the value can be changed.

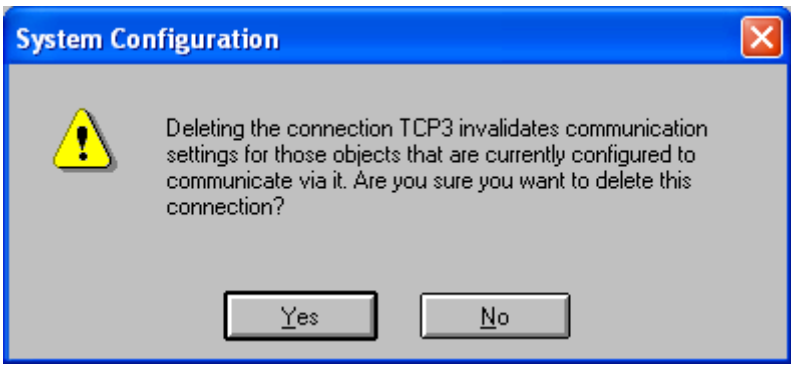
The default value for a TCP connection is 2000 ms (accepted range is 0-65535). The value should be increased if there are long communication delays in the TCP/IP network.

10.7.2.3. TCP connections - Deleting

Any TCP connection, defined in a project's system configuration, can be deleted at any time.

To delete a TCP connection from the configuration:

1. Select the TCP connection from the TCP connections list.
2. Click the Delete button.
3. When prompted to confirm the deletion, click Yes to delete the connection (see Fig. 10.7.2.3.-1). Otherwise, click No to leave the TCP connection intact.



Delete_TCP_conn

Fig. 10.7.2.3.-1 Confirmation to delete the selected TCP connection

The deletion invalidates the communication settings of any device objects which have been configured to use the connection you are about delete.

10.8. System configuration - save

The project's system configuration is saved permanently by using either the OK or the Apply button. The difference is that the OK button closes the System Configuration Tool, whereas the Apply button allows you to proceed working with the tool. The tool also provides you with the possibility to revert to the most recently saved configuration in order to prevent accidental changes to the configuration (see Section 10.8.3. Discard configuration changes).

10.8.1. Save configuration - close tool

To save the changed configuration, closing the System Configuration Tool, click OK. The System Configuration Tool prompts you to confirm the operation (see Fig. 10.8.1.-1).

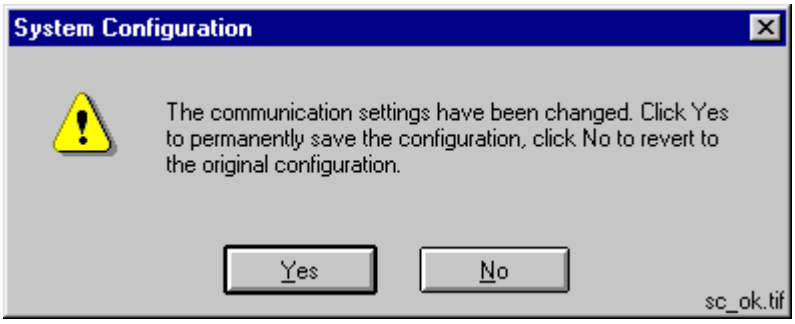


Fig. 10.8.1.-1 Confirm to save the configuration

To save the configuration, click Yes. Clicking No enforces the most recently saved configuration.

10.8.2. Save configuration - proceed configuration

To save a changed configuration without closing the System Configuration Tool, click Apply. The System Configuration Tool prompts you to confirm the operation (see Fig. 10.8.2.-1).

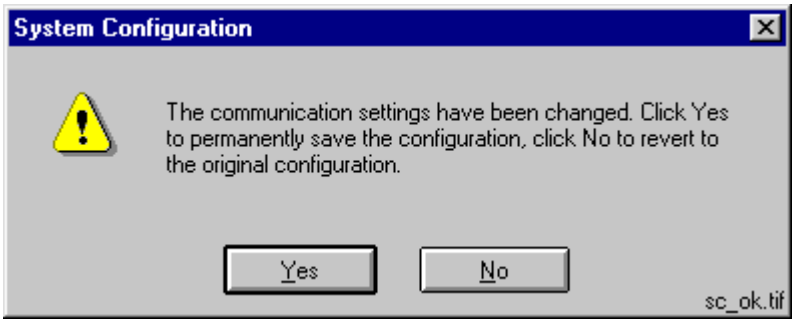


Fig. 10.8.2.-1 Confirm to save the configuration

To save the configuration, click Yes and the configuration becomes the most recently saved configuration. Otherwise click No to proceed without saving.

10.8.3. Discard configuration changes

To revert to the most recently saved configuration, click Cancel. This closes the System Configuration Tool without further notifications.

10.9. Resetting communication settings

The communication settings of the project can be reset from the System Configuration dialog. Resetting means clearing the communication settings (done in the System Configuration) as well as all the object level communication addresses. The main purpose of this function is to reset the obsolete communication setup of an imported project. The System Configuration dialog prompts you to confirm the operation (see Fig. 10.9.-1).

Fig. 10.9.-1 The communication settings reset dialog

To reset the communication settings, click Yes. Clicking No cancels the operation.

After accepting to reset the settings, the deleted system configuration cannot be retrieved by clicking the Cancel button of the System Configuration dialog. Also, to be able to communicate with the connected devices again, all the communication settings must be re-entered.

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