

# CAP 505

## User's Guide



**ABB**



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## **1. About this manual**

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### **1.4. General**

This manual provides thorough information on the CAP 505, Relay Product Engineering Tools software and its applications. This document complies with the CAP 505 version 2.4.0.

Pictures shown are examples only and they may represent older program versions.

Additional information such as the Release Note and README.TXT can be found on the program distribution media.

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



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## 1.6. Abbreviations

HSB	Hot Stand-By
LON	Local Operating Network, communication protocol developed by Echelon
POU	Program Organization Unit
RTD	Resistance Temperature Detector
SPA	Data communication protocol developed by ABB
TCP/IP	Transport Control Protocol/Internet Protocol; de facto communication protocol standard for data transmission over networks

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**1.7. Related documents**

Name of the manual	Document ID
CAP 505 Installation and Commissioning Manual	1MRS751901-MEN
CAP 505 Protocol Mapping Tool, Operation Manual	1MRS755277
CAP 505 Protocol Editing Tool, User's Guide	1MRS751982-MUM
CAP 505 Relay Mimic Editor, User's Guide	1MRS751904-MEN
CAP 505 SPTO Configuration Tool, User's Guide	1MRS751906-MEN
LIB, CAP and SMS, Tools for Relays and Terminals, User's Guide	1MRS752008-MUM
CAP 505 Relay Configuration Tool Tutorial	1MRS751903-MEN
CAP 505 Relay Configuration Quick Start Reference	1MRS751905-MEN

**1.8. Document revisions**

Version	SW Revision number	Date	History
H	2.3.0-1	31.03.2004	Relay Download Tool, REF 54x 3.0 additions
K	2.3.0-2	30.06.2004	Relay Download Tool, REX 52x additions
L	2.3.0-4	05.01.2005	Transducer Linearization Tool, RET 54x additions, Maintenance updates
M	2.3.0-5	01.03.2005	REC 52x 3.0 changes
N	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 505, its base system, operational features, user interface and functional description.

### 2.1. General

CAP 505, the **Relay Product Engineering Tools** software, is a Computer Aided Programming system for medium voltage relays in the RED 500 and SPACOM series.

CAP 505 provides you with the following tools:

- Project Structure Navigator for handling relays and tools.
- Relay Configuration Tool for configuration and programming of relays in the RED 500 series.
- Relay Mimic Editor for mimic configuration of relays in the RED 500 series.
- RED Relay Setting Tool for:
  - Parametrization of RED 500 series of relays.
  - SPA and LON communication.
- Graphical I/O Setting Tool for setting I/O related parameters of the REX 521 relays.
- SPACOM Relay Setting Tool for:
  - Parametrization of SPACOM series of relays.
  - SPA communication.
- Project Export/Import Tool for project management.
- Communication Configuration page for setting communication parameters of the device objects.
- Relay Download Tool for up/downloading of configurations for RED 500 terminals.
- Disturbance Recorder Collector Tool for uploading of disturbance records from the RED 500 series of relays.
- SPTO Configuration Tool for monitoring and configuring the SPTO 1D2, 1D5, 1D6 and 6D3 control modules of the SPAC feeder terminal series.
- Protocol Editing Tool for configuring the protocol object dictionary tables of the REC 52x relays prior to revision F.
- Protocol Mapping Tool for managing and editing the protocol mapping configuration of RED 500 terminals.
- Transducer Linearization Tool for setting input scaling/linearization data of the RTD/analog module (RTD1) in the RED 500 platform terminals.
- System Configuration Tool for configuring the projects' system configurations.
- Event Log Viewer for uploading and viewing event logs from the RED 500 terminals.

CAP 505 runs on various types and sizes of computers. It can be used both as a local system near the relay and as a central system connected to several relays. Communication with the relays is done through the relay's front panel connector or the rear connector.

## 2.2. **Operational features**

This is a summary of functions provided by CAP 505:

- Product engineering (bay level)
- On-line and off-line engineering
- Framework for relay tools
- Project management
- Object oriented project data management
- Graphical programming for control and protection units
- Graphical programming for mimic panel
- Creation of documentation for the application program
- Generation of application program code
- Loading of program code, mimic configuration and parameters to the relay
- Loading 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 505 system consists of the following components:

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

## 2.4. **Base system**

The CAP 505 system contains a base system and a communications system.

Supported communication protocols are:

- SPA, through COM-port and relay rear and front panel interfaces
- LON communication, through LonTalk adapters to the relay rear panel interface
- SPA TCP/IP, through Ethernet adapters to the relay rear panel interface

Supported LON communication cards are:

- PCC-10 PC Card
- PCLTA-20 Card
- RER 109 PCLTA Card (in Windows NT only)

## 2.5. Applications

A station control and protection system contains a wide variety of components and functions. CAP 505 is a toolbox for handling data and tools during the relay engineering projects.

## 2.6. CAP 505 tools

### 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 the *CAP 505 Installation and Commissioning* manual.

### 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 in this manual.

### Relay Configuration Tool

The Relay Configuration Tool is used for configuring the functions of protection, control, condition monitoring, measurement and logics.

The Relay Configuration Tool is based on the IEC 1131-3 standard, which defines the programming language that is used for relay terminals. The programmable system of the RED 500 series of products allows the output contacts to be operated in accordance with the state of the logic inputs, the outputs of protection, control, measurement and condition monitoring functions. The control logic (e.g. interlocking and alarm logic) is programmed with Boolean functions, timers, counters, comparators and flip-flops. The programming languages are: function block diagram language, state function chart diagram language or instruction list language.

This tool is documented in the *Relay Configuration Tool Tutorial* and *Relay Configuration Quick Start Reference*.

### Protocol Mapping Tool (PMT)

The Protocol Mapping Tool is used for creating and editing the protocol mapping configuration, which is a cross-reference table between the application and the communication protocol. This table defines what information can be accessed from the device by using the protocol interface.

The Protocol Mapping Tool uses the relay configuration project to create a mapping for a given application. After a mapping has been created, the user can modify it by removing or adding some points, changing their order and creating protocol compositions, such as user defined registers (bit-field and analog) or control structures.

This tool is documented in the *Protocol Mapping Tool* manual.

**Protocol Editing Tool (POD)**

The Protocol Editing Tool is an engineering tool for protocol table configuration of REC 52x relay terminals. Protocol tables can be read from and written to the target device and also stored onto the hard disk. The tool allows to maintain a user library of protocol tables on a per-project basis. The engineering work can thus be based on the user library or standard templates, which comprises the protocol descriptions that are shipped with the REC 52x object type.

Signal-level protocol table modification is provided with functions such as Insert signal, Remove signal and Move signal. Attribute values of signals can be edited within the limits of the specified values. Protocol table signals can be listed in alphabetical order of the signal identification, address, data type or function block order.

In addition, the Protocol Editing Tool produces the information necessary for event handling configuration in the MicroSCADA system.

This tool is documented in the *Protocol Editing Tool manual*.

**Transducer Linearization Tool**

The Transducer Linearization Tool is a tool for setting input scaling/linearization data of the RTD/analog module (RTD1) in the RED 500 platform terminals. Input scaling/linearization is needed when non-linear sensors, not directly supported by the RTD/analog module, are used. Linear/non-linear scaling is done to each RTD/analog input separately. The tool is available only for certain RED 500 platform terminals.

This tool is documented in Chapter 11. Relay Download Tool for REX 52x in this manual.

**Relay Mimic Editor**

The Relay Mimic Editor is used for configuring the graphical display and the alarm channels of the feeder terminal. The MIMIC configuration may include circuit breakers, disconnectors, indicators, measurement data objects and user-defined texts and explanations.

Alarm function blocks can be configured in the same alarm view of the MIMIC editor. ON and OFF state texts and LED colours can be defined.

This tool is documented in the *Relay Mimic Editor manual*.

**Relay Setting Tool**

The Relay Setting Tool is used for parametrization of the relay units. The parameters can be set off-line in a PC, and downloaded to the relay or uploaded from the relay.

The Relay Setting Tool menu structure including views for parametrization 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.

This tool is 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.

**Relay Download Tool**

The Relay Download Tool is used for sending configurations and mimic pictures to the relay, and for storing configurations to non-volatile memory and for restarting the relay software.

This tool is documented in Chapter 10. Relay Download Tool for REF 54x/REM 54x/ REC 52x/RET 54x and Chapter 11. Relay Download Tool for REX 52x in this manual.

**SPTO Configuration Tool**

The SPTO Configuration Tool targets the control modules SPTO 1D2, SPTO 1D5, SPTO 1D6 in SPAC 300 series and SPTO 6D3 in the SPAC 500 and 600 series in the SPACOM range of products.

The tool can be used to configure the SPTO 1D2, 1D5, 1D6 in the SPAC 300 series, when the built-in factory default setting groups in the modules cannot be benefit from, or whenever it is desirable to make an own configuration.

This tool is documented in the *SPTO Configuration Tool* manual.

**Communication page**

The Communication page is used for configuring the communication settings of the device objects.

The communication page is documented in the *Tools for Relays and Terminals* manual on a per-object type basis.

**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.

The Relay Setting Tools for RED 500 and SPACOM are 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 505 and is intended to serve as an introductory reading to users not familiar with CAP 505.

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.

In this example it is assumed that you have completed commissioning of the CAP 505 software, which is explained in the *CAP 505 Installation and Commissioning Manual*.

### 3.1. Projects

CAP 505 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 505 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 configured. For example, REF 54x 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 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. Another example, is the communication gateway object types, e.g. LSG (LON/SPA Gateway). Device objects can be hosted by a gateway object, for which you define correct communication settings to enable communication through the gateway.

### 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.
Plant 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.
Protection & Control	Object types of this group serve the purpose of representing protection and control devices.

### 3.5. Starting CAP 505

To start CAP 505, select the Start CAP 505 icon from the program folder created by the CAP 505 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, you begin by inserting four RED 500 device objects and one SPACOM device object to the project. Then you add a simple representation of a station with three bays, illustrating how to move the device objects in the project structure.

#### 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.

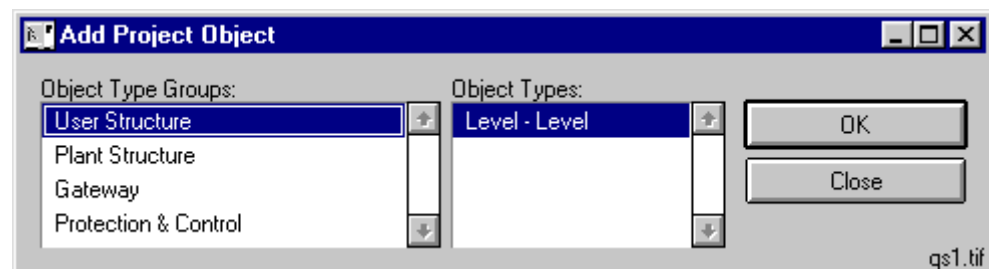
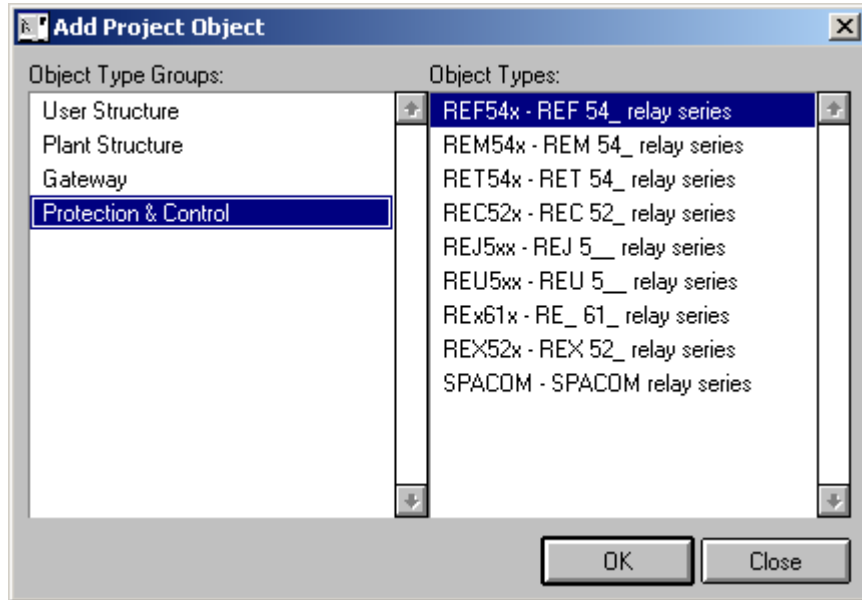


Fig. 3.6.-1 Inserting a new object to the project

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.

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To insert a device object representing a REF 54x 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.



add\_proj\_obj

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

The appropriate object type (REF 54x) is already selected. To insert it, click OK, which opens the New Object's Properties dialog for entering the object's name and title.

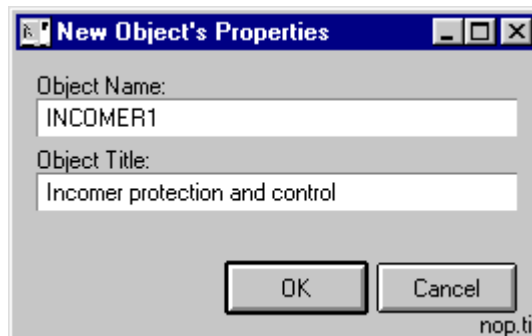
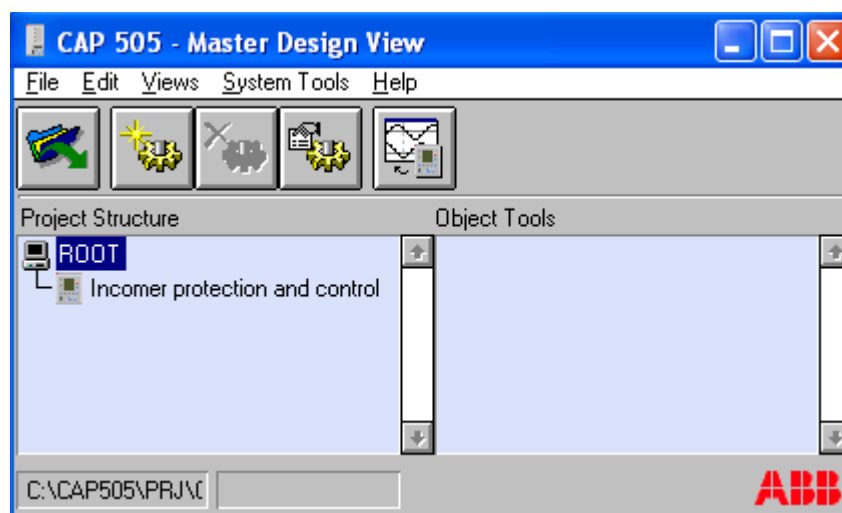


Fig. 3.6.-3 Entering the name and title for the object

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 REF 54x 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 titles for both of the objects. These new REF 54x 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.

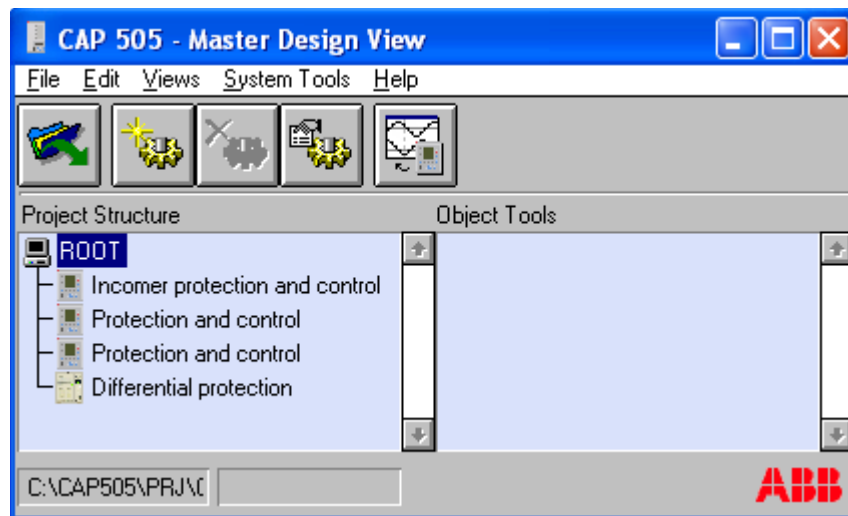


qs4\_1

*Fig. 3.6.-5 Three REF 54x device objects in the project*

Now you have three REF 54x device objects in the project. As you may recall, the aim is to also insert 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.



qs5\_1

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.

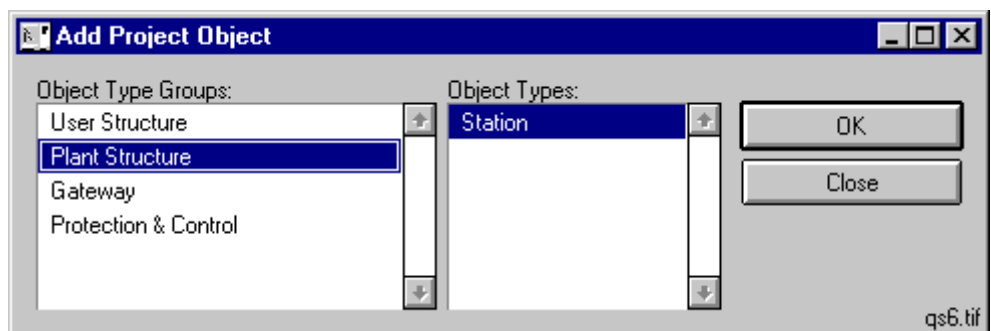


Fig. 3.6.-7 Selecting the Station object type

To have the Station object inserted, click OK. The dialog that 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.

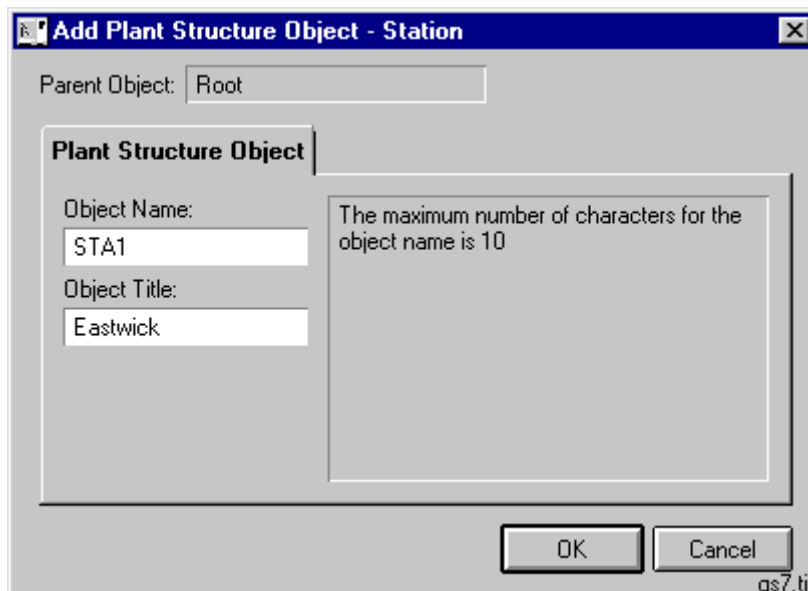
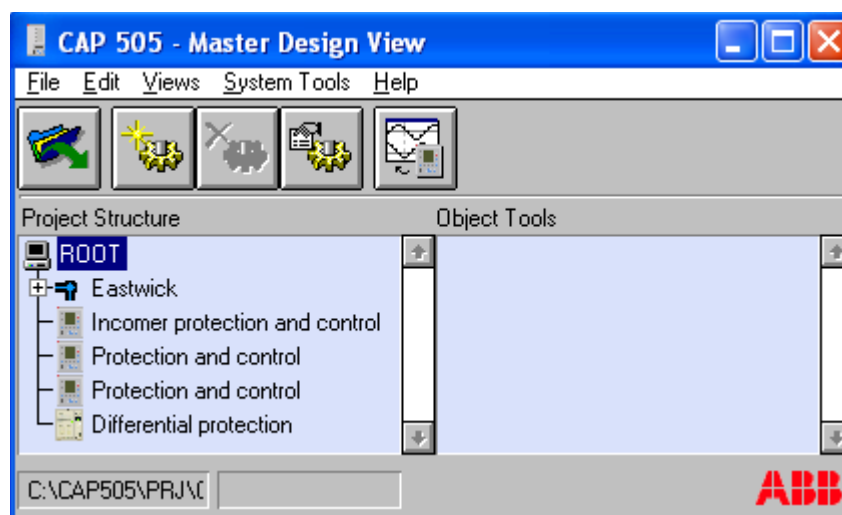


Fig. 3.6.-8 Inserting a Plant Structure object - Station

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.



User's Guide

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 type groups and object types accordingly (see Fig. 3.6.-10).

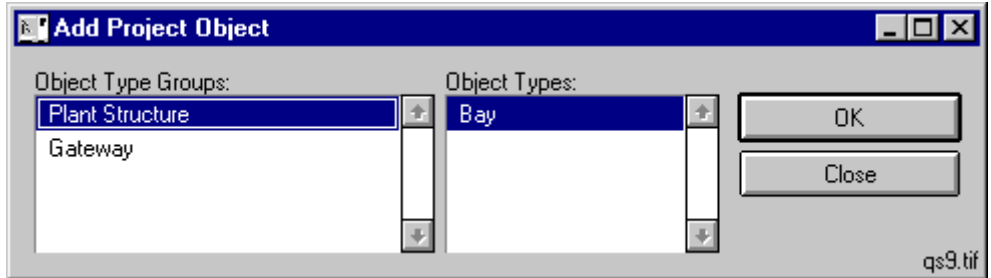


Fig. 3.6.-10 Selecting the Bay object type

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

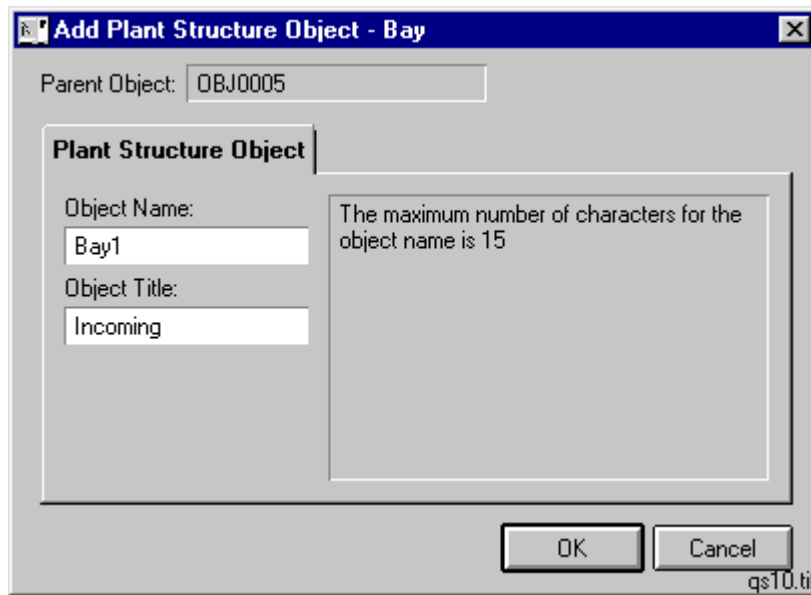
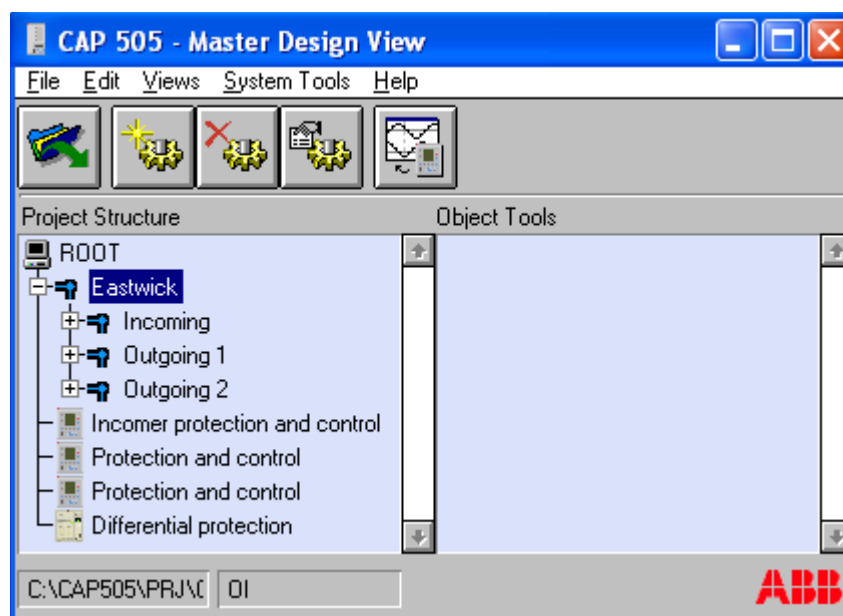


Fig. 3.6.-11 Specifying the name and title for the Bay object

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.



qs11\_1

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.

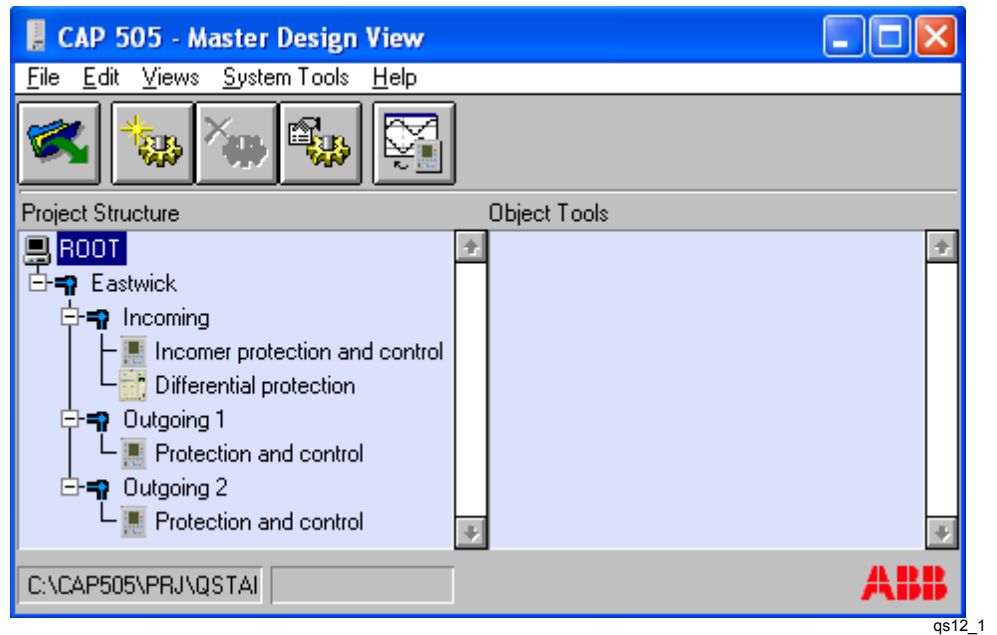


Fig. 3.7.-1 Objects in their final locations

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 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 and LON channels. From the **System Tools** menu, select item **System Configuration** and page **Communication**, see Fig. 3.8.-1

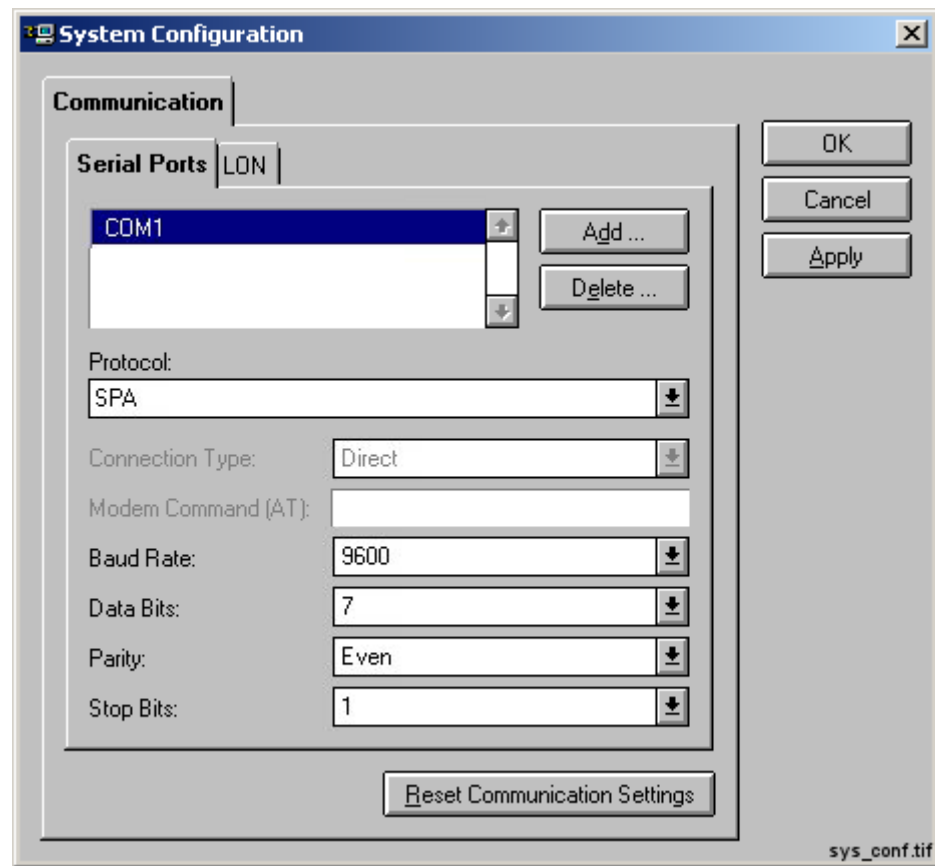


Fig. 3.8.-1 Setting up the serial ports

How to set up the LON channel is described in the *CAP 505 Installation and Commissioning* manual.

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

Prior to 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 REF 54x 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 505/501 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 Fig. 3.9.2.-2.

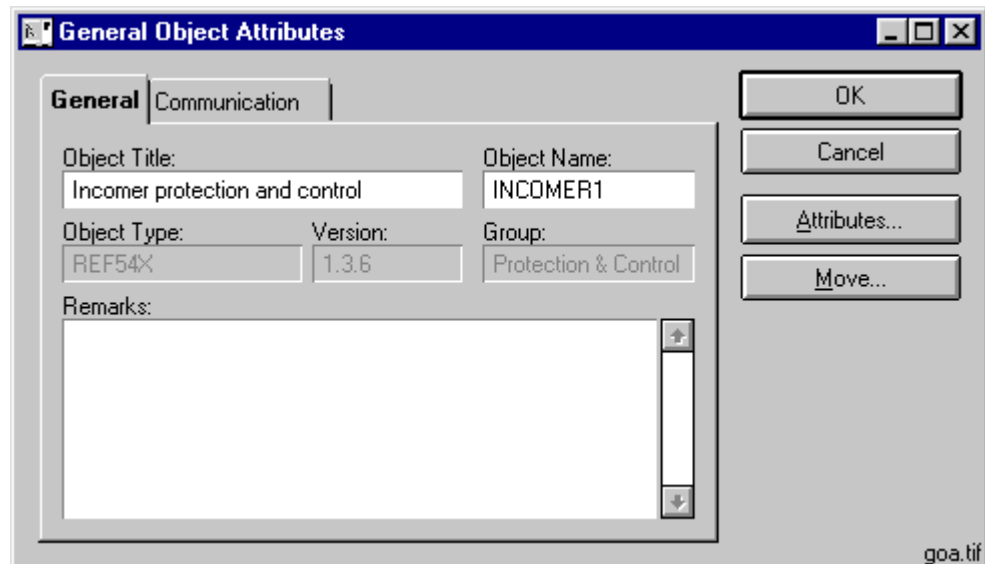


Fig. 3.9.2.-2 General page for INCOMER1

#### 3.9.2.1. RED 500 relay object types

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

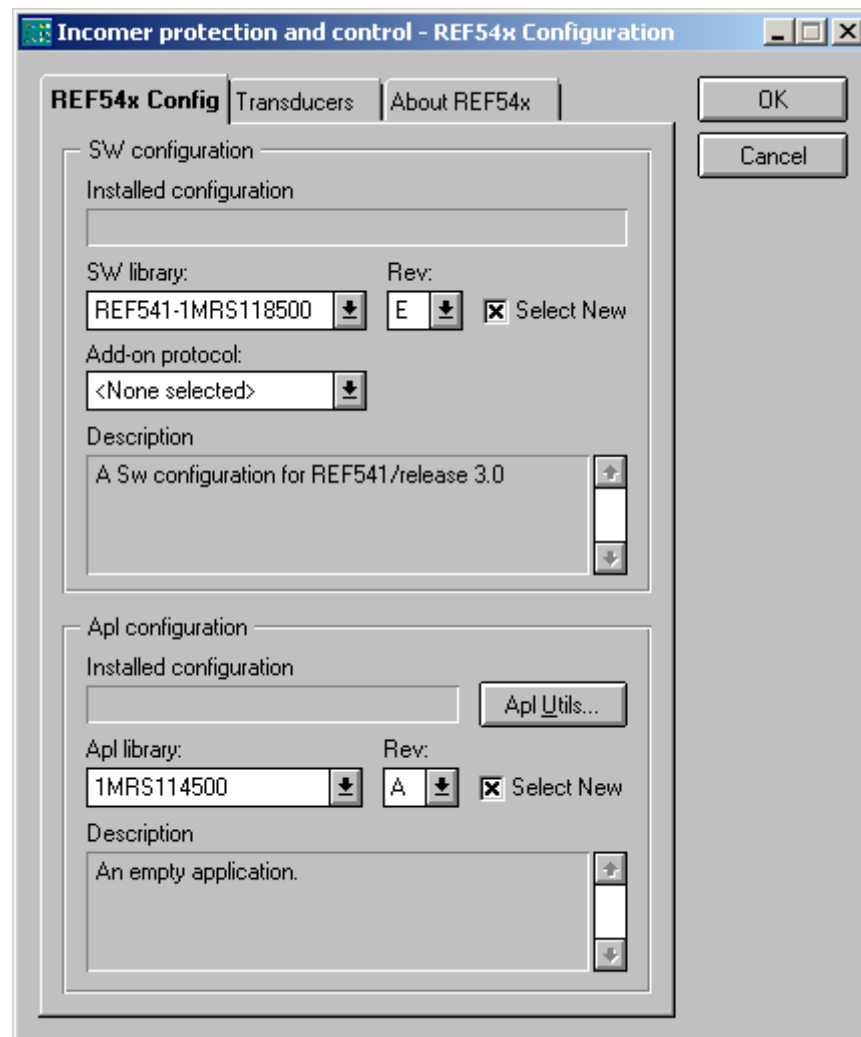
Close the object's configuration dialog by clicking OK to return to the General Object Attributes dialog. For more information on configuring device objects, see the *Tools for Relays and Terminals* manual.

## Configuring the quick start device objects

To proceed with the example, 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 3.9.3-1.

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



conf\_device\_obj

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

## Assigning the software configuration

As stated in Table 3.9.3-1, 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 example 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 REF 54x, REM 54x, REC 52x and RET 54x object types

The REF 54x, REM 54x, REC 52x and RET 54x object types provide an alternative of using an application configuration, which you can upload 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. Reopen the General Object Attributes dialog selecting the Communication page to provide communication settings for the object. Select the communication protocol and configure the communication settings. Connect the communication cable, if it has not been done yet.
4. Open 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 example, configure the other two REF 54x device objects (OUT1 and OUT2) by using Table 3.9.3-1 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 REF 54x objects. The configuration dialog that appears on the screen, differs from the one you used for the REF 54x objects, see Fig. 3.9.2.2.-1.

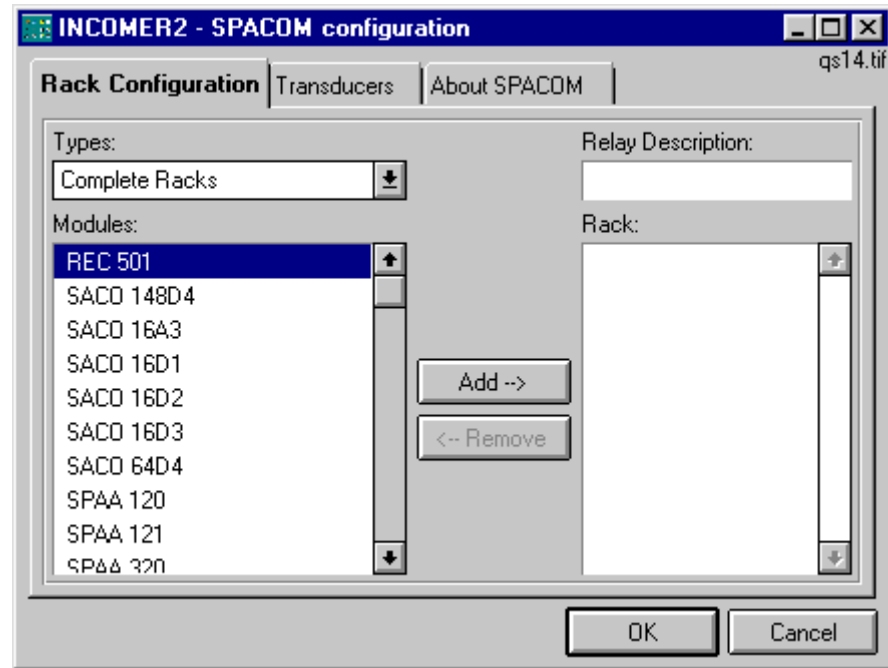


Fig. 3.9.2.2.-1 The configuration dialog for SPACOM device objects

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.



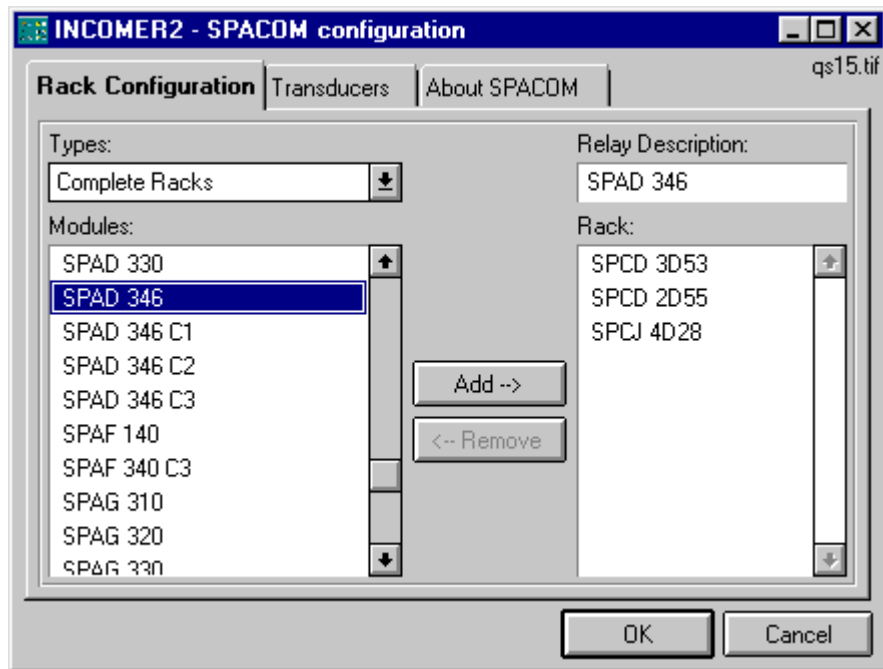


Fig. 3.9.2.2.-2 The selected SPACOM configuration

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).

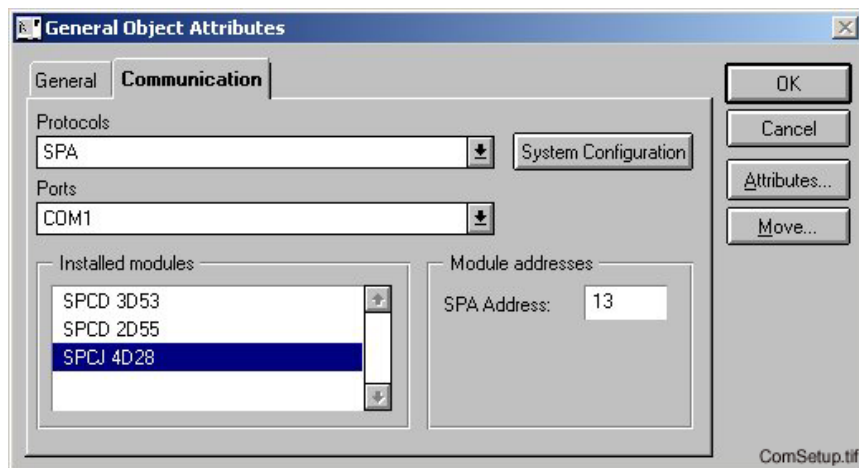


Fig. 3.9.2.2.-3 Communication addresses for some modules using SPA protocol

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 3.9.3-1 Example device configuration**

REF 54x 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, the example project contains only the Master Design View, which is the only view allowing you to insert device objects to the project and configure them.

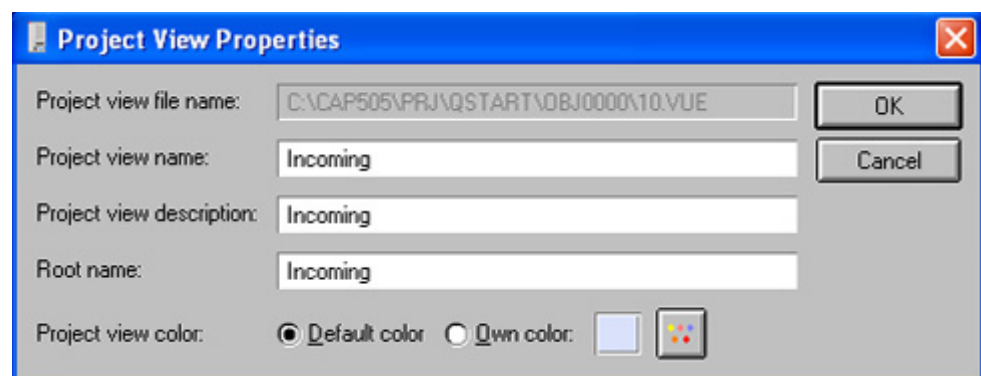
**3.10.****Using user views****General**

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 example 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.



qs16\_1

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

## User's Guide

Specify the information for the view as shown in the figure above. 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. Object names are displayed in parentheses.

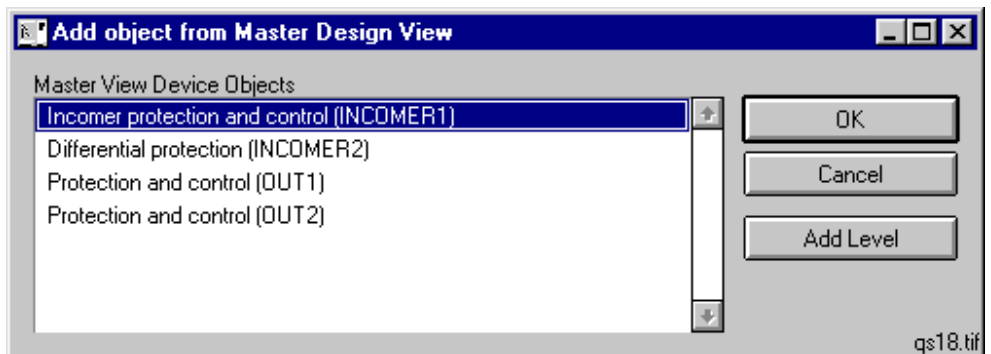
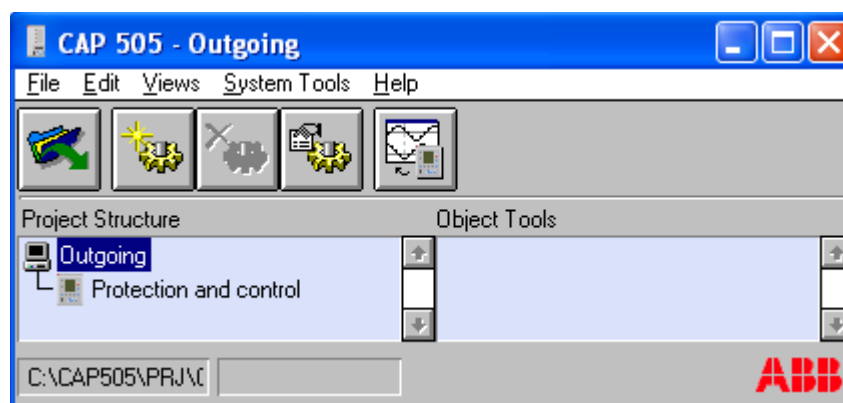


Fig. 3.10.-3 List of objects in Master Design View

Notice the Add Level button in 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 505 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. It provides you with access to the CAP 505 tools and project-based object-oriented data-management.

### 4.2. Projects

In CAP 505, 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 maximum number of projects in CAP 505 is limited only by the available disk space on your computer.

The navigator allows you to build projects and operate these by means of a hierarchical tree structure. The structure is comprised 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 505. 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 serve 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 tool bar, menus and keyboard shortcuts. Fig. 4.5.-1 illustrates the Navigator's user interface and its elements.

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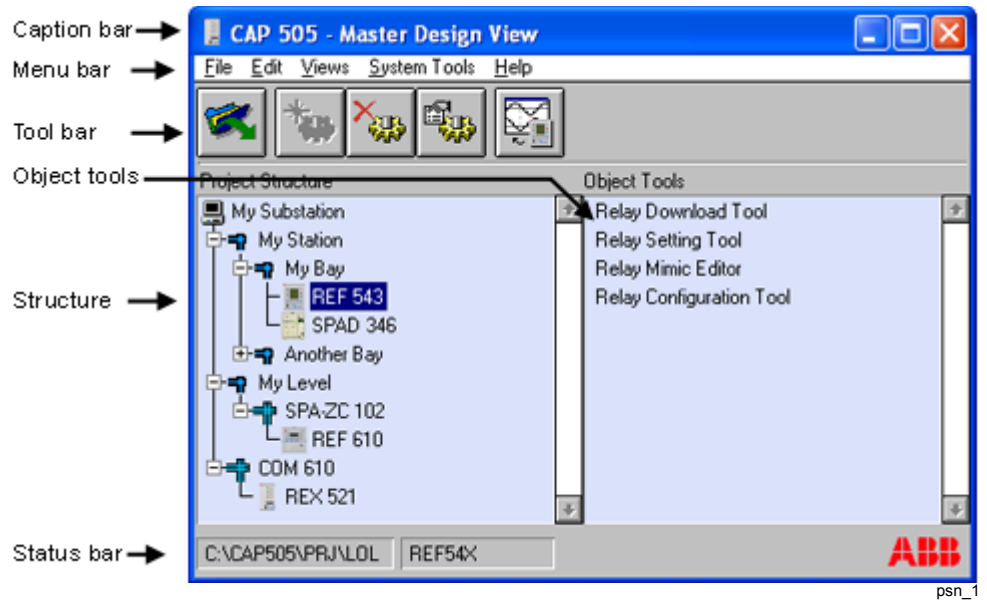





Fig. 4.5.-1 The user interface of the Project Structure Navigator

**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 icon symbols are used for different object type groups in the project view:

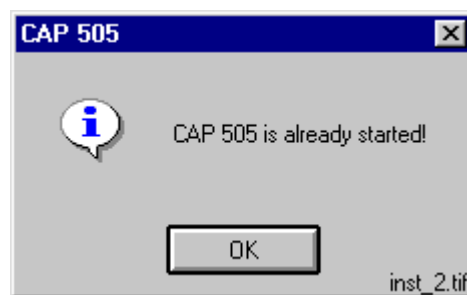
**Table 4.5.-1 Symbols for different object type groups**

	User Structure or Plant Structure
	Gateway
 etc.	Protection & Control

**4.6. Entering the Project Structure Navigator**

CAP 505 is started by selecting the shortcut "Start CAP 505" from the CAP 505 program folder and pressing <Enter> or double-clicking on 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 505 which is not allowed, you are notified that CAP 505 is already running (see Fig. 4.6.-1).

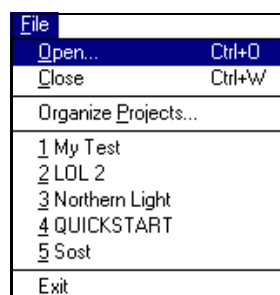


*Fig. 4.6.-1 Notification that CAP 505 is already running*

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*

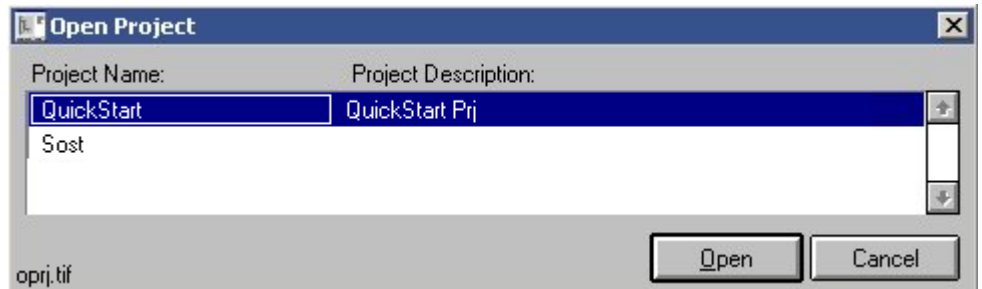
**4.7.1. File Open**

**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**

This alternative closes the currently open project.

#### 4.7.3. **Organize Projects**

When 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 some 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 from the keyboard, 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 505 is closed and MicroSCADA service stopped.



To close CAP 505, click Exit on the CAP 505 Login window. This will stop the MicroSCADA service.

## 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.

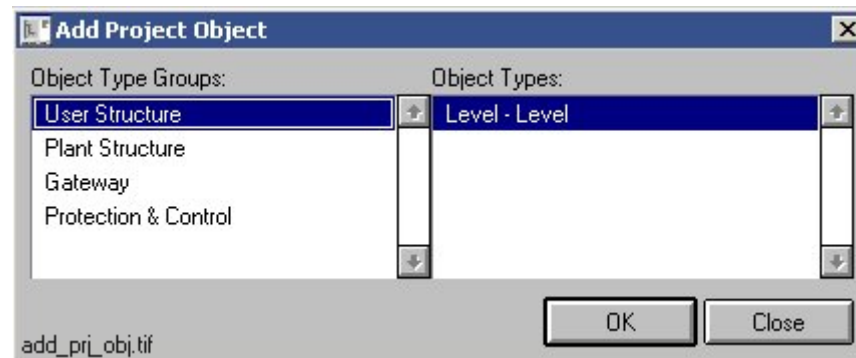


Fig. 4.8.1.-1 Insertion of an object

The Project Structure Navigator displays all the object type groups currently available in the CAP 505 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.

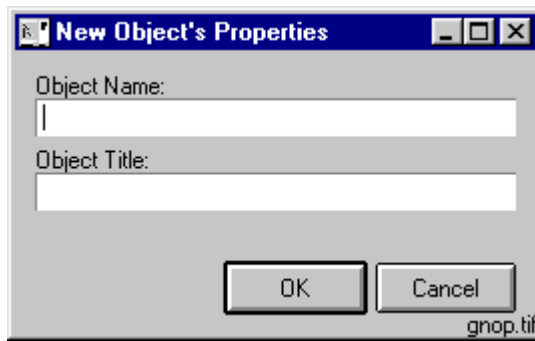


Fig. 4.8.1.-2 Provide properties for the new object

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 505 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:

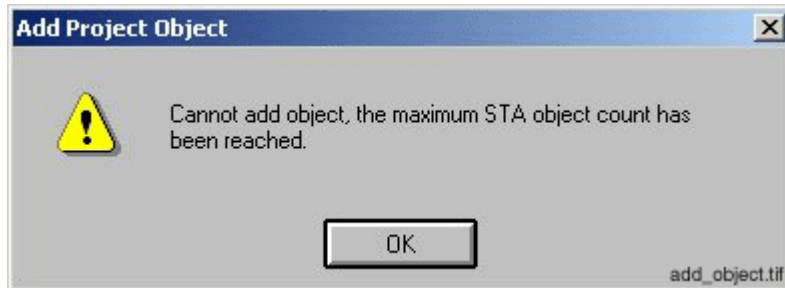


Fig. 4.8.1.-3 The limitation of project object instances is exceeded

### 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.

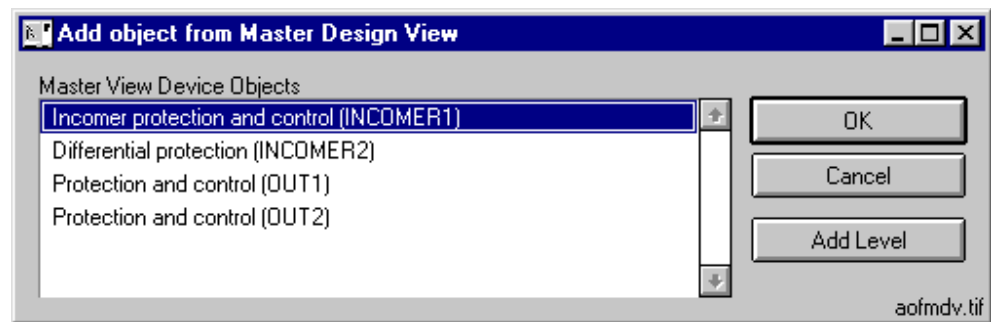


Fig. 4.8.1.-4 Inserting a device object to a user view

To insert a device object, 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).

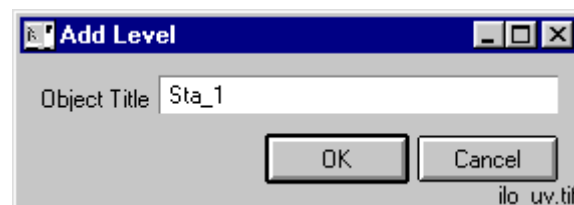


Fig. 4.8.1.-5 Inserting a Level object to a user view

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 and viewing object's attributes. The General page is available for all objects in all views, whereas the Communication page is displayed only in the 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).

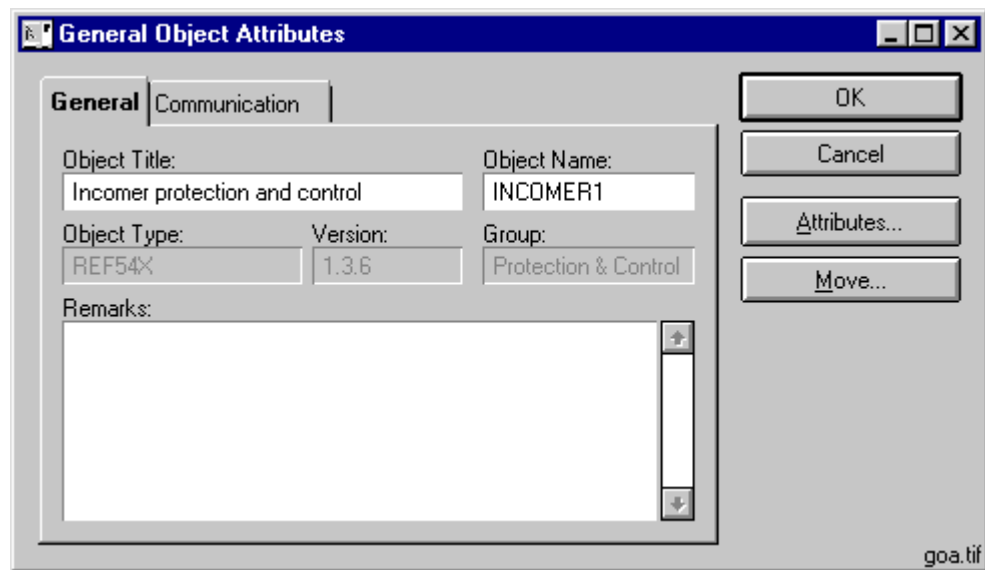


Fig. 4.8.3.1.-1 The General Object Attributes dialog

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. <b>Note!</b> 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. <b>Note!</b> This button does not have any impact on changes to the object's configuration.
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.
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

### 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 (Move button). You can access this function only if the currently selected object's type supports moving objects.

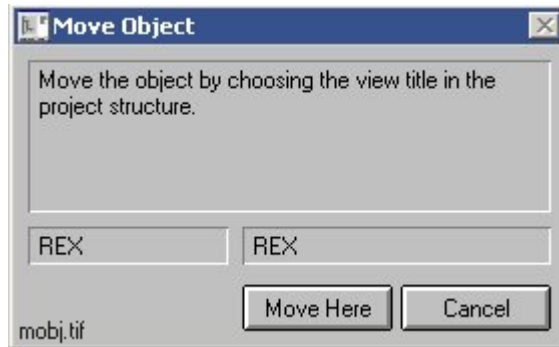


Fig. 4.8.3.2.-1 The Move Object dialog

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.

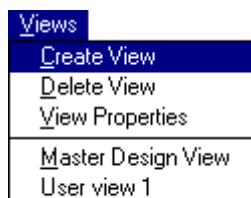
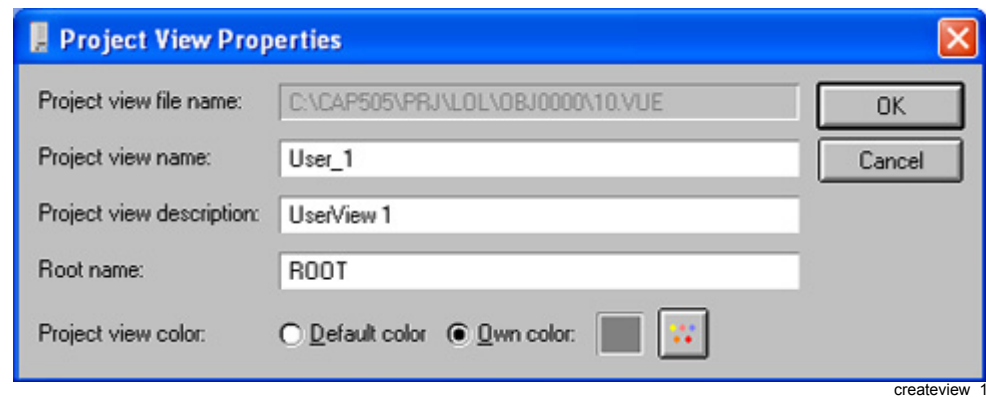


Fig. 4.9.-1 The Views menu

### 4.9.1. Create View

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

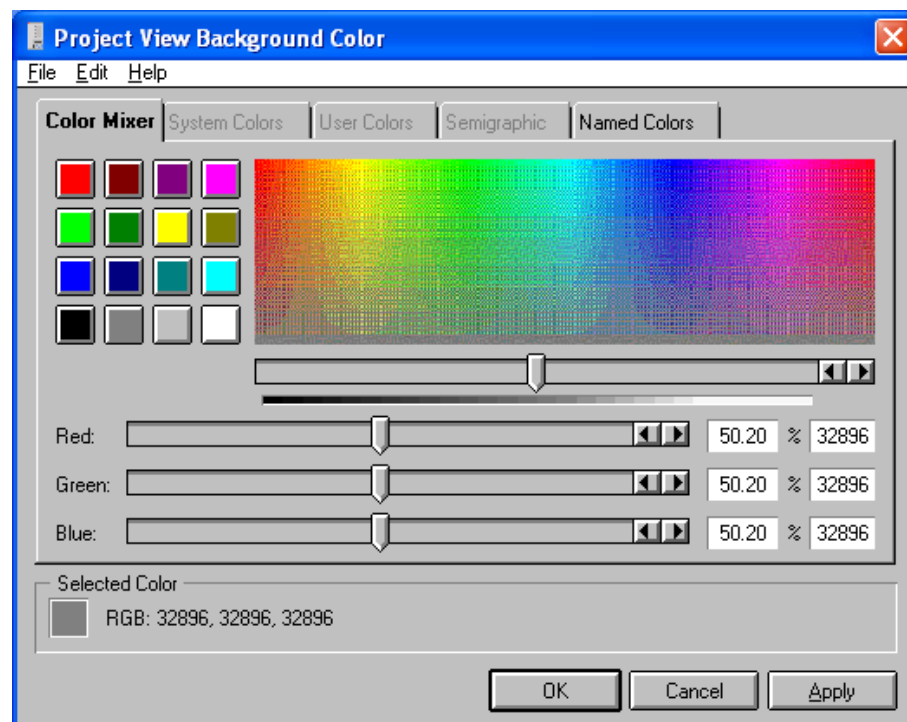


createview\_1

Fig. 4.9.1.-1 Creating a new view

New user views are created by defining the view name, i.e. 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.

Own view colors can be used to differentiate separate projects and/or separate views of one project. By clicking the button next to the "Own color" sample color box a Color Chooser dialog is opened for selecting a color. The "Default color" option reverts to the default light blue color.



ViewColors

Fig. 4.9.1.-2 Defining own view color

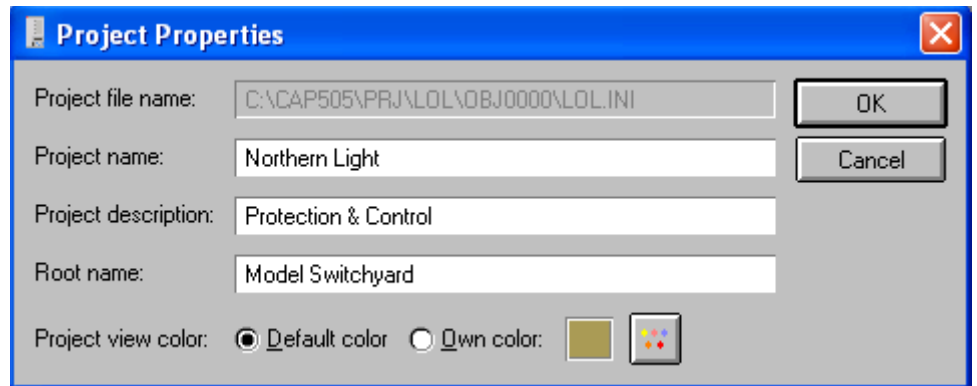


**4.9.2. Delete View**

This option deletes the current view. Only user views can be deleted, i.e. you cannot delete the Master Design View.

**4.9.3. View Properties**

By selecting this option can the current view's properties be changed.



prjprop\_1

*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.

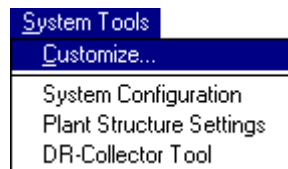
The background color for the view can be changed by clicking the button next to the "Own color" sample color box, or the default light blue color selected with the "Default color" option.

**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 505 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). By default, menu items for invoking the System Configuration Tool, the Plant Structure Settings Tool and the DR-Collector Tool are available.

For detailed information on the System Configuration Tool, refer to the *CAP 505 Installation and Commissioning* manual.

For detailed information on the Plant Structure Settings Tool, refer to Chapter 7. Plant Structure object types

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.

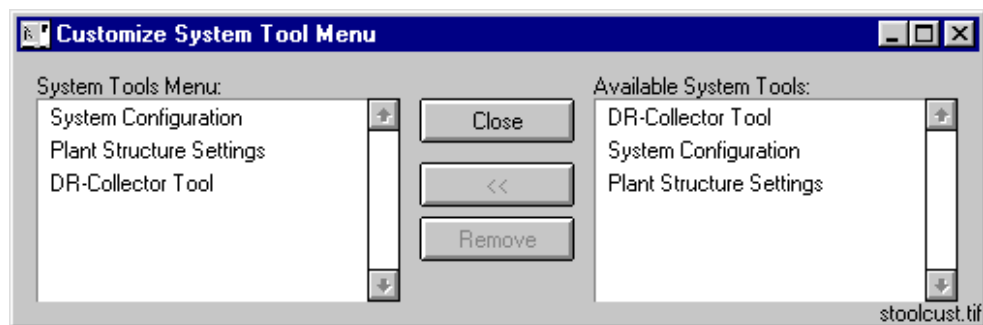


Fig. 4.10.1.-1 The customization dialog

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 505.

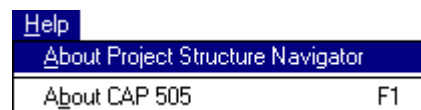


Fig. 4.11.-1 The Help menu

MHelp\_1

**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.



The information presented in the About dialog should be available when contacting your local support.

**4.11.2.****About CAP 505**

**Keyboard entry: <F1>**

This About dialog contains information about the current version of CAP 505.



The information presented in the About CAP 505 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 505 project collection, which comprises all the projects stored under the directory \CAP505\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 Fig. 5.2.-1.

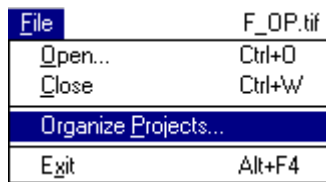


Fig. 5.2.-1 File menu with Organize Projects...

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

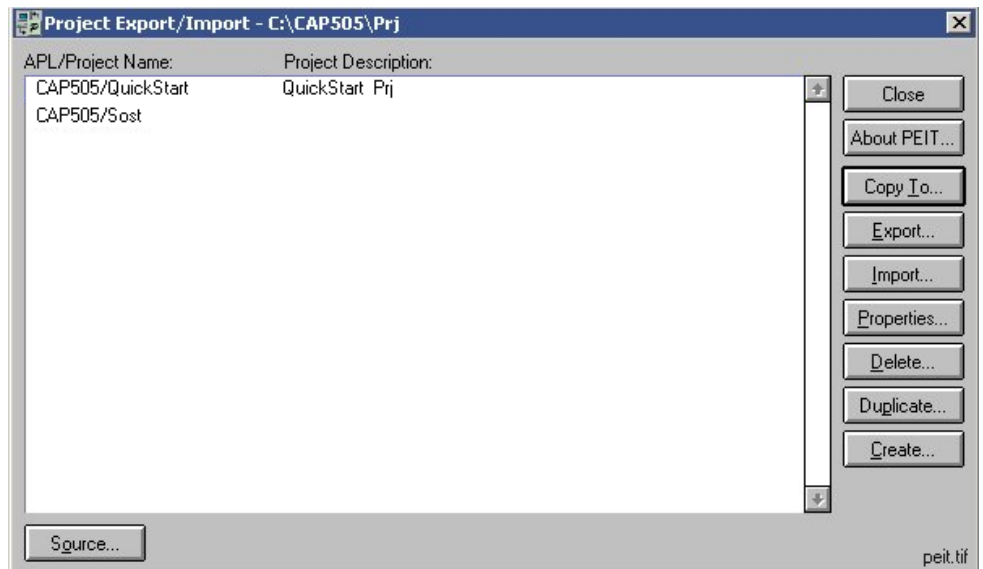


Fig. 5.2.-2 The user interface of the Project Export/Import Tool

Table 5.2.-1 presents the project-management functionality provided by the Project Export/Import Tool.

**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 505 project collection to an arbitrary user-defined location.
Import...	For importing projects from an arbitrary user-defined location to the CAP 505 project collection.
Properties...	Provides information about the project folder.
Delete...	For deleting projects from the CAP 505 project collection.
Duplicate...	For duplicating projects in the CAP 505 project collection.
Create...	For creating projects in the CAP 505 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 505 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 505, it means that the project is in the CAP 505 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:

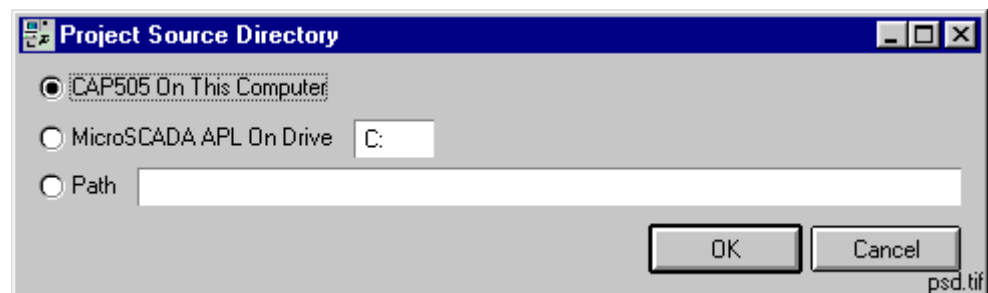


Fig. 5.3.1.-1 The Project Source Directory dialog

## User's Guide

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) format in addition to the standard format: <drive:>\<directory path>. Sample UNC entries are provided below:

**Using a share name**

`\\WORKSTA\Backup\CAP505\Projects`

where;

WORKSTA is the name of the target computer.  
 BACKUP is a share name on the target computer.  
 CAP505\PROJECTS is a directory path under the share name.

**Using the operating system's administrative share name**

`\\WORKSTA\C$\Backup\CAP505\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\CAP505\ProjectS

is a directory path under the share name.

**5.3.2.****Project storage**

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

`<DRIVE:>\SC\CAP505\PRJS`

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

`<DRIVE:>\CAP505\PRJ`

The MicroSCADA application projects are stored under the following 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.

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The destination can be one of the following alternatives:

- The CAP 505 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 505 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.

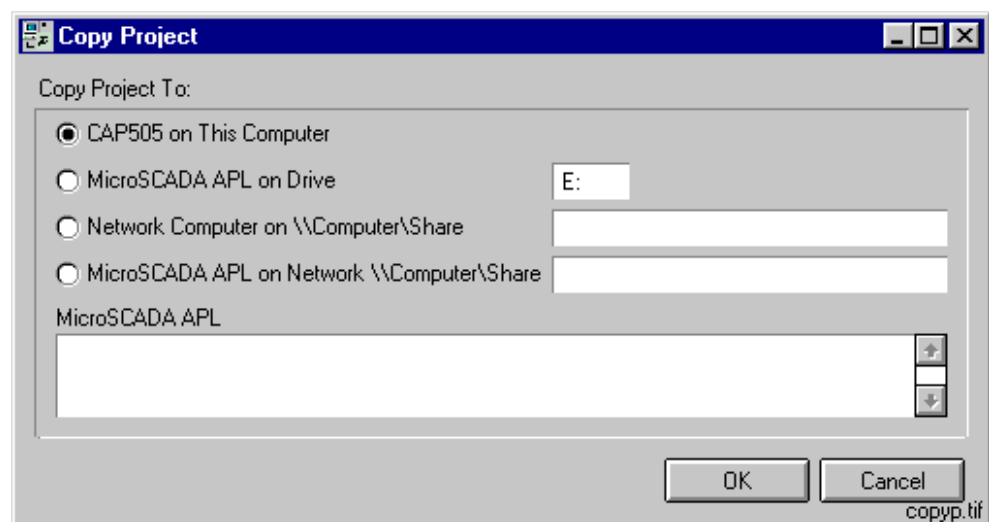


Fig. 5.3.3.-1 The Copy Project dialog



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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 505 or other product. It is recommended to save such projects in a special-purpose directory outside the directory structure of CAP 505, for example C:\EXPORTS.



Especially, avoid using the directory \CAP505\TEMP for such purpose, since the CAP 505 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 also is 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.

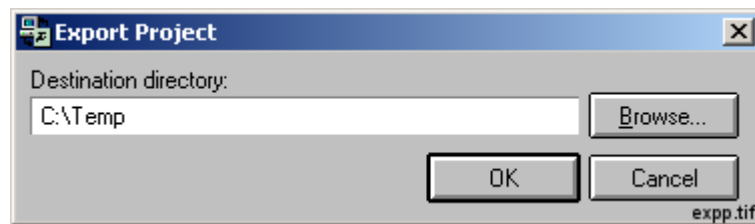


Fig. 5.3.5.-1 The Export Project dialog

### 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 would mean 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).

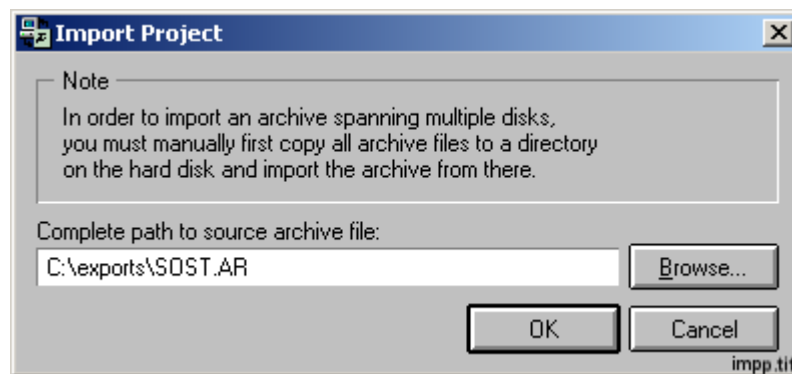


Fig. 5.3.6.-1 The Import Project dialog

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.

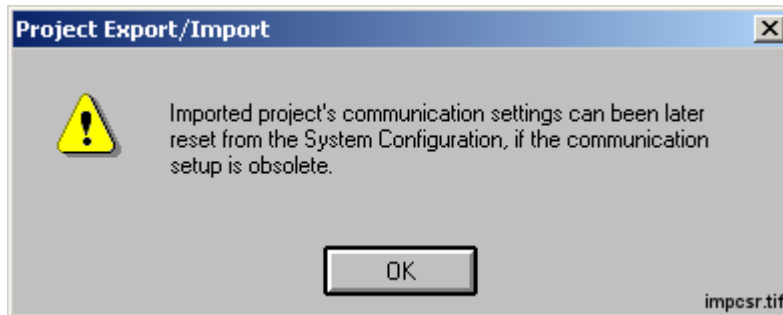


Fig. 5.3.6.-2 The communication settings reset dialog

5.3.7.

**Project properties**

The following dialog shows the filename of the selected project:

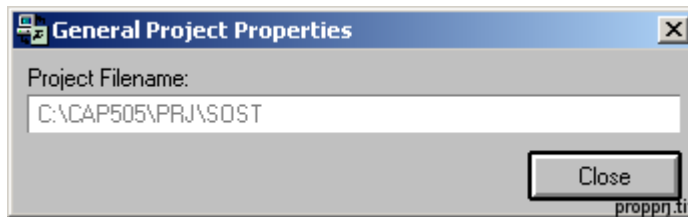


Fig. 5.3.7.-1 The General Project Properties dialog

### 5.3.8. Deleting a project

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

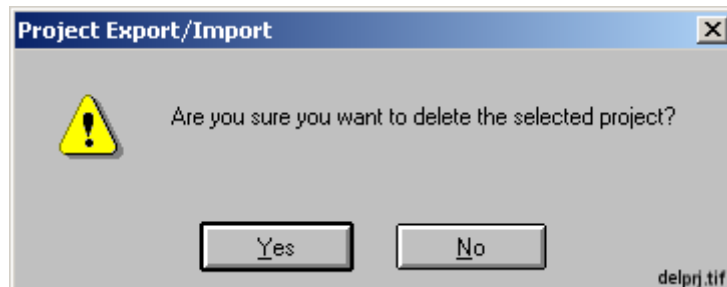


Fig. 5.3.8.-1 Once you delete a project, you cannot undo it

### 5.3.9. Duplicating a project

Duplicating a project means that an exact copy of the selected project is copied to your CAP 505 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.



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

A through Z and  
0 through 9

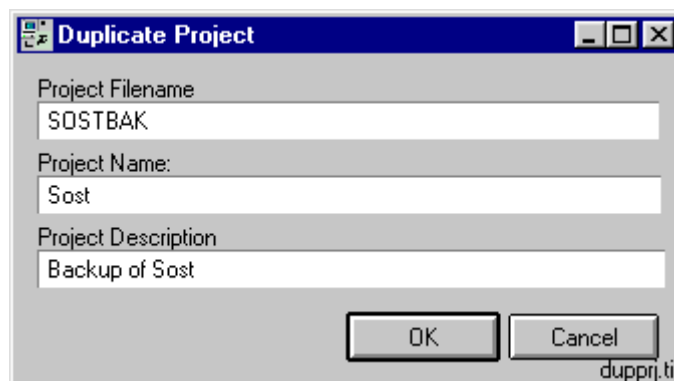


Fig. 5.3.9.-1 The Duplicate Project dialog

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

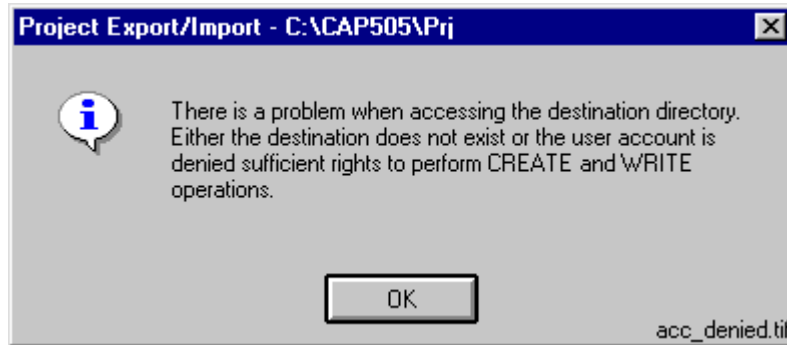
### 5.3.10. Creating a new project

Creating a new project is done in a dialog similar to duplicating a project. The newly created project is assigned an empty system configuration meaning that you have to setup its system configuration by means of the System Configuration Tool.

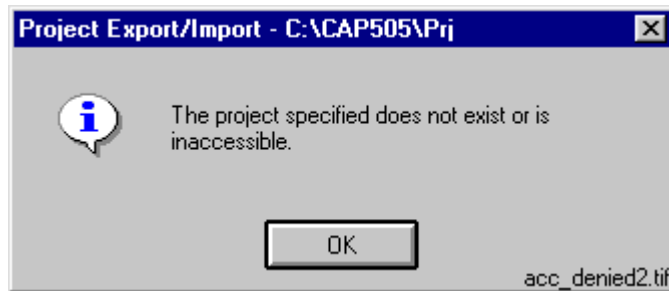
Regarding project creation, the same restrictions that apply to the project duplication also apply here (see Section 5.3.9. Duplicating a project).

**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 in 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 even 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 505/501 environment.

### 6.2. Starting the Plant Structure Settings Tool

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

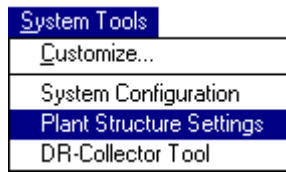


Fig. 6.2.-1 Starting the Plant Structure Settings tool

### 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.

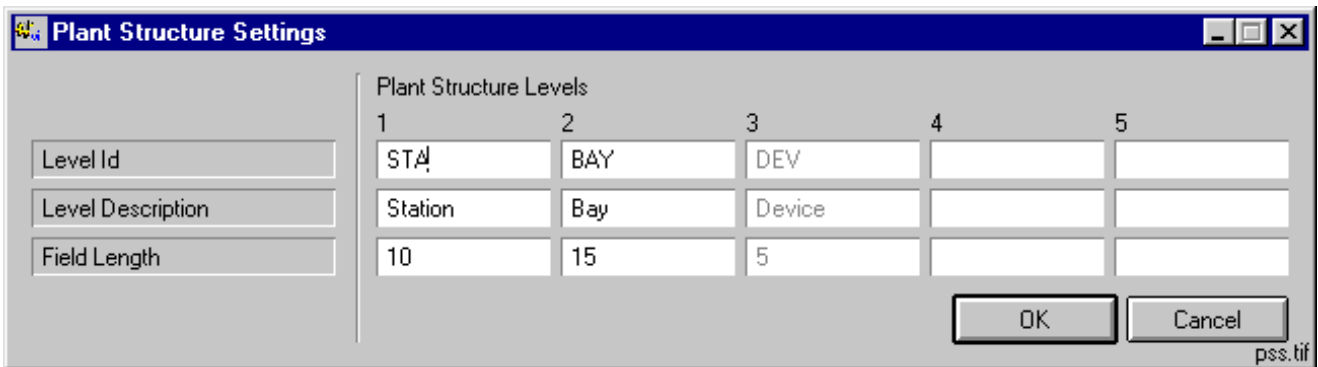


Fig. 6.3.-1 Plant Structure Settings dialog

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

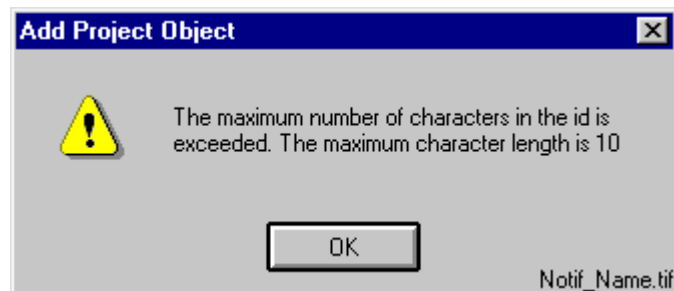
The Plant Structure object types are intended to be used, when building MicroSCADA compatible project structures. It is possible to define five structure levels, although three of them are predefined.

### 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.



*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).

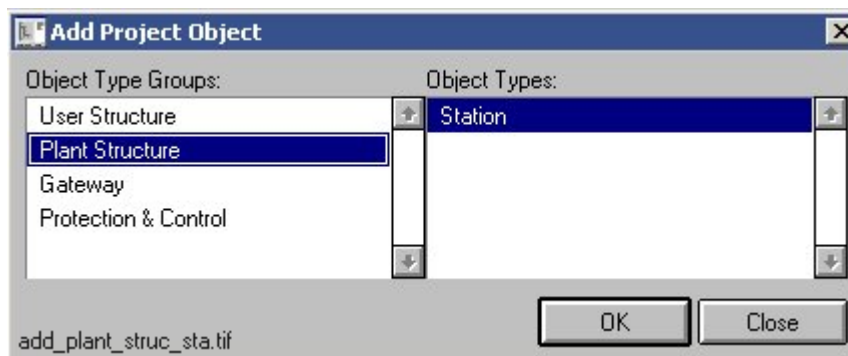


Fig. 7.4.-1 Adding a station level object

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).

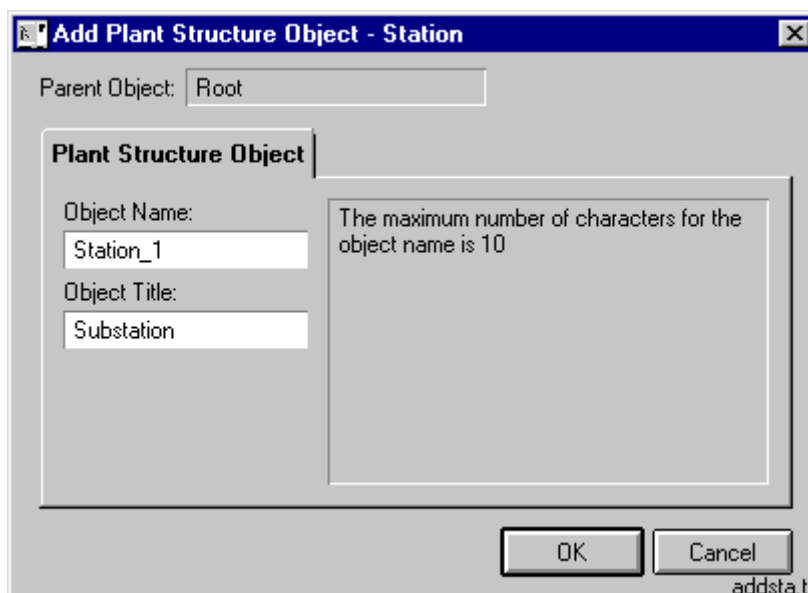


Fig. 7.4.-2 Adding a Station level object

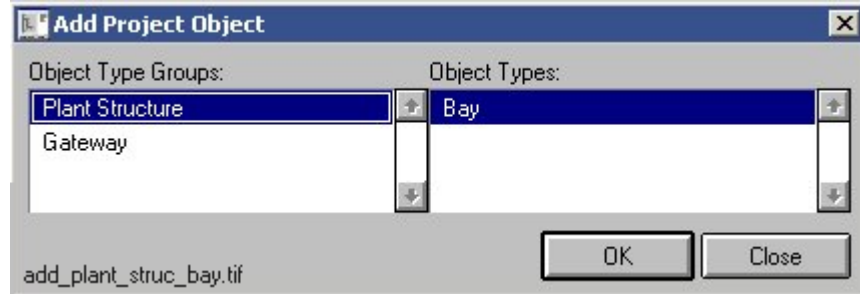
Type in an appropriate name and title for the object and click OK to have the station level object inserted.

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**

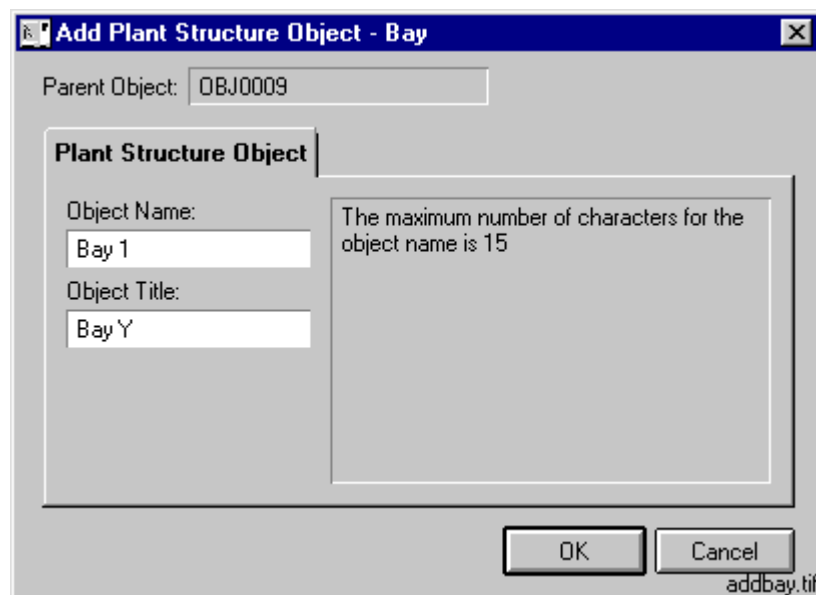
Highlight a station level object of a Plant Structure and select Insert Object from the Edit menu to open the Add Project Object dialog (see Fig. 7.5.-1).



*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 (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 in 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 (see Fig. 8.2.1.-1). Notice that in every view, the root node is also a Level object.

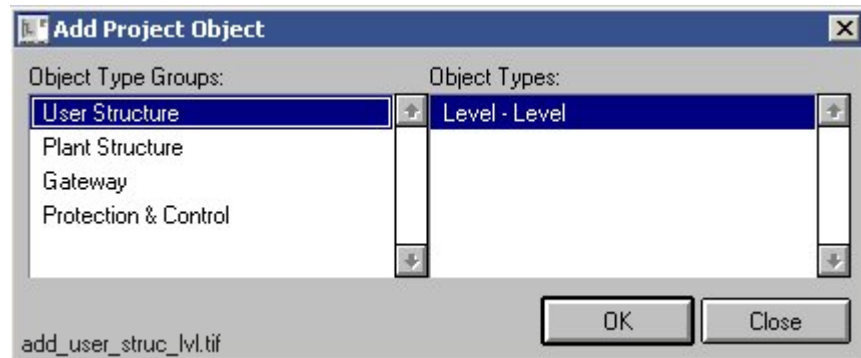


Fig. 8.2.1.-1 Adding a User Structure object

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.

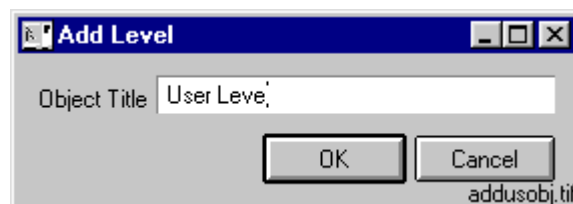


Fig. 8.2.1.-2 Adding a Level object

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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 505 supports the following gateways:

- LON/SPA Gateway SPA-ZC 100/102 (LSG)
- LON Star Coupler RER 111
- COM 610 communication gateway

The two LON gateway object types are described in a separate *LON Gateways Configuration manual* (see Section 1.7. Related documents). This chapter describes only the COM 610 object type.

### 9.1. General

In CAP 505 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 a 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 relay/terminal), and the protocol used in remote communication is called the slave protocol (protocol between CAP 505 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 the 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

Following master/slave protocols supported by COM 610 can be used in CAP 505.

Slave protocols:

- A COM 610 object can be connected to CAP 505 via SPA router or SPA TCP/IP protocol.

Master protocols:

- A COM 610 object allows SPA, LON 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 project is mandatory only in a situation where the relay is connected to a COM 610 gateway with LON protocol. If the devices are using SPA or SPA TCP/IP protocol, the device objects can be added to the project with or without a COM 610 object.

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).

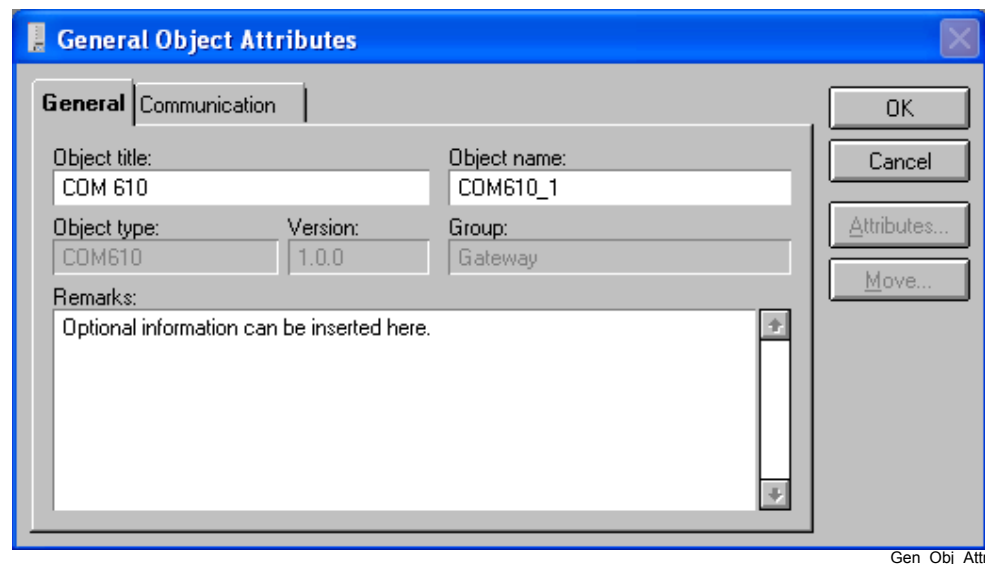


Fig. 9.3.-1 General object attributes for COM 610 objects



## 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. Together these settings 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 505 is not necessarily the same as defined in the physical relay/terminal.



SPA addresses behind one COM 610 object must be unique in CAP 505.

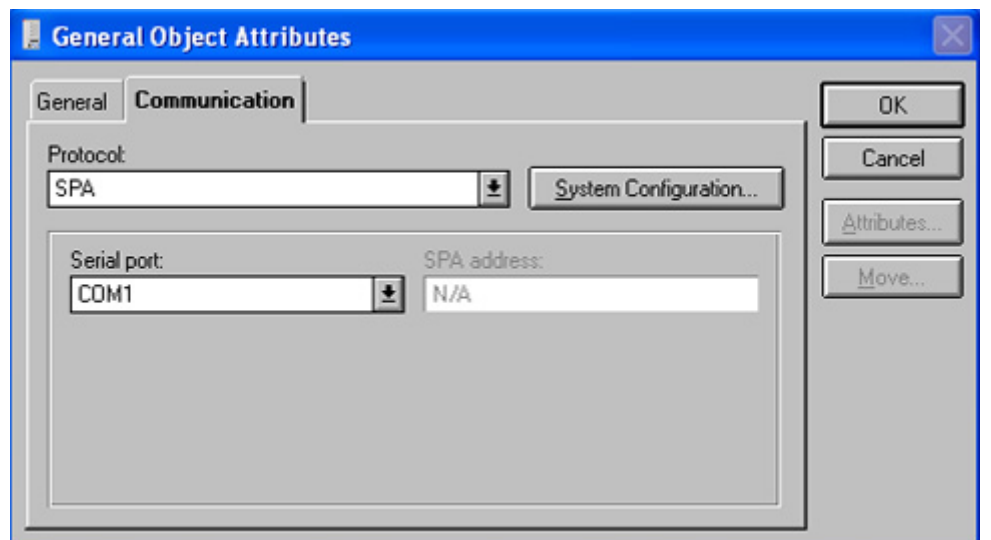
### 9.4.1. Communication settings of COM 610 object

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 COM 610 to CAP 505, the only required definition is the serial port to be used. The SPA address is not applicable for the gateway itself.



SPA\_pro\_settings

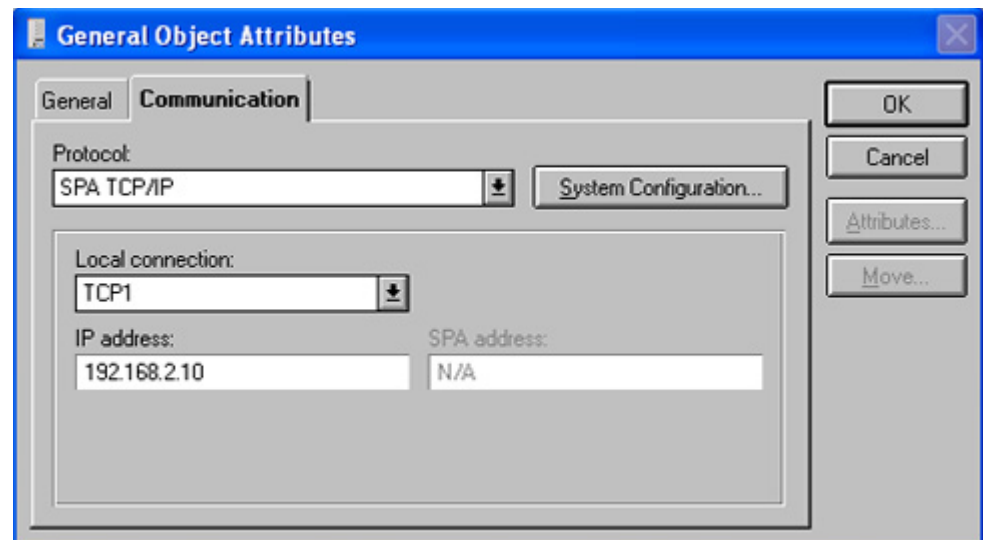
Fig. 9.4.1.1.-1 SPA protocol settings for COM 610 objects

### 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 505, 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.



SPA\_TCP\_IP\_settings

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).

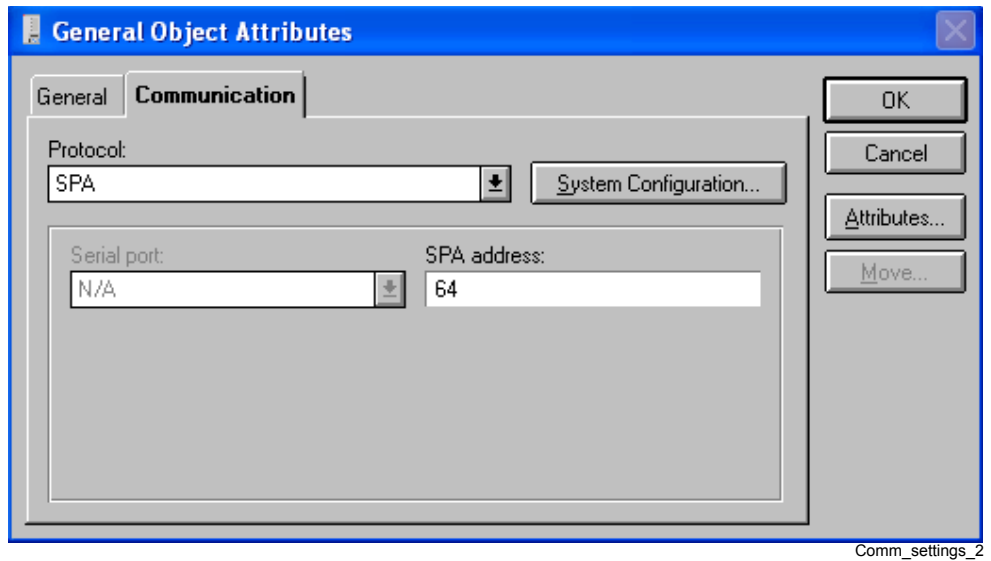


Fig. 9.4.2.-1 Communication settings for RED 500 series terminal with COM 610 as master.

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



Address mappings between CAP 505 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:

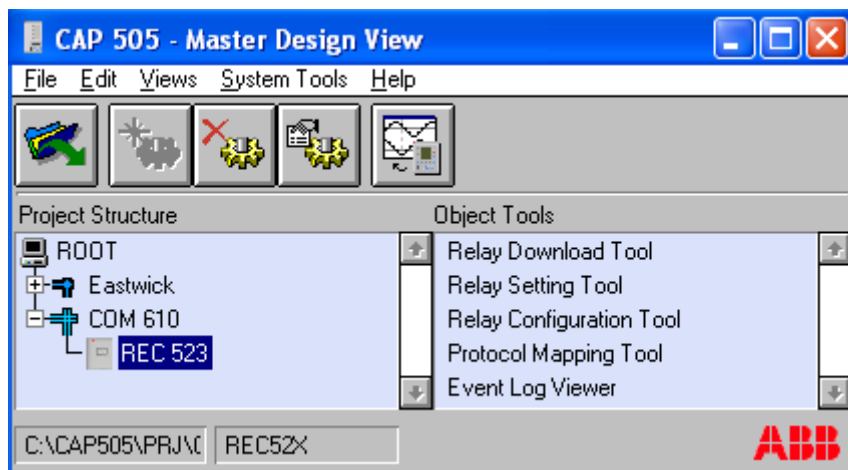


Fig. 9.5.-1 COM 610 object hosting a REC52X object



## 10. Relay Download Tool for REF 54x/REM 54x/ REC 52x/RET 54x

### About this chapter

This chapter describes the functionality of the Relay Download Tool, when used with REF 54x, REM 54x, REC 52x or RET 54x terminals.

### 10.1. General

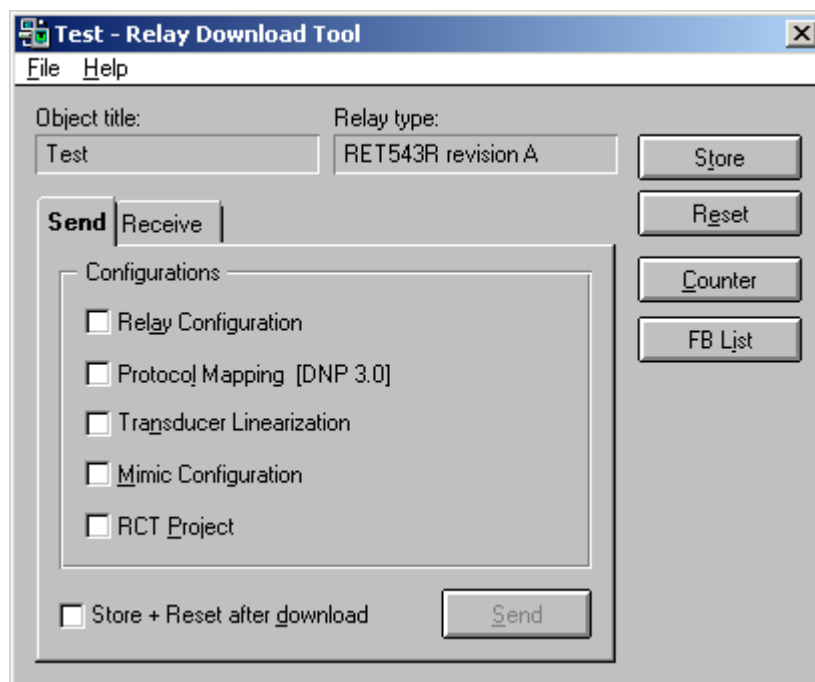
The Relay Download Tool performs bidirectional communication with relay units, allowing you to:

- Send Relay Configuration Tool configurations (Relay configuration) to the relay terminal.
- Send add-on protocol mapping table (Protocol mapping) to the relay terminal.
- Send transducer linearization file (Transducer linearization) to the relay terminal.
- Send Relay Mimic Editor pictures (Mimic configuration) to the relay terminal.
- Send Relay Configuration Tool projects (RCT project) to the relay terminal.
- Receive add-on protocol mapping table (Protocol mapping) from the relay terminal.
- Receive transducer linearization file (Transducer linearization) from the relay terminal.
- Receive Relay Mimic Editor pictures (Mimic configuration) from the relay terminal.
- Receive Relay Configuration Tool projects (RCT project) from the relay terminal.
- Read function block lists from the relay terminal.
- Read configuration counter values from the relay terminal.
- Reset the relay terminal.
- Store the current settings and data in the non-volatile memory of the relay terminal.

Due to the fact, that the Relay Download Tool is shared by relay terminals which support different capabilities, some features are available only for certain relay types. For example sending/receiving of the Mimic Configuration is not available for REC 52x relay types, and sending/receiving Protocol Mapping is available for only certain REF 54x, REM 54x, REC 52x and RET 54x relay revisions. If some feature is not valid for the relay in question, then the feature is disabled in the tool.

### 10.2. User interface

The Relay Download Tool window contains two pages. The Send page contains functions for sending (downloading) data to the relay terminal. The Receive page contains functions for receiving (uploading) data from the relay terminal. To switch between the pages, click on the page title.



RDT\_Main1

Fig. 10.2.-1 The Relay Download Tool window

### 10.3. Menu commands

This section describes commands that are available from the menu bar.

#### 10.3.1. File menu

The File menu is used for terminating the Relay Download Tool session.



Fig. 10.3.1.-1 The File menu of Relay Download Tool

##### 10.3.1.1. Exit

By selecting this menu item, the Relay Download Tool session terminates and you return to the Project Structure Navigator.

#### 10.3.2. Help menu

The Help menu is used for invoking the Relay Download Tool's About dialog, which displays version information.



Fig. 10.3.2.-1 The Help menu of the Relay Download Tool

### 10.3.2.1. About

By selecting this menu item you can view the Relay Download Tool's version information.

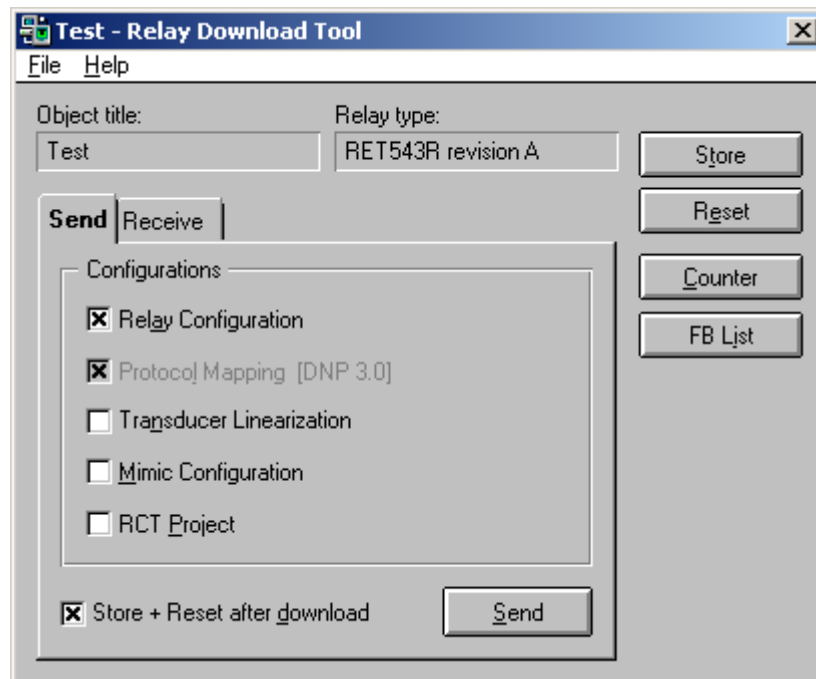
## 10.4. Relay communication functions

This section describes the relay communication functions.

### 10.4.1. Send page

Fig. 10.4.1.-1 shows the Send page, which contains check boxes for selecting what to download to the relay terminal. The available options are: Relay Configuration Tool configurations and projects, protocol configuration file (Protocol Mapping), transducer linearization file and Relay Mimic Editor configurations. Downloading is executed by clicking the Send button.

If the "Store + Reset after download" check box is checked when clicking the Send button, then the Store and Reset commands are sent automatically after a successful download of the selected files. These commands are described in Section 10.5. Relay command buttons.



RDT\_Send1

Fig. 10.4.1.-1 The Send page

### 10.4.1.1. Protocol Mapping in REF 54x/REM 54x/RET 54x

Certain REF 54x, REM 54x and RET 54x terminal types support so-called add-on protocols. Add-on protocol is an optional communication protocol, which can be configured and activated separately. Examples of possible add-on protocols are IEC 60870-5-103, Modbus and DNP 3.0.

The protocol configuration file (so-called Protocol Mapping) is prepared in advance by the Protocol Mapping Tool. Then it can be sent and the protocol is activated by the Relay Download Tool. Protocol Mapping check box can be selected only if the relay terminal supports add-on protocols, and a certain protocol is selected in advance in the object properties for the relay in question. Note that IEC 60870-5-103 protocol has a fixed mapping in the relay and it needs not to be configured in CAP 505.

If the Relay Configuration is selected to be sent, then the related Protocol Mapping is forced to be sent, too. Note also that a protocol mapping differing from the currently active add-on protocol in the relay cannot be sent without sending the Relay Configuration also. If trying to do that, then the following message will be shown:



*Fig. 10.4.1.1.-1 Active add-on protocol mismatch*

#### 10.4.1.2.

#### **Protocol Mapping in REC 52x**

Additional protocols like IEC 60870-5-101, Modbus and DNP 3.0 are fixed in REC 52x relays, which means that the active protocol cannot be changed. The only thing to do with the Relay Download Tool is only to transfer the protocol configuration file for the IEC 60870-5-101 protocol.

The protocol configuration file (so-called Protocol Mapping) for the IEC 60870-5-101 protocol is prepared in advance by the Protocol Mapping Tool. Then it can be sent by the Relay Download Tool to the relay. Protocol Mapping check box can be selected only if the selected REC 52x relay revision supports the configuration with the Protocol Mapping Tool.

The Relay Configuration and the Protocol Mapping can be sent independently of each other, unlike with the REF 54x, REM 54x and RET 54x terminals. Note that also an empty REC 52x relay contains a default protocol mapping.

#### 10.4.1.3.

#### **Starting to send Relay Configuration**

If Relay Configuration is selected to be downloaded to the relay, then some checkings will be done before starting the file transfer procedure.

Some relay terminal types support storing of configuration information, for example title, author, last modification date and last download date of the configuration program, and also a bay name. If the selected relay supports this, then the present



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configuration information is read and shown on the confirmation dialog. New values are determined and set automatically based on the Relay Configuration Tool and CAP 505 project data.

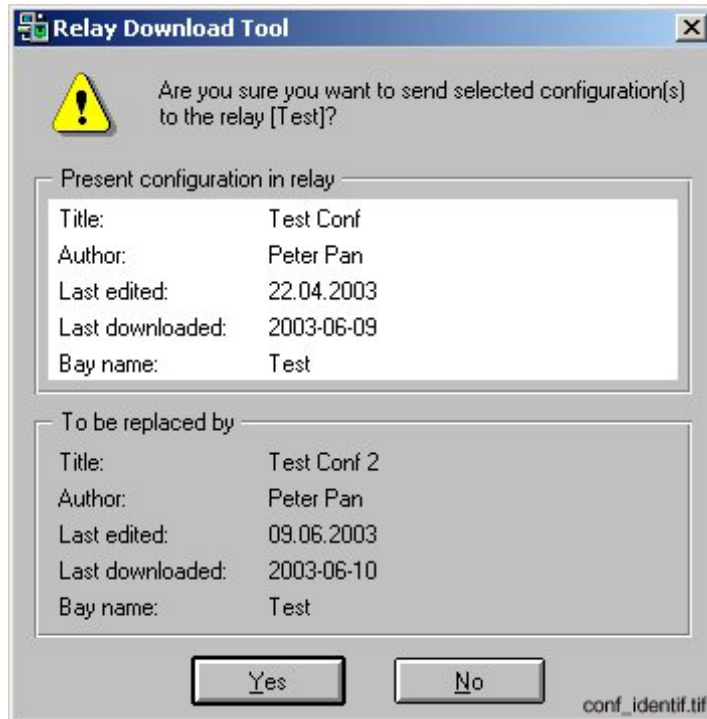


Fig. 10.4.1.3.-1 Relay configuration identification

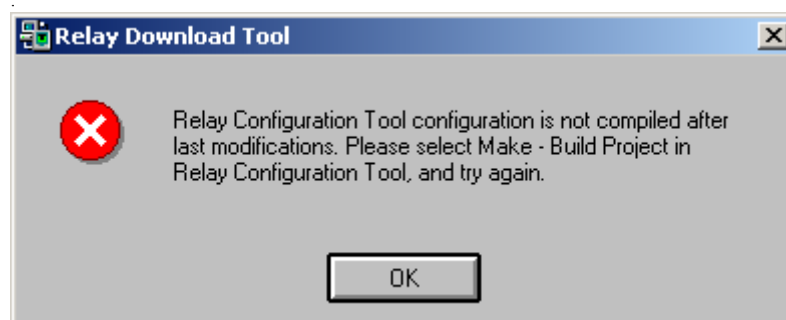
After you have confirmed to start the sending, the Relay Download Tool will perform the following compatibility checkings:

- It verifies that the connected relay matches the type and revision set in the relay configuration. In case of a mismatch, downloading will not be allowed before the settings are correct.



Fig. 10.4.1.3.-2 Relay type mismatch

- It checks that the configuration is compiled after last changes. If the configuration has been modified in the Relay Configuration Tool without compiling it, downloading is prevented before the project is compiled.



RCT\_conf\_not\_comp.

Fig. 10.4.1.3.-3 Configuration modified after last compilation

- The selected PLC (processor) type is checked. If the selected processor (relay) type in the relay configuration differ from the processor relay in the Relay Configuration Tool project, it is not allowed to download the configuration.

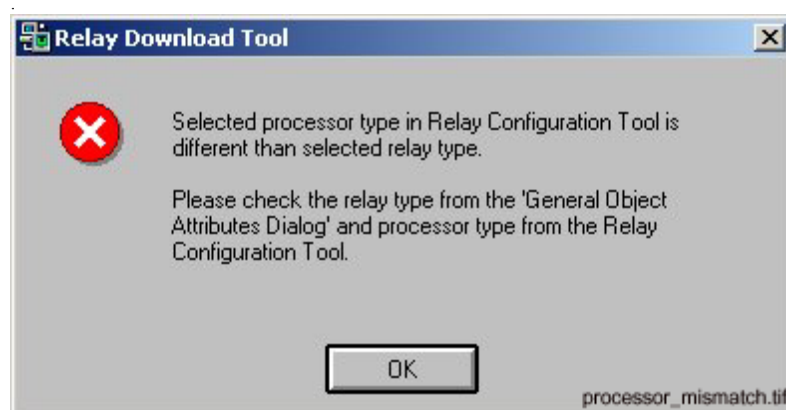


Fig. 10.4.1.3.-4 Processor type mismatch

When all the checkings have successfully passed, the final confirmation to start sending is done. The confirmation dialog contains a warning about the fact that the relay parameters are reset to their default values, when downloading a new relay configuration.

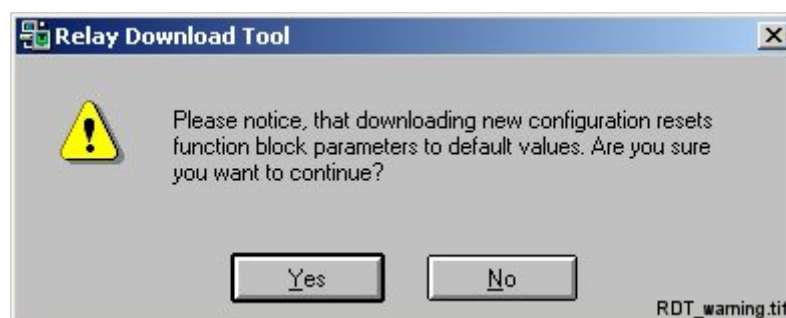
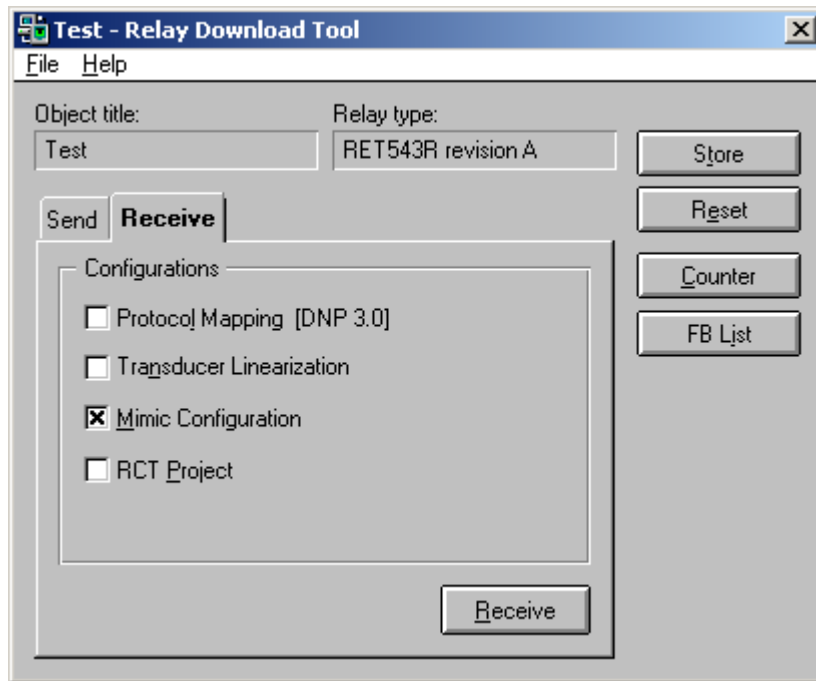


Fig. 10.4.1.3.-5 Warning about resetting parameters to default values

**10.4.2. Receive page**

Fig. 10.4.2.-1 shows the Receive page, which contains check boxes for selecting what to upload from the relay terminal. Relay Configuration Tool project, protocol configuration file (Protocol Mapping), transducer linearization file and Relay Mimic Editor configurations can be selected. Note, that since IEC 60870-5-103 protocol has a fixed mapping, its protocol mapping table cannot be received from the relay. Uploading is executed by clicking the Receive button.



RDT\_Receive1

Fig. 10.4.2.-1 The Receive page

**10.4.3. File transfer procedure**

**10.4.3.1. Progress indicator dialog**

Fig. 10.4.3.1.-1 shows a dialog, which is presented during a file transfer procedure. The progress bar displays the percentage of the file's size, having been sent to/ received from the relay terminal. The actual filename is also shown.

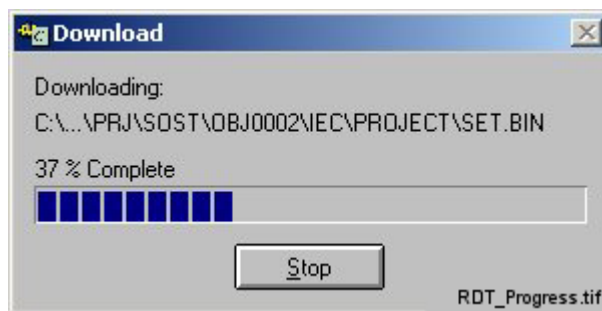


Fig. 10.4.3.1.-1 The progress indicator dialog

### 10.4.3.2. Communication errors

The following error messages may appear during the file transfer:

#### Incorrect communication settings

The following error message appears when the relay is not responding or some other communication error occurs:



*Fig. 10.4.3.2.-1 Error message for incorrect communication settings*

#### Relay not responding

The following error message appears when the relay is not responding:



*Fig. 10.4.3.2.-2 Error message indicating that the relay does not respond*

### 10.4.3.3. Relay configuration errors

Various other error messages may appear when attempting to download erroneous configuration(s). Such configurations contain either features that are unsupported by the targeted relay or erroneous settings.

For instance, the following message is shown, when the relay returns an error status indicating that an unsupported feature has been applied in the configuration.

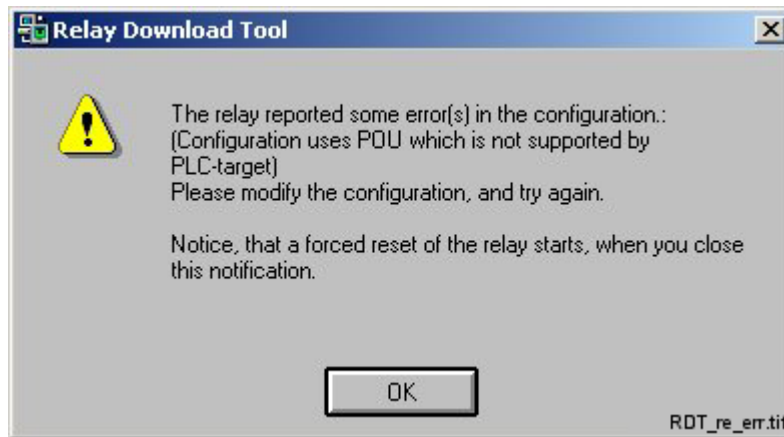


Fig. 10.4.3.3.-1 An unsupported POU (Program Organization Unit) is included in the transmitted configuration

If the error message contains only an error code without description, a system error has occurred in the relay.

Some relay terminal types support advanced configuration error reporting. After downloading the configuration the relay will check that all function block specific requirements regarding analog channel configuration and task cycle time are fulfilled. If errors are detected, a list containing all discovered errors will be presented with the name of the function block that reported the error, and a short textual error description.

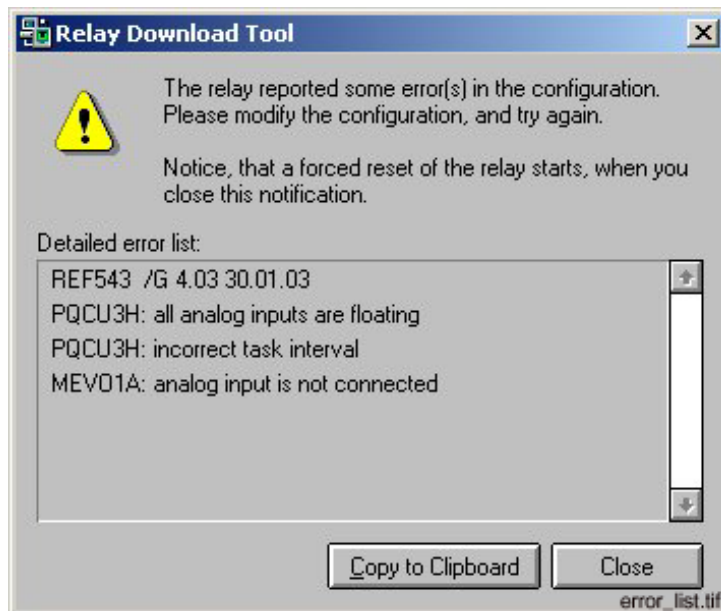


Fig. 10.4.3.3.-2 Example of error list when downloading incorrect configuration

## 10.5. Relay command buttons

This section describes the relay command buttons.

### 10.5.1. Store

The Store command saves current settings and data into the non-volatile memory of the relay.

When storing is in progress, the relay allows no communication. Attempts to communicate with the relay will end in the following notification dialog:



*Fig. 10.5.1.-1 Storing in progress*

### 10.5.2. Reset

The Reset command resets the relay.

### 10.5.3. Counter

The Counter command displays the number of configurations successfully sent to and stored in the relay (see Fig. 10.5.3.-1).

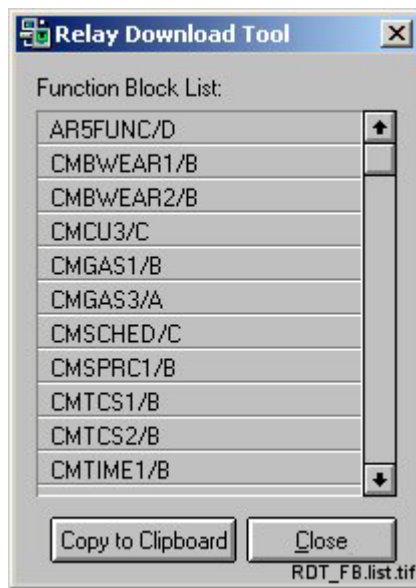


*Fig. 10.5.3.-1 Number of downloaded and successfully stored configurations in the relay.*

### 10.5.4. FB List

The FB List button invokes the dialog for viewing the activated function blocks in the relay. The function blocks are listed in ascending alphabetic order.

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*Fig. 10.5.4.-1 Activated function blocks in the relay*

Notice that you can copy the function block list onto the clipboard by using the Copy to Clipboard button.

To close the dialog, click Close.





## 11. Relay Download Tool for REX 52x

### About this chapter

This chapter describes the functionality of the Relay Download Tool, when used with REX 52x terminals.

### 11.1. General

The Relay Download Tool performs bidirectional communication with relay units, allowing you to:

- Send a protocol mapping table to the terminal
- Receive a protocol mapping table from the terminal

At the moment the protocol mapping table for the DNP 3.0 protocol is the only configuration you can send to or receive from a REX 52x terminal. The protocol mapping table itself must be prepared in advance by the Protocol Mapping Tool. Due to the fact that only some revisions of the REX 52x terminals support the DNP 3.0 protocol, the Relay Download Tool is also visible only for certain REX 52x types in CAP 505.



Sending the protocol mapping table to the REX 52x is possible only with the SPA protocol via the optical front panel connector. Rear connectors (SPA or LON) are not supported for downloading. However, receiving the protocol mapping from the REX 52x is possible also via the rear connections. If the front panel SPA connector is not configured for the connected object in CAP 505, this message will be shown at the tool start-up:



Fig. 11.1.-1 Caution for improper communication settings

### 11.2. User interface

The Relay Download Tool window contains two pages. The Send page contains functions for sending (downloading) data to the relay terminal. The Receive page contains functions for receiving (uploading) data from the relay terminal. To switch between the pages, click on the page title.

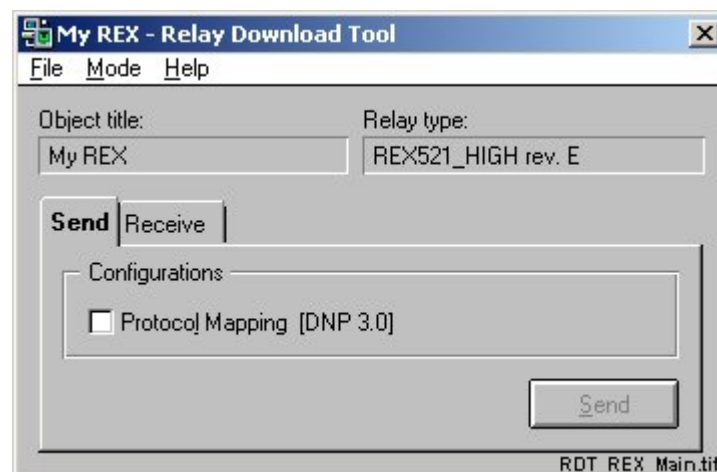


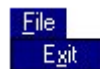
Fig. 11.2.-1 The Relay Download Tool window

### 11.3. Menu commands

This section describes commands that are available from the menu bar.

#### 11.3.1. File menu

The File menu is used for terminating the Relay Download Tool session.



RDT\_REX\_File\_Menu

Fig. 11.3.1.-1 The File menu of Relay Download Tool

##### 11.3.1.1. Exit

By selecting this menu item, the Relay Download Tool session terminates and you return to the Project Structure Navigator.

#### 11.3.2. Mode menu

The Mode menu is used for setting the operation mode of the terminal.



RDT\_REX\_Mode

Fig. 11.3.2.-1 The Mode menu of the Relay Download Tool

##### 11.3.2.1. Set to Protection Mode

By selecting this menu item, the Relay Download Tool sets the terminal back to the protection mode. This menu item is intended only for the situation, when the sending of the protocol mapping table is interrupted for some reason and the terminal is not automatically set back to the protection mode. The selection of this menu item is never needed in normal use.

**11.3.3. Help menu**

The Help menu is used for invoking the Relay Download Tool's About dialog, which displays version information.



RDT\_REX\_Help.tif

Fig. 11.3.3.-1 The Help menu of the Relay Download Tool

**11.3.3.1. About**

By selecting this menu item you can view the Relay Download Tool's version information.

**11.4. Relay communication functions**

This section describes the relay communication functions.

**11.4.1. Send page**

Fig. 11.4.1.-1 shows the Send page, which contains check boxes for selecting what to download to the relay terminal. The only available option for REX 52x is the protocol mapping table. Downloading is executed by clicking the Send button.



Fig. 11.4.1.-1 The Send page



During the sending of the protocol mapping table the terminal is set to the configuration mode. Due to this, the protection functionality of the terminal is not in use during the downloading. This is indicated by showing this confirmation dialog after the Send button is clicked, and before the actual sending begin



Fig. 11.4.1.-2 Warning about setting the protection mode off

After you have confirmed to start sending the protocol mapping table to the terminal, the type and revision of the connected terminal is verified against the selection made in CAP 505. Both the hardware configuration and the standard configuration must match. If there is a mismatch in the hardware settings, the file transfer operation is cancelled and this message will be shown:



Fig. 11.4.1.-3 Hardware configuration mismatch

If there is a mismatch in the standard configuration settings, this message will be shown:



Fig. 11.4.1.-4 Standard configuration mismatch

## 11.4.2.

### Receive page

Fig. 11.4.2.-1 shows the Receive page, which contains check boxes for selecting what to upload from the relay terminal. The only available option for REX 52x is the protocol mapping table. Uploading is executed by clicking the Receive button.

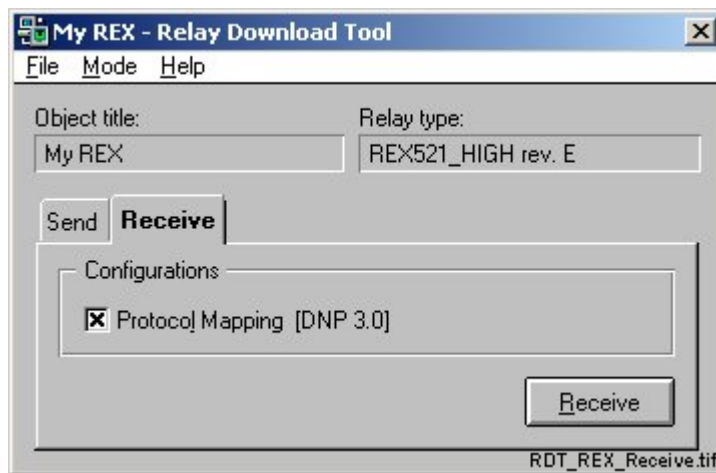


Fig. 11.4.2.-1 The Receive page

Before starting the file transfer procedure, the same hardware and standard configuration checking is done (like when sending). If a mismatch in the settings is found, a message will be shown and the file transfer operation will be cancelled.

### 11.4.3. File transfer procedure

#### 11.4.3.1. Progress indicator dialog

Fig. 11.4.3.1.-1 shows a dialog, which is presented during a file transfer procedure. The progress bar displays the percentage of the file's size, having been sent to/received from the relay terminal. The actual filename is also shown.



Fig. 11.4.3.1.-1 The progress indicator dialog

By clicking the Stop button, the file transfer operation is aborted.

#### 11.4.3.2. Communication problems

Some communication problems may appear during the file transfer operation. Depending on the situation and the severity of the problem, two kinds of messages may be shown: one with the options to retry or cancel the operation, and the other without an option to continue.



*Fig. 11.4.3.2.-1 Incorrect communication settings message*



*Fig. 11.4.3.2.-2 Communication time-out message*

---

## 12. Transducer Linearization Tool

### 12.1. General

The Transducer Linearization Tool is a tool for setting input scaling/linearization data of the RTD/analog module (RTD1) in the RED 500 platform terminals. Input scaling/linearization is needed when non-linear sensors, not directly supported by the RTD/analog module, are used. Linear/non-linear scaling is done to each RTD/analog input separately. The tool is available only for certain RED 500 platform terminals. The first terminal type having this support is RET 54x release 3.0. The tool is used for the following tasks:

- Editing input scaling/linearization data
- Exporting input scaling/linearization data to a text file
- Importing input scaling/linearization data from a text file
- Printing transducer input linearization curves

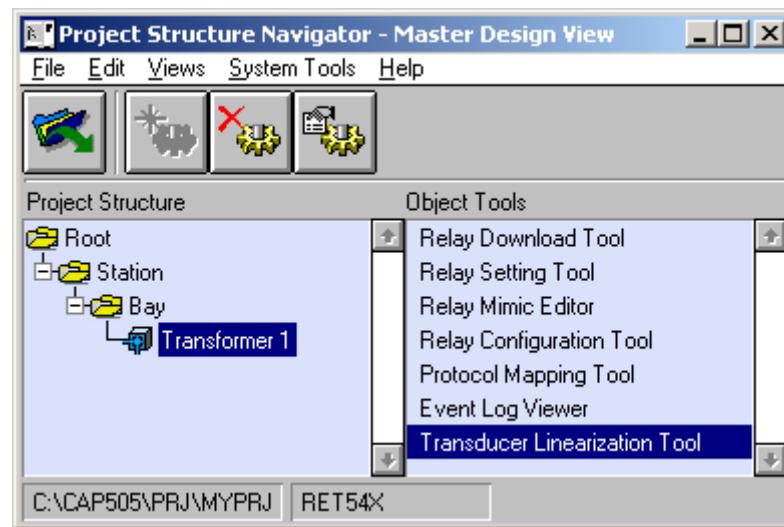
Uploading/downloading of the input scaling/linearization data is done by using the Relay Download Tool and the setting of relay parameters is done by using the Relay Setting Tool. For more information about uploading/downloading to the terminal, refer to Chapter 10. Relay Download Tool for REF 54x/REM 54x/ REC 52x/RET 54x in this manual. For more information about setting relay parameters, refer to the Tools for Terminals and Relays manual. For more information about the RTD/analog module, consult the technical reference manual for the product in question.

### 12.2. Start-up

The Transducer Linearization Tool is started from the Project Structure Navigator. Before starting the tool, the desired relay object should be selected in the project structure tree.

The tools that are available for the selected object appear on the Object Tools list, as shown in Fig. 12.2.-1. The Transducer Linearization Tool is available as an object tool in the Project Structure Navigator for a relay object if the relay type supports input scaling/linearization.

The Transducer Linearization Tool can be opened by double-clicking its name on the list.

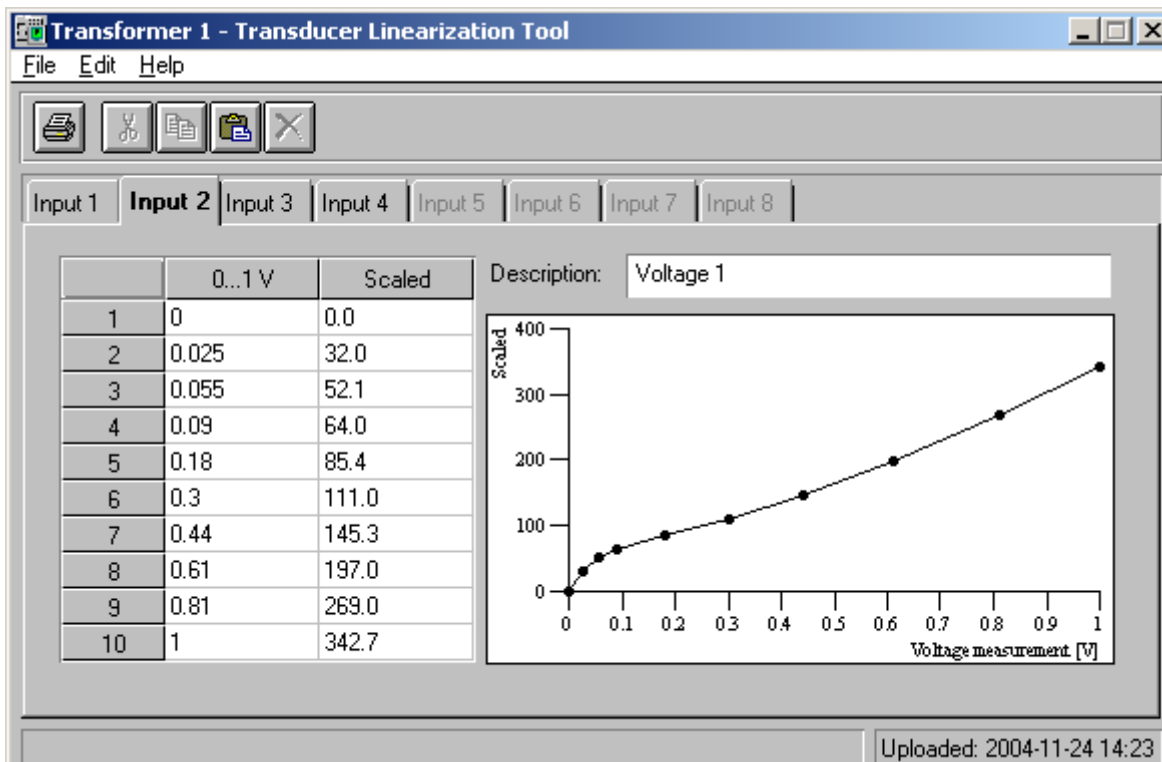


TLT\_start

Fig. 12.2.-1 Starting the Transducer Linearization Tool from the Project Structure Navigator.

### 12.3. User interface

The main view of the Transducer Linearization Tool is shown in Fig. 12.3.-1.



TLT\_main\_view

Fig. 12.3.-1 The main view of the Transducer Linearization Tool



## User's Guide

The main view contains the following elements:

- Menu bar
- Toolbar
- Transducer Linearization view
- Status bar





**12.3.1.****Menu bar and toolbar commands**

The menu bar contains the following commands:


- File
  - Import...
  - Export...
  - Print Setup...
  - Print
  - Exit
- Edit
  - Cut
  - Copy
  - Paste
  - Delete
- Help
  - Linearization Tool Help
  - About Linearization Tool

Table 12.3.1-1 explains the functionality of the commands and the corresponding toolbar buttons.

**Table 12.3.1-1 Menu bar and toolbar commands:**

Command:	Toolbar button:	Functionality:
File - Exit		Exits from the tool
File - Import		Imports input scaling/linearization data
File - Export		Exports input scaling/linearization data
File - Print Setup		Opens the Printer Setup dialog
File - Print		Prints transducer input linearization curves
File - Cut		Cuts selection into clipboard
File - Copy		Copies selection into clipboard
File - Paste		Pastes the clipboard contents

**Table 12.3.1-1 Menu bar and toolbar commands:**

Command:	Toolbar button:	Functionality:
File - Delete		Deletes selection

### 12.3.2. Transducer linearization view

The view consists of eight pages, each of which corresponds to an RTD/analog input. An individual linearization curve can be created for each input.

The following parameters are used for each linearization curve:

- Description, optional text for describing the input linearization curve
- Table consisting of up to ten pairs of input value/scaled value for the input

The RTD/analog input linearization curve being edited is drawn in a graph picture. Only the table values can be uploaded/downloaded from the relay. The description text is used internally in the Transducer Linearization Tool only.

### 12.3.3. Status bar

When a transducer linearization is shown, the status bar contains the following information:

- Date and time stamp of the transducer linearization file upload

## 12.4. Using Transducer Linearization Tool

In order to use the Transducer Linearization Tool for the selected terminal object, its RTD/analog module configuration parameters need to be set in the Relay Setting Tool. All inputs having its input mode parameter set to the off state will be disabled. Inputs having its linearization curve parameter set to the disabled state will have all its controls dimmed. The following terminal parameter settings must be considered before using the Transducer Linearization Tool:

- Input mode (F016V01x)

Depending on the Input mode, one of the following:

- Voltage range (F016V02x)
- Current range (F016V03x)
- Resistance range (F016V04x)
- Temperature range (F016V05x)
- Linearization curve (F016V09x)

Above, 'x' denotes the input number of the RTD/analog module and input linearization curve page in the transducer linearization view.

### 12.4.1. Reading and saving transducer linearization data

Input scaling/linearization data of the currently selected relay object is automatically read when starting the Transducer Linearization Tool. If there is no input scaling/linearization data to be read, all input pages will have an empty table.

When exiting the tool, input scaling/linearization data will be saved for the current relay object. The user is asked for confirmation before the saving is done. If any input contains invalid data, the user is prompted to cancel the save operation or to return to the input curve page having erroneous data and to correct the values.

**12.4.2. Editing transducer linearization data**

Each input linearization curve page consists of a description field and a table containing input values and scaled values for the input (see Fig. 12.4.2.-1). Editing the description field is optional and it can be left empty, whereas the table must consist of at the minimum of two and at the maximum of ten rows of valid input value/scaled value pairs.

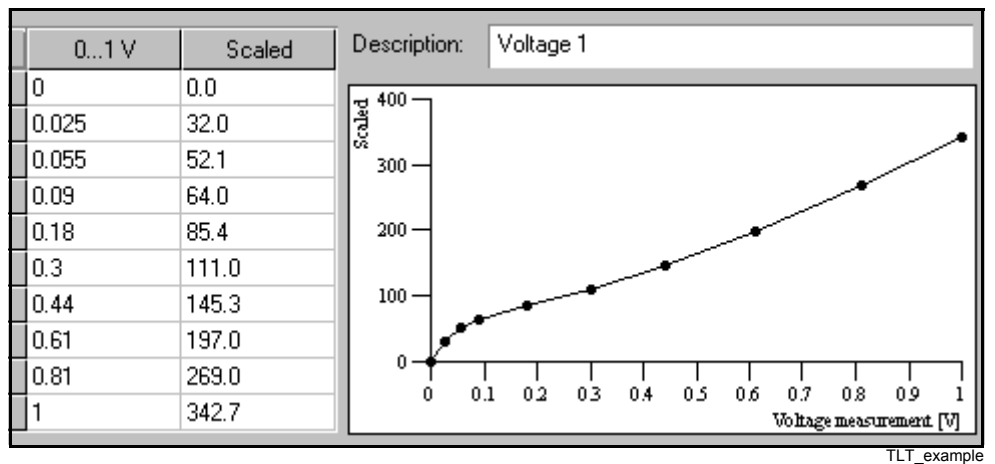


Fig. 12.4.2.-1 Example of editable transducer linearization data

Input scaling/linearization will be done for the input range entered into the table. In order to include the whole input range, include input value/scaled value pairs for the least and greatest input range.

The input linearization can be edited by changing or entering values in the table. Only valid values can be entered in the table. A valid input value is a value that is in the input range shown in the input values column title. The input range is determined by the input range parameter selection that is done in the Relay Setting Tool. A valid scaled input value is a value in the range [-10000...10000].

Start to enter or change a value by clicking in a cell of the table. A value in the left cell must have a corresponding value in the right cell, otherwise the value will be erased. The curve is immediately redrawn after the value in the right cell has been edited and the cursor moved to another cell.

The table is automatically sorted according to the left column. To enter a value in the middle of the table, just append a row to the end of the table having an input value in between already entered values.



Values in the table can be selected by pressing down the left mouse button and by dragging the mouse. The selection can be cleared, cut or copied to the clipboard for pasting in other RTD/analog input curve pages or other application programs. To do this, click the right mouse button at the selection and choose the wanted command from the pop-up menu. Alternatively choose the command from the toolbar or Edit menu.

### 12.4.3. Exporting transducer linearization data

The Export function is used when transferring input scaling/transducer linearization data between relay objects. The data is saved in a text file, which name can be entered or selected from an export dialog, which is opened from the Export command in the File menu.

### 12.4.4. Importing an exported transducer linearization data

The Import function is used when transferring input scaling/transducer linearization data between relay objects. The data is read from a previously exported input scaling/linearization data file, which name can be entered or selected from an import dialog, which is opened from the Import command in the File menu.

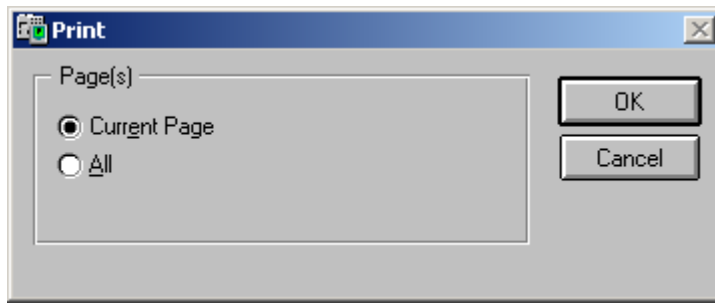
### 12.4.5. Printing transducer input linearization curves

**Table 12.4.-1 Print and Print Setup functions:**

Selection	Functionality:
Print Setup	Opens a dialog in which print setup for the paper as well as for the printer can be defined.
Print	Opens a dialog in which it is possible to select printing of the current linearization curve or all linearization curves. Printed output of the linearization curve pages is similar to what is displayed on the screen.

The transducer linearization can be printed to any printer defined in the operating system. After selecting File - Print Setup from the menu, the standard Print Setup dialog of the operating system appears on the screen. Any available printer can be selected and the printer settings can be configured as needed before the printing.

After selecting File - Print from the menu or by clicking the corresponding toolbar button, a print dialog will be opened (see Fig. 12.4.-1) in which current linearization curve page or all linearization curve pages can be printed. Confirm printing by pressing the OK button or cancel the printing by pressing the Cancel button.



TLT\_print

*Fig. 12.4.-1 Print dialog*



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