LIB, CAP and SMS

Tools for Relays and Terminals

User's Guide

Contents

1. About this manual

1.1. Copyrights

1.2. Trademarks

1.3. Guarantee

Please inquire about the terms of guarantee from your nearest ABB representative.

1.4. General

This manual provides thorough information on the relay object types and relay tools used in CAP 501, CAP 505, SMS 510 and LIB 510 applications.

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.

ABB Oy regularly provides standard training courses on its main products.The training program is available on the Internet at http://www.abb.com/substationautomation. Please contact your ABB representative for more information.

1.5. Use of symbols

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

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

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

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

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

1.6. Abbreviations

IED	Intelligent Electronic Device
LAN	Local Area Network
LED	Light-emitting diode
LON	Local Operating Network, communication protocol developed by Echelon
PQ	Power Quality
PSN	Project Structure Navigator
RAS	Remote Access Service
SPA	Data communication protocol developed by ABB
TCP/IP	Transport Control Protocol/Internet Protocol; de facto communication protocol standard for data transmission over networks

1.7. Related documents

Name of the manual	Document ID
LIB 500 4.0.4 Operation Manual	1MRS751885-MUM
LIB 500 4.0.4 Configuration Manual	1MRS751880-MEN
LIB 510 4.0.4 Operation Manual	1MRS751888-MUM
LIB 510 4.0.4 Configuration Manual	1MRS751886-MEN
LIB 500 *4.2 Operation Manual	1MRS755359
LIB 500 *4.2 Configuration Manual	1MRS755360
LIB 510 *4.2 Operation Manual	1MRS755361
LIB 510 *4.2 Configuration Manual	1MRS755362
SMS 510 User's Guide	1MRS751267-MUM
SYS 500 System Management, User's Guide	1MRS751857-MEN
CD-ROM (Technical Descriptions of Functions)	1MRS750889-MCD
MEDREC16, Transient Disturbance Recorder manual	1MRS752341-MUM

1.8. Document revisions

Version	SW revision number	Date	History
G	n/a	31.03.2004	REF 54x 3.0
H	n/a	30.06.2004	REX 521 rev. E, Event Log Viewer, IEC protocols in LIB 5x0
K	n/a	07.10.2004	REF 610 additions New chapters: - 12. REx 61x DNP 3.0 point configuration - 13. Troubleshooting
L	n/a	20.12.2004	RET 54x additions
M	n/a	01.03.2005	Maintenance updates
N	n/a	08.07.2005	Maintenance updates
P	n/a	07.02.2006	SPA TCP/IP protocol added Maintenance updates

2. RED relay object types

2.1. Description

An object type is a package that contains relay configuration descriptions, profile files, standard function pictures and data files, format pictures and texts.

RED relay object types package is used in the CAP 501 Relay Setting Tools, CAP 505 Relay Product Engineering Tools, SMS 510 Substation Monitoring System and MicroSCADA application libraries LIB 500/510.

Object types are named according to the relay type. For example, all configuration descriptions of the relays REF 541, REF 543 and REF 545 will be stored under the object type REF 54x.

The purpose of this manual is to describe the usage of relay and terminal tools which are under the LIB, CAP and SMS products.

2.1.1. Communication support

When the following protocols are used, the supplied relay tools provide the most comprehensive support for the RED relay objects.

Table 2.1.1-1 Supported communication protocols

CAP 501	SPA, SPA TCP/IP
CAP 505	LON, SPA, SPA TCP/IP
SMS 510	LON, SPA
LIB 500/510	LON, SPA

In addition to the protocols above, in LIB 500/510 the following protocols are partly supported for certain relay types with certain restrictions. When using the protocols below, only parametrization with the RED Relay Setting Tool and disturbance recording uploading with the DR-Collector Tool (but not automated upload) is supported. This means that for example the Event Editor or the PQ-Monitoring Tool cannot be used with these protocols.

Table 2.1.1-2 Partly supported communication protocols in LIB 500/510

Protocol	Relay types	Condition	Remarks
IEC 60870-5-101	REF 54x, REM 54x, REC 52x, REX 52x, RET 54x	-	All but REC 52x require either a COM 6xx or KU-2000 gateway
IEC 61850-8	All other RED object types but REC 52x	Only with SYS 600	Requires a SPA-ZC 40x communication gateway

2.2. Installation and configuration

2.2.1. CAP 501/505

After a RED relay has been inserted (use the Add function) to the project tree, it has to be configured with the Properties/Attributes function, see "General Object Attributes/Communication page" on page 54. This is described in Section 2.4. on page 25 (Supported object types). Communication settings are described in Section 2.5. on page 53 (Configuring communication settings).

SMS 510

Please see the SMS 510 User's Guide.

2.2.2. LIB 510/MicroSCADA: installing and configuring REx terminals

The following steps and tools are required for a REx terminal picture function in MicroSCADA:

1. Installation of the terminal picture function (Installation Tool)
2. Configuration of the terminal picture function (Standard Configuration Tool)
   - Attributes
   - REx Configuration (Object Configuration Tool)
   - Communication settings (CConfig Tool)
   - Event handling (Event Editor)
   - Configuring representations (Representation Tool)
3. Terminal parametrization (RED Relay Setting Tool)

Steps one and two are shortly described in the following sections, but relay parametrization is beyond the scope of this manual, please see the LIB 510 Operation Manual, RED Relay Setting Tool.

Steps 1 and 2 above are accessed from the Tool Manager/Picture Editor. LIB 500 Configuration Manual (Introduction) gives a general description of the principles for installing and configuring picture functions. For every terminal a separate picture function is added to the process picture. Please see the Operator's Manual and the Technical Reference Manual of the relevant terminal for further information.

2.2.2.1. Installing terminal picture functions

In the installation tool, choose LIB4/LIB 510/PROTECTION & CONTROL. Select an appropriate object type, for example REF 54x and click once by mouse. After the RED standard function has been highlighted, enter a Picture Function Name for the function and click the Install button. Place the function anywhere in the base picture.

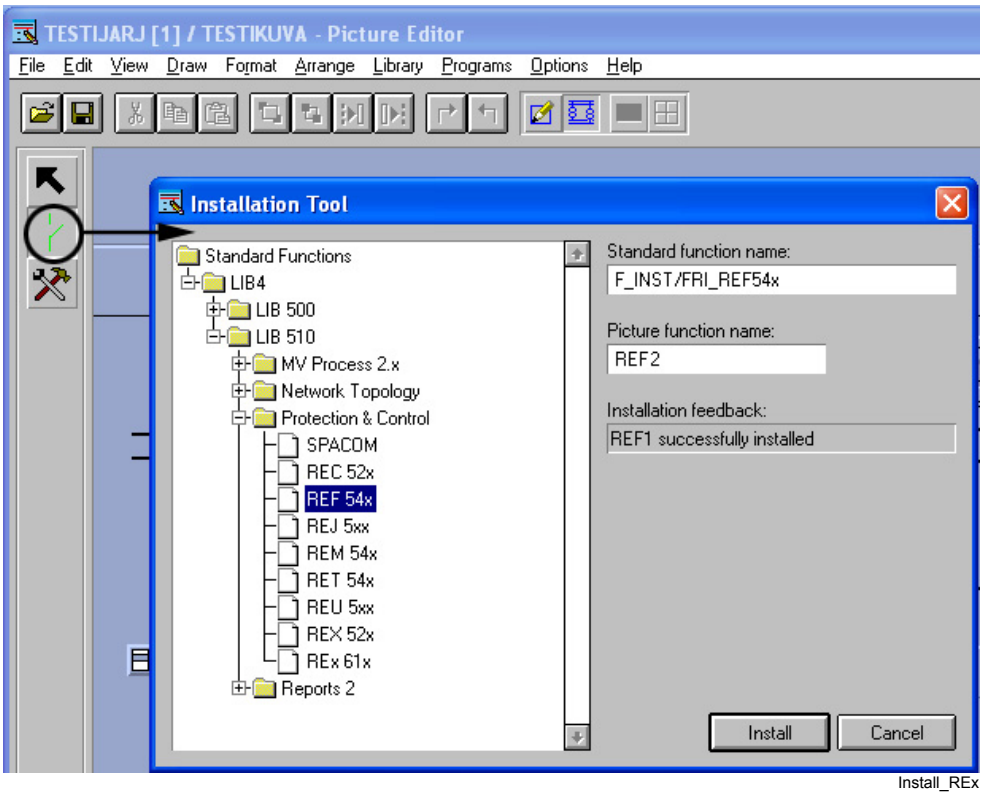


Fig. 2.2.2.1.-1 The procedure for installing a terminal picture function. Terminal picture function REF1 was successfully installed; the icon is visible in the upper left corner.

2.2.2.2. Terminal picture function configuration

The following flowchart shows the procedure of adding and preparing relay terminals for the process picture. This example applies to REF 54x.

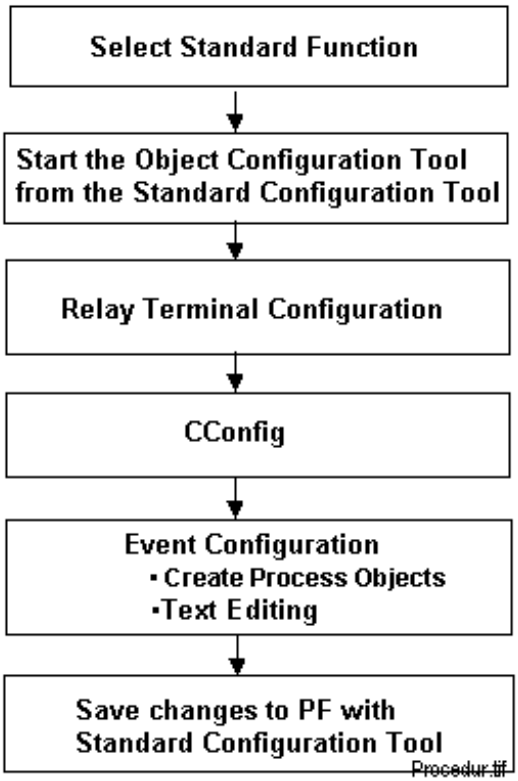


Fig. 2.2.2.2.-1 The procedure of the terminal configuration

The Object Configuration Tool is opened from the Tools menu of the Standard Configuration Tool. The configuration of the relay can be divided into four phases.

1. Relay terminal object type selection and configuration, SW library and APL library (Object Configuration Tool). (Function is described in Section 2.4. on page 25).
2. Storing terminal specific data (for example communication type in CConfig tool). (Function is described in Section 2.5. on page 53).
3. Event configuration (Event Editor). (Function is described in the LIB 510 Configuration Manual).
4. Storing terminal picture function data is done by the Standard Configuration Tool by selecting Apply or OK.

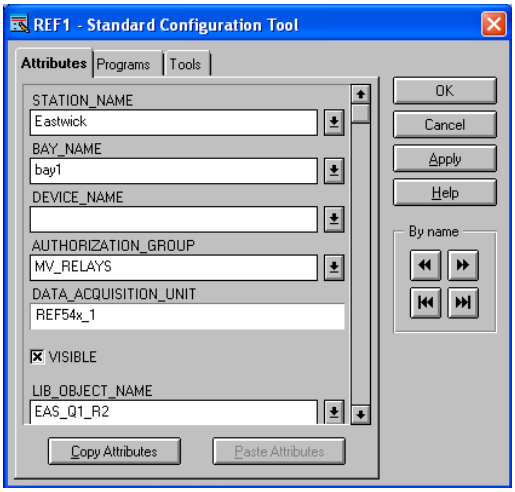
Before starting the configuration, please ensure that the base system objects concerning the stations and nodes are correctly configured.

2.2.2.3. Standard Configuration Tool functions

Select the terminal picture function. Start the Standard Configuration Tool to modify the configurable attributes and to start the REx Configuration Tool. The pages Attributes and Tools are described in this section. The Representation Tool in the Tools menu is not described.

Attributes page

The following configurable attributes of the installed object are possible to change. A description of the configurables and the different choices follows below.



SCTAttr

Fig. 2.2.2.3.-1 Standard Configuration Tool/Attributes page

Table 2.2.2.3-1 Configurable attributes that can be changed for the installed objects.

Configurable	Choices
STATION_NAME	The name of the substation. As a default the maximum length of the text is 9 characters. This text will be used as a substation identifier of the relay objects on the event list, alarm list, printout, database query, etc. It is very important that this text is similar to all objects within the same substation.
BAY_NAME	The name of the bay/feeder. As a default the maximum length of the text is 14 characters. This text will be used as a bay/feeder identifier of the relay objects on the event list, alarm list, printout, database query, etc. It is very important that this text is similar to all objects within the same bay/feeder.
DEVICE_NAME	The name (identifier) of the relay. As a default the maximum length of the text is 5 characters. This text will be used as an identifier of the relay on the event list, alarm list, printout, database query, etc.
AUTHORIZATION GROUP	The authorization group used for the object.
VISIBLE	Visibility of the relay unit object button in the process picture.
LIB_OBJECT_NAME	Identifies the relay object. The name should be unique within the application. The logical names of event process objects will be created by using this name: LN = LIB_OBJECT_NAME + Index (A-Z, 1..). (An index is defined by the Event Editor) Max. length of attribute: 9 characters.

Saving relay data to the picture function

After you have configured the relay terminal using the configuration tools, the data has to be saved to the picture function. This is done by using the Standard Configuration Tool commands by selecting OK or Apply.

Copying picture function data

To copy picture function data and to paste it into another picture function, use the commands Copy attributes and Paste attributes in the Standard Configuration Tool. After you have copied the picture function data, open the Object Configuration Tool and make the necessary definitions (addresses etc.).

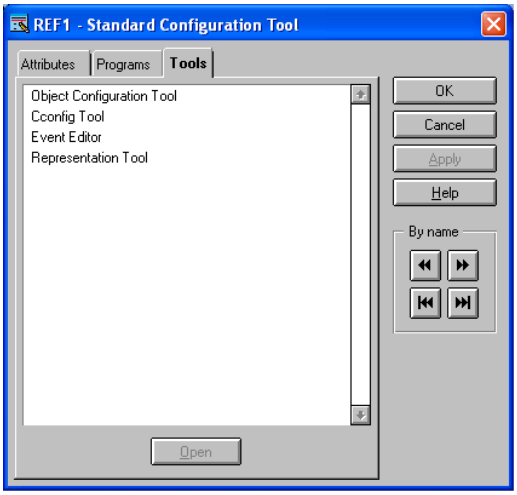
Deleting picture functions

Picture functions that have no connections to databases can be deleted directly in the Picture Editor. To delete a picture function element:

- Select the element with the selector

- Then click at the border of the element.
- Choose Delete in the Edit menu and the element disappears. This can also be done by pressing Delete on the keyboard.

Tools page



SCTTools

Fig. 2.2.2.3.-2 The Standard Configuration Tool dialog

The following tools can be started from the Tools page in the Standard Configuration Tool:

- Object Configuration Tool for selection of terminal type and application library (Function is described in Section 2.4. on page 25).
- CConfig Tool for communication settings (Function is described in Section 2.5. on page 53).

- Event Editor for event handling (Function is described in the LIB 510 Configuration Manual).
- Representation Tool for picture function symbol used for the terminal object.

Object Configuration Tool

- The standard function parameters for the relay unit are configured via the Object Configuration Tool.

The Object Configuration Tool is started from the Standard Configuration Tool by selecting Tools/Object Configuration Tool.

The data for the units is read from the *REF 54x object type library*. These descriptions are stored in the directory *lib4/fmod/sm_red*.

The following example concerns the REF 54x relay.

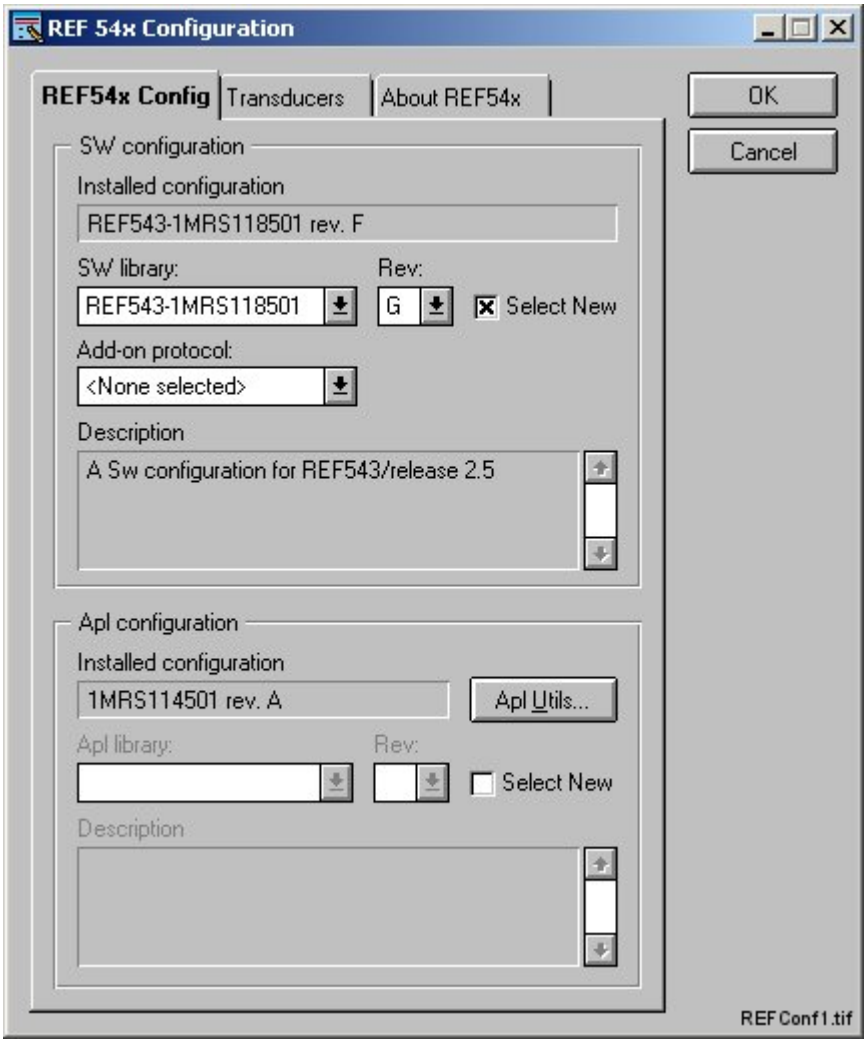


Fig. 2.2.2.3.-3 The dialog appearing when REF 54x Configuration is selected

2.2.2.4. Terminal parametrization

After the terminal picture function configuration, the terminals are parametrized by the RED Relay Setting Tool.

2.3. Object types general

2.3.1. Projects

A project is a collection of object instances arranged in a hierarchical order. Object hierarchy is achieved by the use of nodes. Each node behaves like a directory in a file system where each directory may contain files (in this case object instances). A project always has a root node (resembling the root directory in a file system) and it is also possible that this is the only node in the whole project. In CAP 5xx the default project is named SOST for Simple Object Selection Tool. In MicroSCADA both the project and directory name is PRJ in the PROTECTION directory under application.

In technical terms, a project is stored on disk in directories. Each project has its home root directory, for example SOST. The next directory level has OBJ#### directories where #### stands for a sequence number. Each object has a home directory of its own in the directory structure, for example SOST\OBJ0001.

2.3.2. Object types

Object types determine the information structure and functionality of an object instance.

All dialogs and program codes that control the behaviour and structural design of the object instance are stored in the object type resource files. This relationship between object types and object instances resembles drivers in an operating system, where some drivers control physical devices and some control the behaviour of the operating environment itself.

2.3.3. Object type groups

Object type group can be considered as a collection of object types that serve the same purpose. For example, among a number of other types, the SPACOM and REF 54x object types belong to the object type group Protection & Control.

2.3.4. Objects

Each object in a project is an instance of an object type. Generally applicable information is taken from the object type, while the instance stores settings, e.g. parameter values. These values are later used by the object type or by a tool that is adapted to use the information structure of the object.

The object type determines the file structure for the object instance. Some object types prefer to save all object specific parameters in a single file in the object directory. Other object types use subdirectories with a various number of files. Tools that have been adapted for use with the object type information structure then use object information stored in these parameter files when the object instance is selected for a tool.

2.4. Supported object types

2.4.1. REF 54x, REC 52x, REM 54x, RET 54x

This paragraph describes the operation and properties of the object types REF 54x, REC 52x, REM 54x and RET 54x. However, as these object types share the same operating principle, this paragraph refers to the REF 54x object type only.

2.4.1.1. General

The REF 54x object type configures object instances for REF 541, REF 543 and REF 545 terminals. The software configuration determines which REF terminal is being configured. Used function blocks determine the relay functionality. This information is stored in the application configuration. The REF 54x object type only configures the object instance, no communication takes place against the actual relay. When an object instance is configured, it is possible to apply its configuration in an appropriate tool. For instance, Relay Setting Tool, Relay Configuration Tool and the Relay Mimic Editor apply to object instances that belong to the REF 54x object type.

In the REF 54x configuration dialog you can choose the following functions:

- Select relay unit software and application configurations
- Save an application configuration to the application library
- Delete an application from the application library
- Export from the application library
- Import to the application library
- Receive an application from the relay to the user application library

The page REF 54x Config is divided into two sections: SW configuration and Apl configuration.

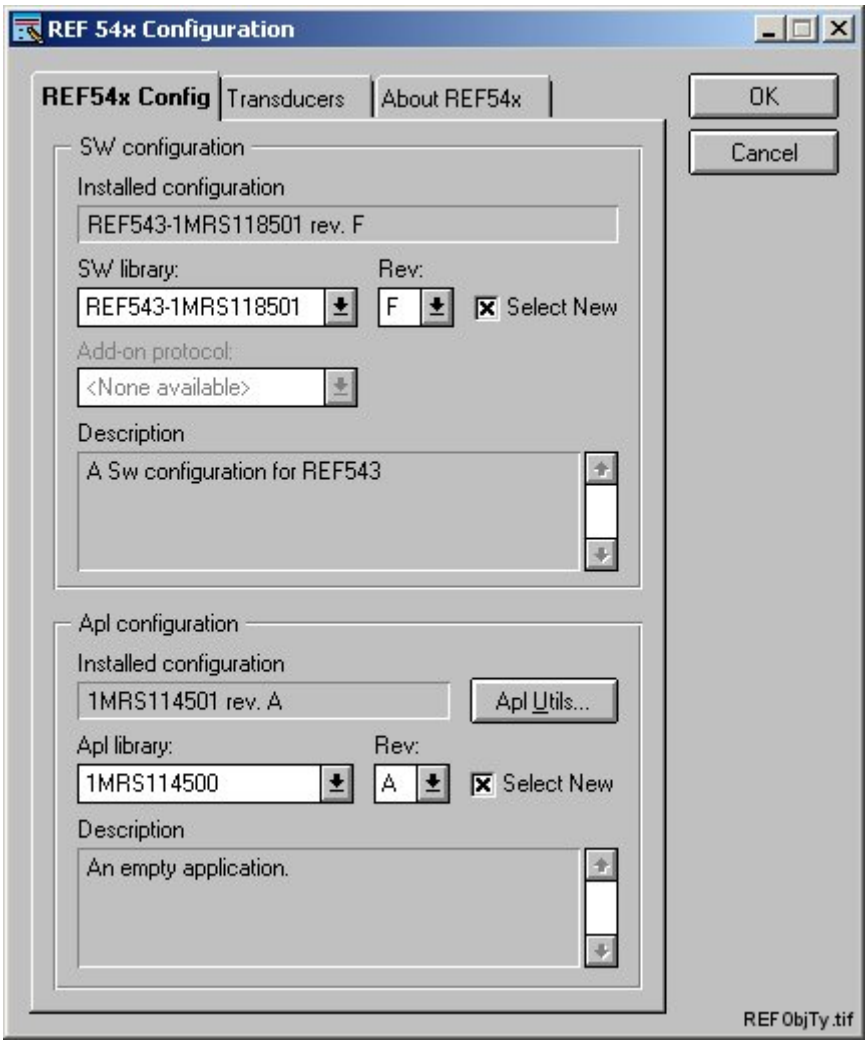


Fig. 2.4.1.1.-1 The REF 54x object type dialog

2.4.1.2. SW configuration

Selecting SW configuration

A new SW configuration can be selected from the SW library list. Before selecting a new SW configuration, the SW library list must be activated by checking the Select New check box. You can select a specific SW library version from the Rev list.

The Installed configuration field displays the most recently installed SW configuration.

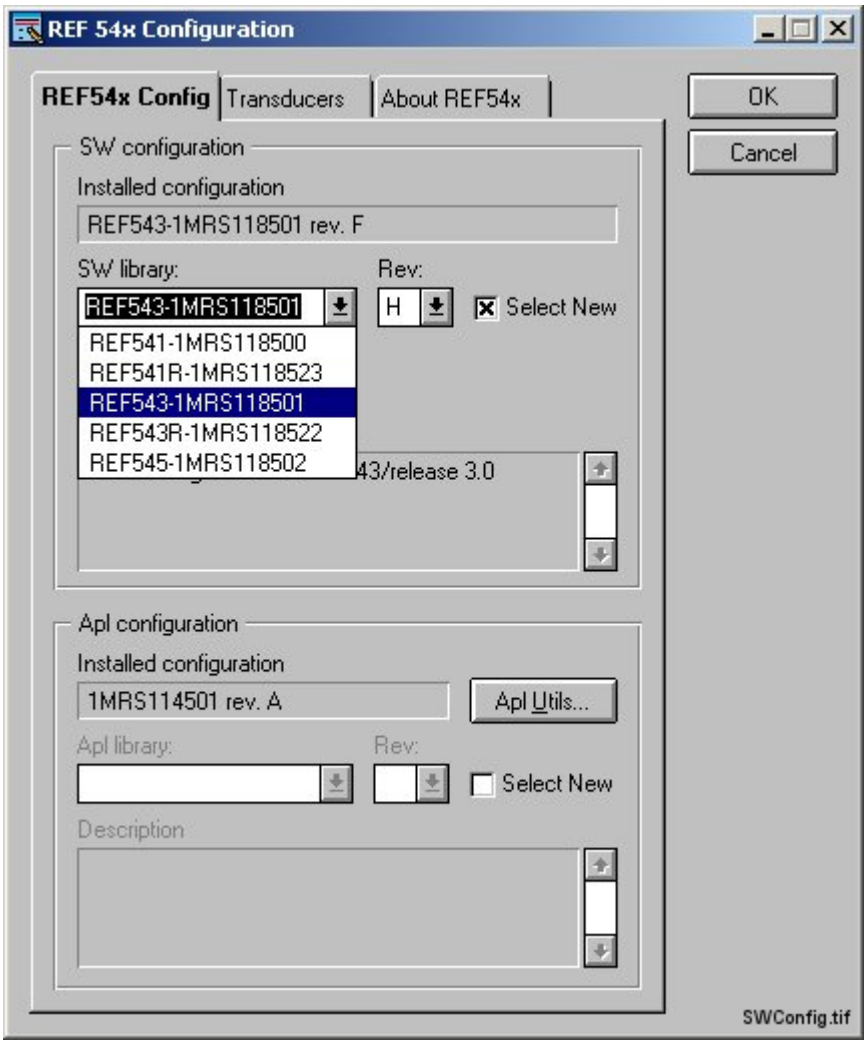


Fig. 2.4.1.2.-1 Selecting a new SW configuration

Selecting add-on protocols

Some REF 54x, REM 54x and RET 54x object types support so-called add-on protocols. An 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 3.00.

The add-on protocol list is activated, when a new SW configuration is selected. The protocol choices are dependent on the selected SW library and its version. Note that REC 52x object type does not have the add-on protocol list available at all.

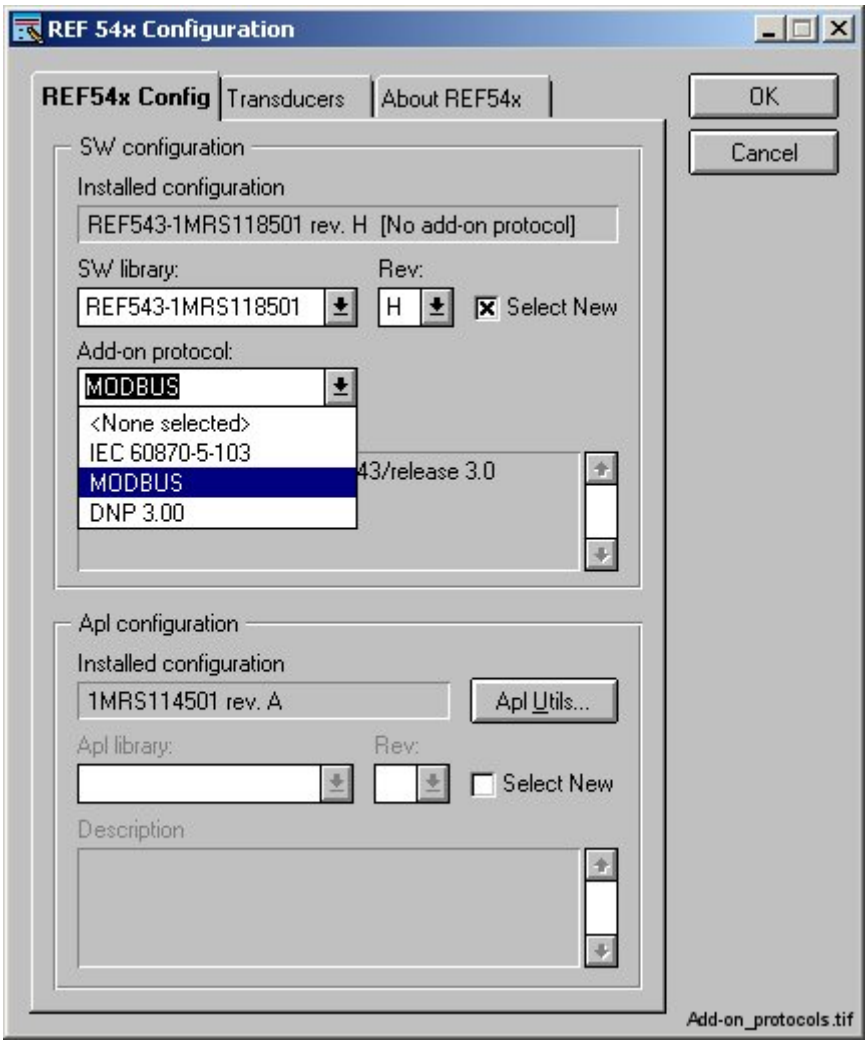


Fig. 2.4.1.2.-2 Selecting a new add-on protocol

It must be noticed that the add-on protocol selection made on this dialog does not activate the protocol in the relay: the selection is only informative by giving an input to other tools. For example, the protocol mapping for Modbus and DNP 3.00 protocols is made separately by the Protocol Mapping Tool, and the selected protocol is activated by the Relay Download Tool. The visibility of the correct add-on protocol specific parameters in the Relay Setting Tool is determined by this setting as well. The parameter visiblity requires also that the relay application has been compiled by the Relay Configuration Tool using the correct SW/Apl configuration selections.

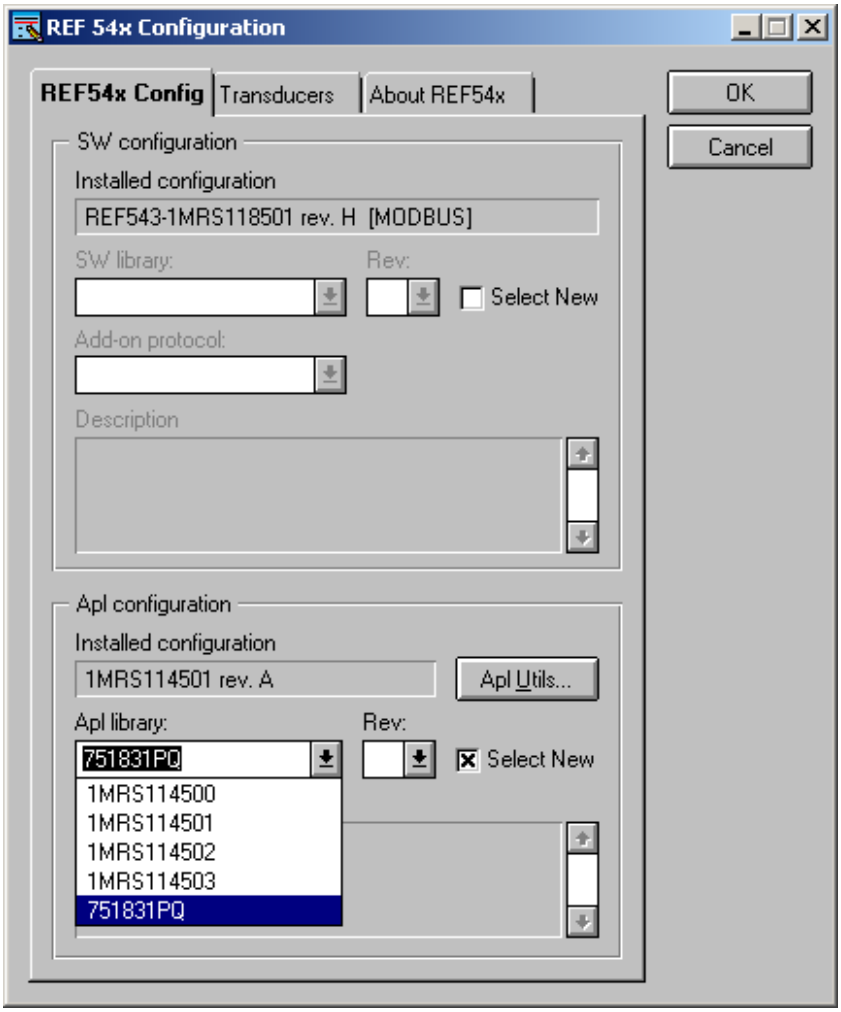
2.4.1.3. Apl configuration

Selecting Apl configuration

A new Apl configuration can be selected from the Apl library list. Before selecting a new Apl configuration, the Apl library list must be activated by checking the Select New check box. You can select a specific application configuration version from the Rev list. If the Apl configuration is a 'user-made' application (see Fig. 2.4.1.4.-2), it has no version number.

The Installed configuration field shows the most recently installed Apl configuration.

The Description field shows the application description.



AlpConf

Fig. 2.4.1.3.-1 Selecting a new Apl configuration. The Apl library list also contains applications made by the user.

2.4.1.4. Apl utilities

This section gives an overview of additional application library management functions.

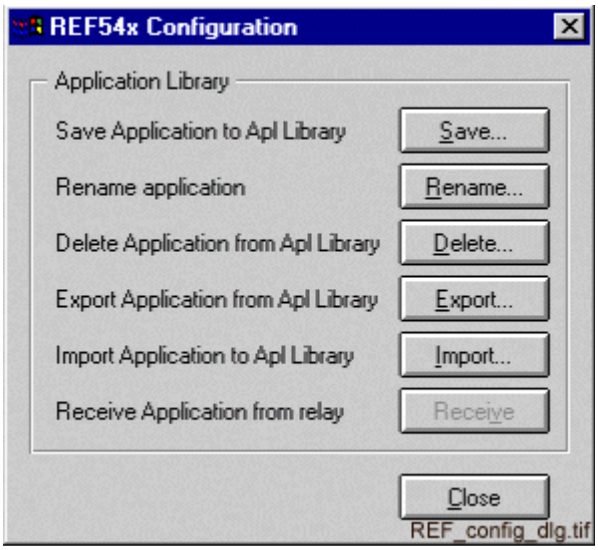


Fig. 2.4.1.4.-1 Application library utilities. The Receive function is not available in LIB 500 environment.

Save

A designed application can be saved from the target object to the application library by using the Save command. In the following dialog the Application Name is a single-word name and the optional Application Description is a short description of the application.

Choose the Save button to save the application as a 'user-made' application. 'User-made' applications appear on the Apl library list (see Fig. 2.4.1.3.-1).

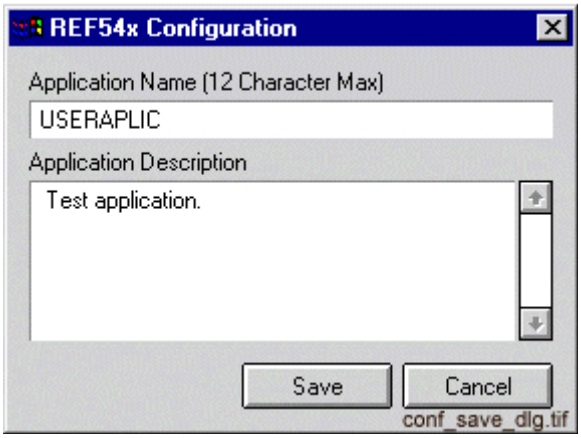


Fig. 2.4.1.4.-2 Save dialog

Rename

An application name can be changed by using the Rename command. An application can be renamed and the Application Description can be changed in the following dialog.

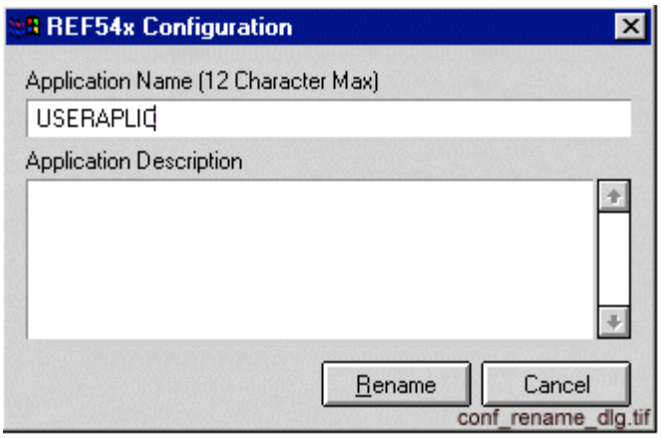


Fig. 2.4.1.4.-3 Dialog for renaming an application and changing its description

Delete

Deleting an application from the application library is an irreversible operation. All files belonging to the application are deleted. In the following dialog you are requested to select an application from the Apl library list. Only applications made by the user appear on the list.

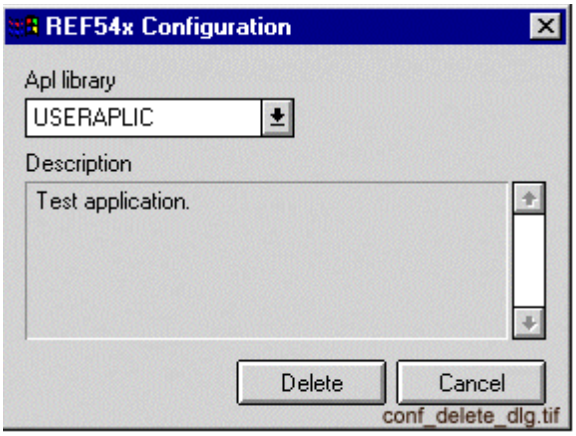


Fig. 2.4.1.4.-4 Dialog for deleting an application from the application library

Export

A relay application can be exported from the application library to some other location specified by the user. The destination location can be on the local system or on a network drive or a floppy: The destination location is specified as a directory path, e.g. C:\APPLICATIONS (the destination directory must already exist when you choose Export command). Select the application from the Apl library list and click Export. Only applications made by the user are shown on the list.

An example of the usage of this export function is e.g. when the relay application is made by CAP tools and should be transferred to LIB 500/510. Before it can be taken into use, it should also be imported by the Import function. More information is provided in the section dealing with importing.

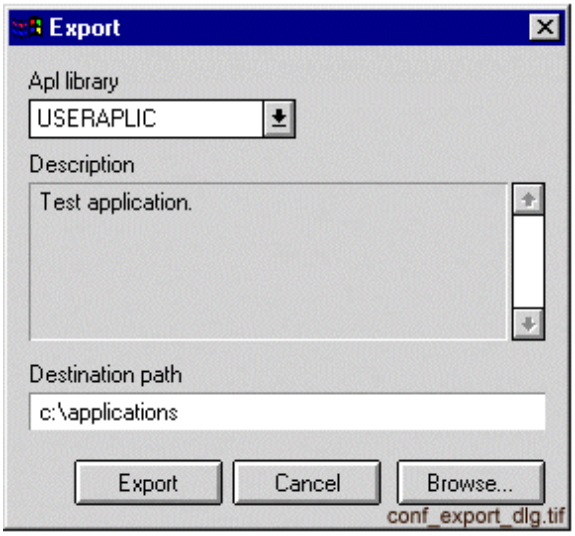


Fig. 2.4.1.4.-5 Dialog for exporting an application

Import

The import function adds applications to the Apl library. After you have exported the application, you should import it to the target system in order to add the application to the Apl list. Please ensure that the REF 54x version, which is imported, is the same version or is compatible with the REF 54x version to which it is imported.

If the applications are exported by using the REF 54x object type version 1.2.4 or later, select the option Compressed application file. Give a full path of the file. In this case the application subject to import is always in a compressed format.

If the application is exported by using an earlier version than the REF 54x object type version 1.2.4, select the option Uncompressed application folder. Give a path of the folder containing the application.

Click the Import button in order to import the an application to the Apl library.

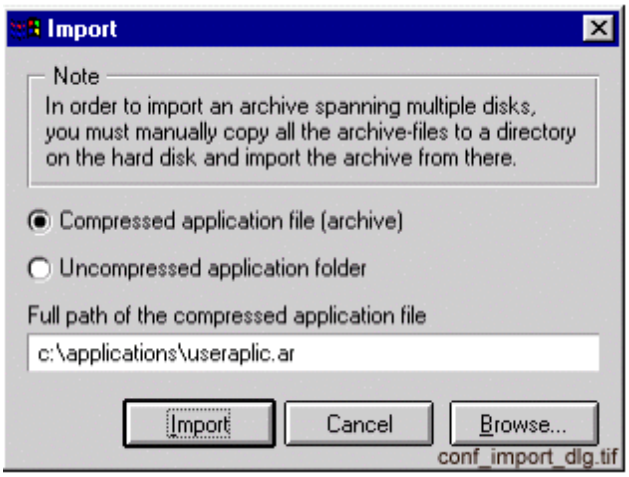


Fig. 2.4.1.4.-6 Import dialog

Receive

A Relay application can be received from the relay to the user application library by using the Receive command. After clicking the Receive button, the following dialog requesting a confirmation appears on the screen.

At this moment, it is only possible to receive Relay Setting Tool configuration from the relay. This means that the received application contains data only for the Relay Setting Tool and data e.g. for the Event Editor cannot be received from the relay.

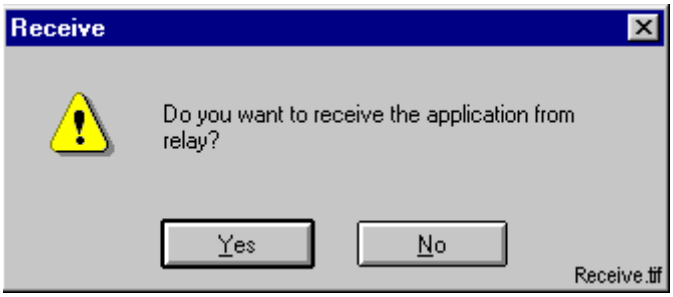


Fig. 2.4.1.4.-7 Dialog for confirming selection

If the Receiving process was completed successfully, the following dialog appears for the naming of the application.

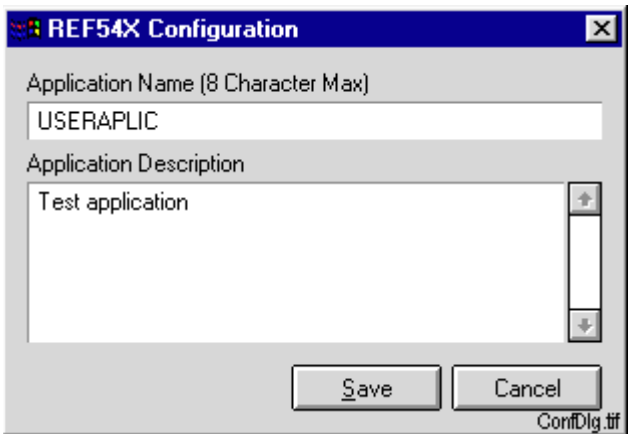


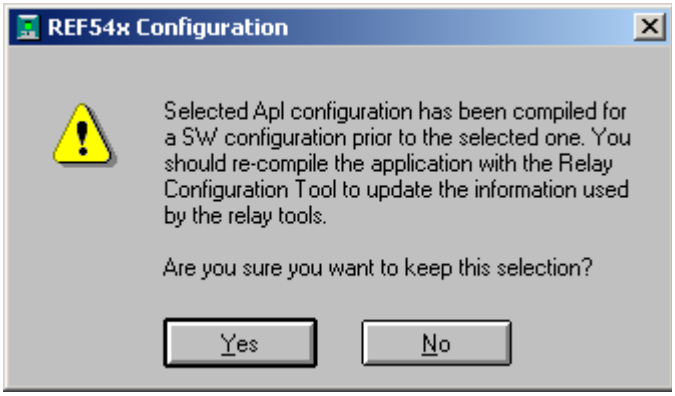
Fig. 2.4.1.4.-8 Dialog for naming application

2.4.1.5. Correlation between SW configuration and Apl configuration

Both the SW configuration and the Apl configuration contain references for the separate function blocks included in the relay application. The SW configuration defines all the possible function blocks and their revisions, which can be used. The Apl configuration includes only the function blocks currently in use. It is extremely important that the selected Apl configuration has been compiled for the correct SW configuration (compilation is made by the Relay Configuration Tool in CAP 505).

If the function block revisions of the selected Apl configuration do not match with the selected SW configuration, the relay tools may get wrong information about the relay. It should be noticed that the relay works correctly regardless of this possible mismatch; it is only the image of the relay application, whose some details may cause relay tools to behave incorrectly.

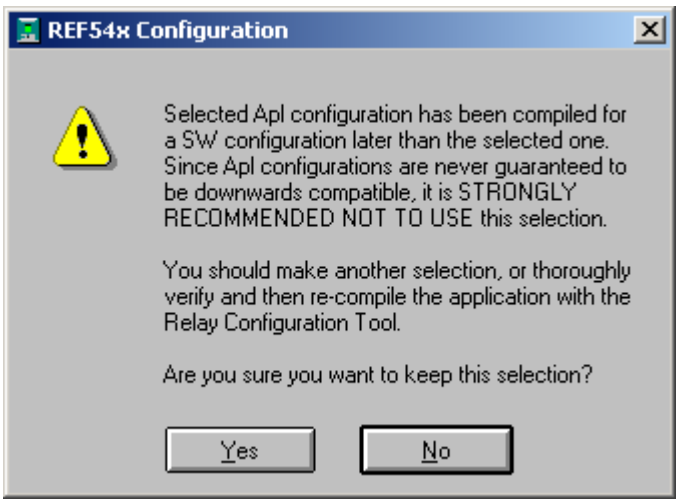
The function block revisions are checked when trying to save the selections. Since there are two different cases tied to their severity, there are also two possible warning messages. A less critical case is when the function block revisions of the Apl configuration are older compared to the selected SW configuration. This is quite normal, when you upgrade the connected relay, but still have the old Apl configuration selected. In this case, a warning message will be shown (see Fig. 2.4.1.5.-1):



Config_mismatch_old_appl.

Fig. 2.4.1.5.-1 Warning about a configuration mismatch (older application)

A more serious case is when you try to select an Apl configuration intended for a newer SW configuration. Since this kind of an application may contain features not supported by the older relay revision, selecting this combination is never recommended. In this case, a warning message will be shown (see Fig. 2.4.1.5.-2):

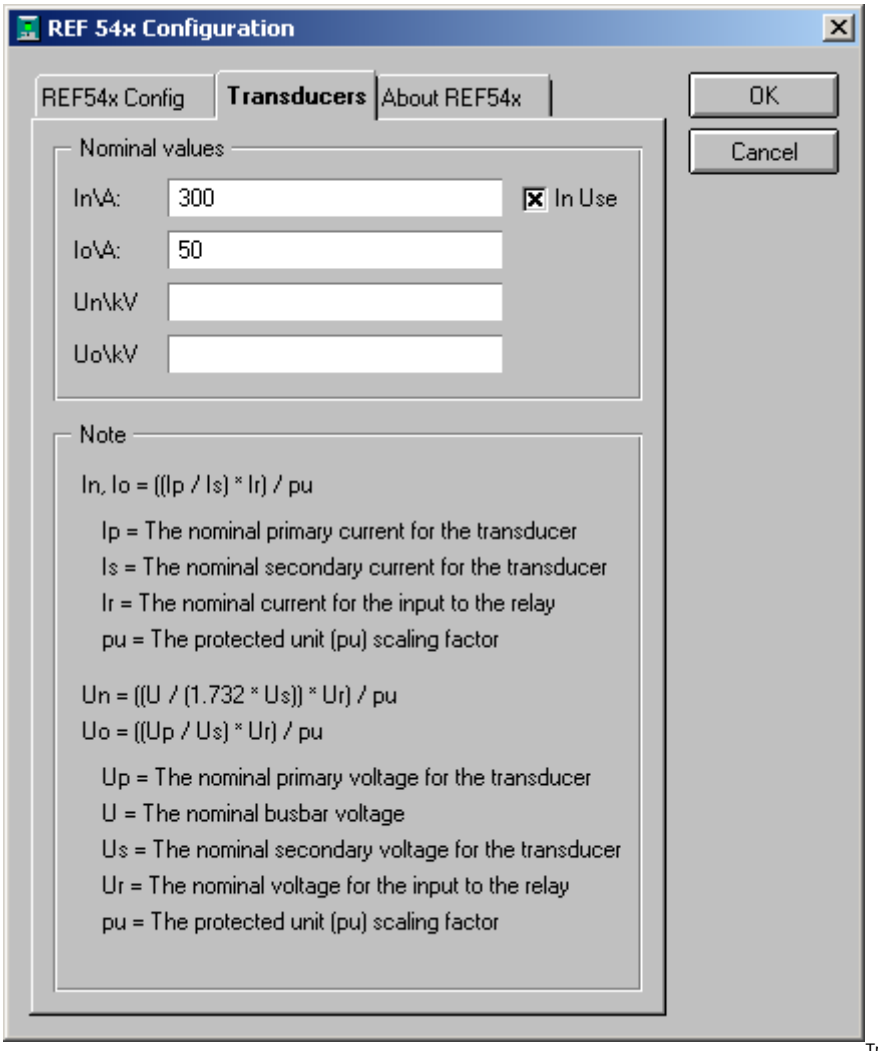


Config_mismatch_new_appl.

Fig. 2.4.1.5.-2 Warning about a configuration mismatch (newer application)

Both these situations can be corrected by recompiling the relay application or by making another selection. However, since the mismatch message is only informative, the mismatching configuration selections can also be accepted and saved.

2.4.1.6. Transducer settings

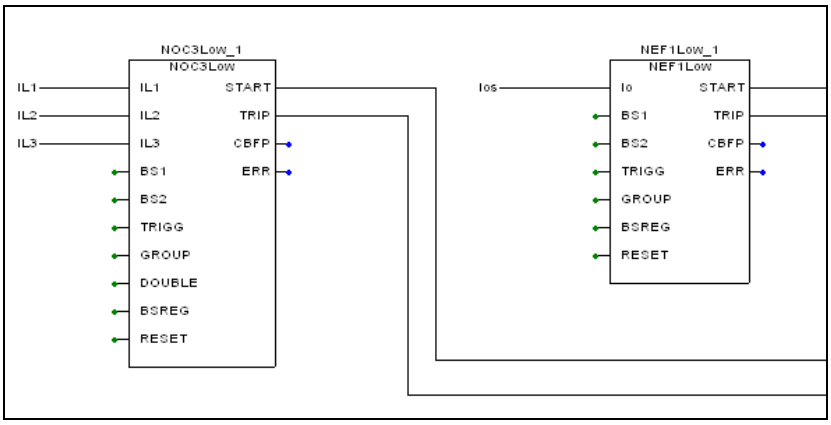


Transd_settings

Fig. 2.4.1.6.-1 Giving transducer settings

Setting of the transducer values differs slightly between the concerned object types. Compared to Fig. 2.4.1.6.-1 above, the protected unit scaling factor is not valid for REC 52x. For RET 54x, the transducers cannot currently be set at all due to the complexity of the RET 54x applications.

When you set the transducer values, the expectation is that the input values to the relay function blocks are of the same type; i.e. that an I_o input on the relay function block gets the input from an I_o source. The same is expected for I_n, U_o and U_n. See example in Fig. 2.4.1.6.-2:

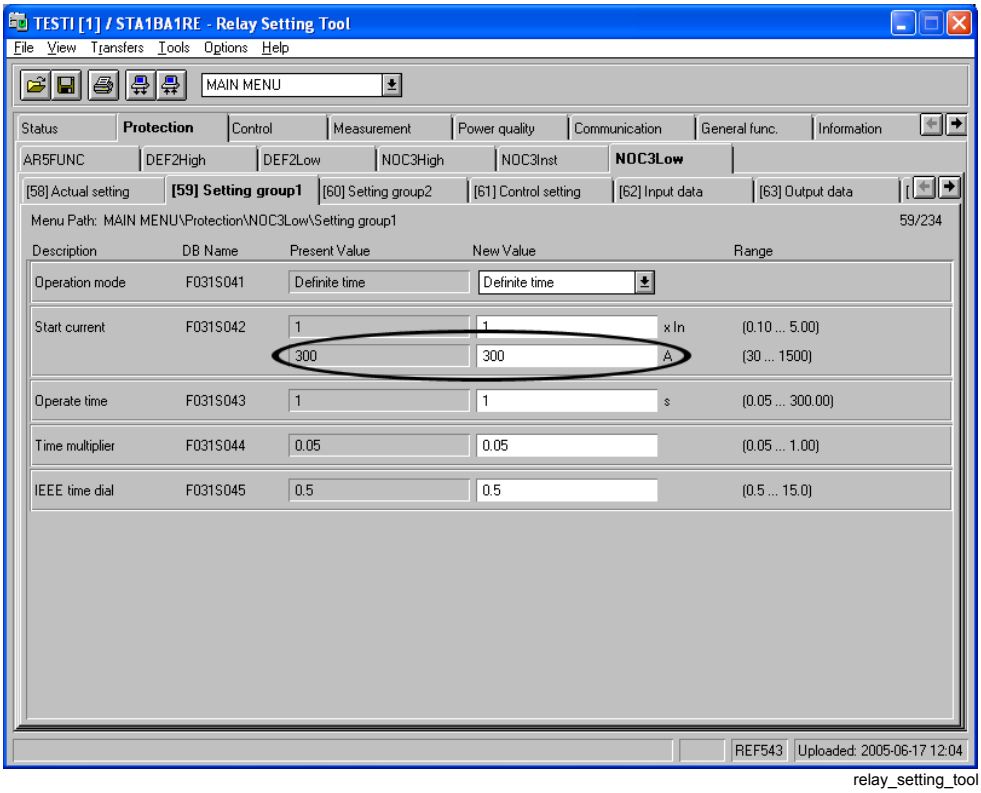


ExSampBl

Fig. 2.4.1.6.-2 Example of function block configuration where the I_n inputs are connected to I_n inputs on the function block and the I_o inputs are connected to I_o function block inputs.

If the inputs to the function block input are different from the inputs the function block normally uses, it is recommended that the transducer settings are taken out of use. Remove the In Use selection (see Fig. 2.4.1.6.-1).

When the transducer settings are taken out of use, settings in the RED Relay Setting Tool can be done only by the time nominal values (see Fig. 2.4.1.6.-3).



relay_setting_tool

Fig. 2.4.1.6.-3 The encapsulated area (primary values) is disabled when there are no transducer settings in use.

2.4.2. REX 52x

This section describes the REX 52x object type and its properties.

2.4.2.1. General

The REX 52x object type configures object instances for REX 521 terminal. The Hardware (HW) configuration determines, which REX terminal is being configured. Used function blocks determine the relay functionality. This information is stored in the Standard Configuration Tool. The REX 52x object type only configures the object instance, no communication takes place against the actual relay. When an object instance is configured, you can apply its configuration in an appropriate tool. For instance, Relay Setting Tool applies to object instances that belong to the REX 52x object type.

Use the REX 52x configuration dialog to select the relay unit HW and Standard Configurations. The REX 52x Config page (see Fig. 2.4.2.1.-1) is divided into two sections: HW configuration (described in Section 2.4.2.2. on page 39) and Standard configuration (described in Section 2.4.2.3. on page 41).

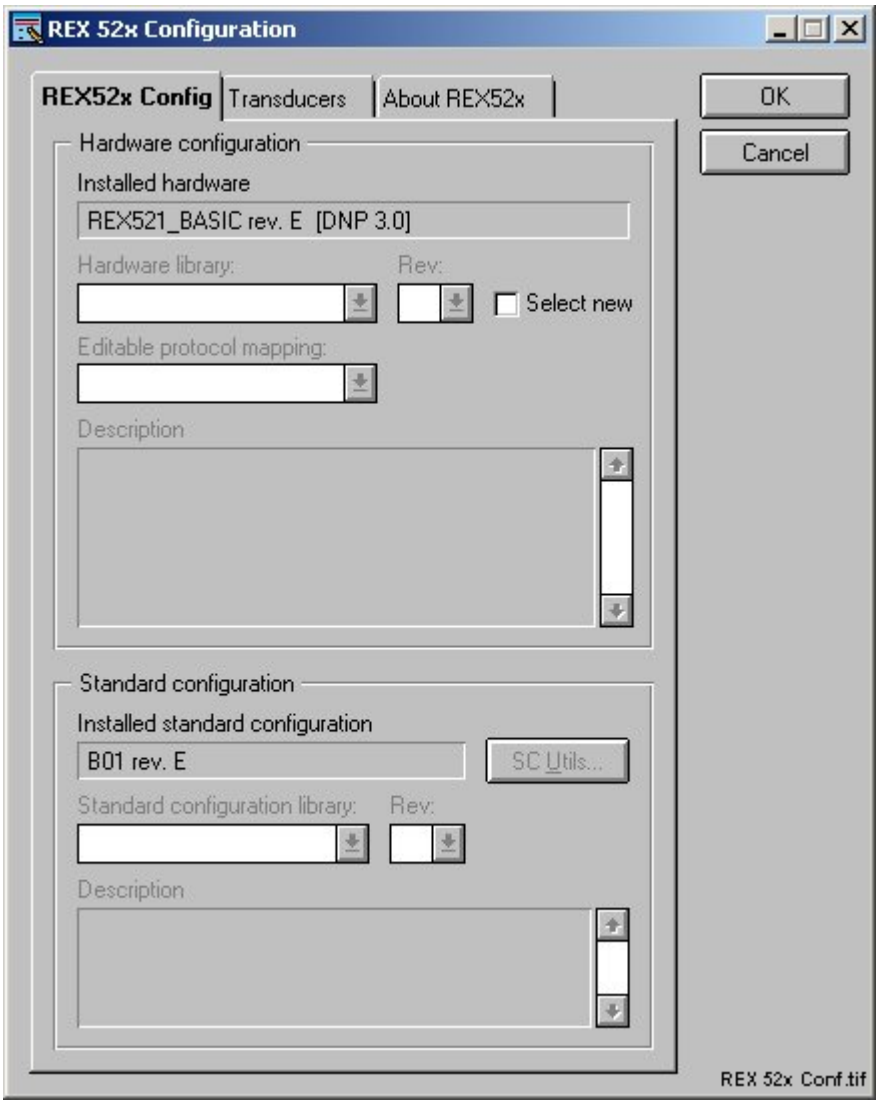


Fig. 2.4.2.1.-1 REX 52x Config page is divided into two sections: Hardware configuration and Standard configuration.

2.4.2.2. HW configuration

Selecting HW configuration

The HW configuration can be selected from a list where all supported HW configurations for the specific relay type are listed. Before you select a new HW configuration, you must activate the HW library list by checking the Select New check box (see Fig. 2.4.2.2.-1). From the Rev list you can select a specific HW library version. The Installed hardware field displays the most recently installed HW configuration.

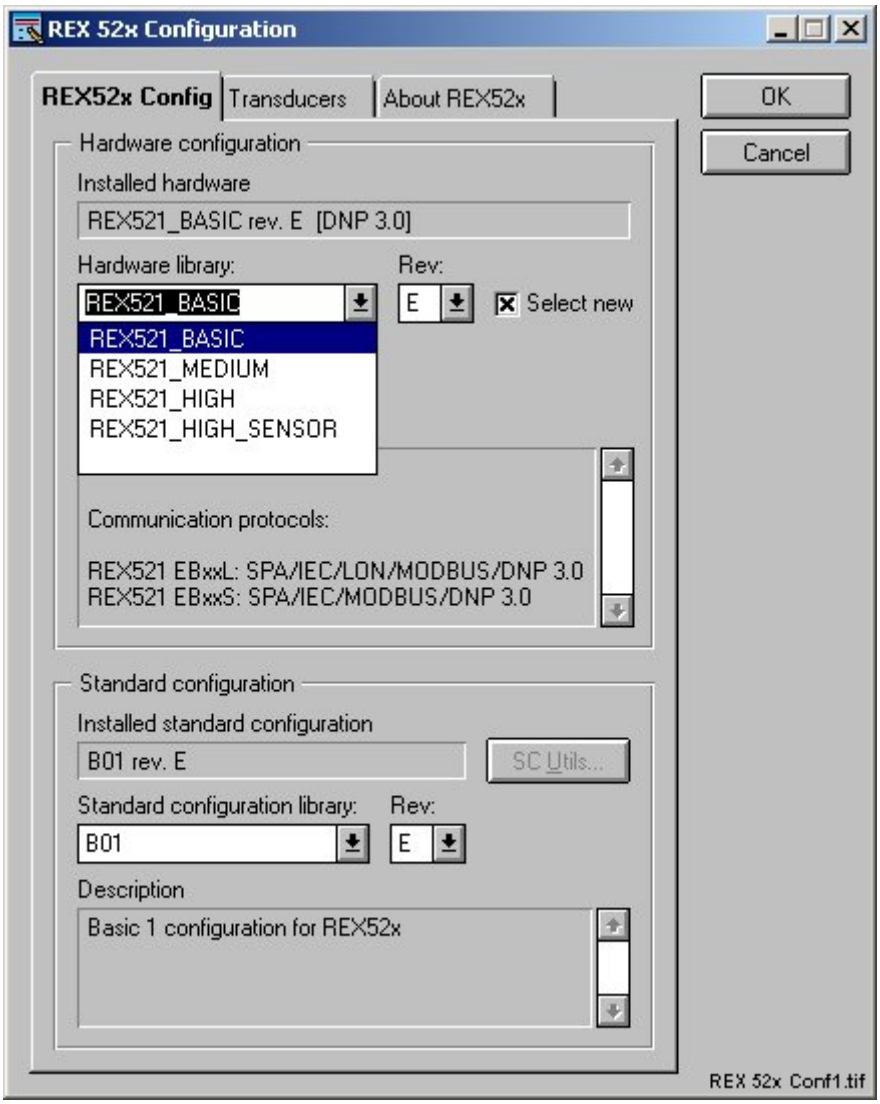


Fig. 2.4.2.2.-1 Before you select a new HW configuration, you must activate the HW library list by checking the Select new check box.

Selecting editable protocol mapping

Some REX 52x object revisions support editing of protocol mappings. The protocol choices are dependent on the selected HW configuration and its version, so the "Editable protocol mapping" list is updated when a new HW library version is selected. Since it is possible to edit only the DNP 3.0 protocol in CAP 505 at the moment, the "Editable protocol mapping" list is always disabled, and it automatically contains either the selection "DNP 3.0" or "<None available>".

Note! The protocol selection made on this dialog does not activate the protocol in the relay: the selection is only informative by giving an input to other tools.

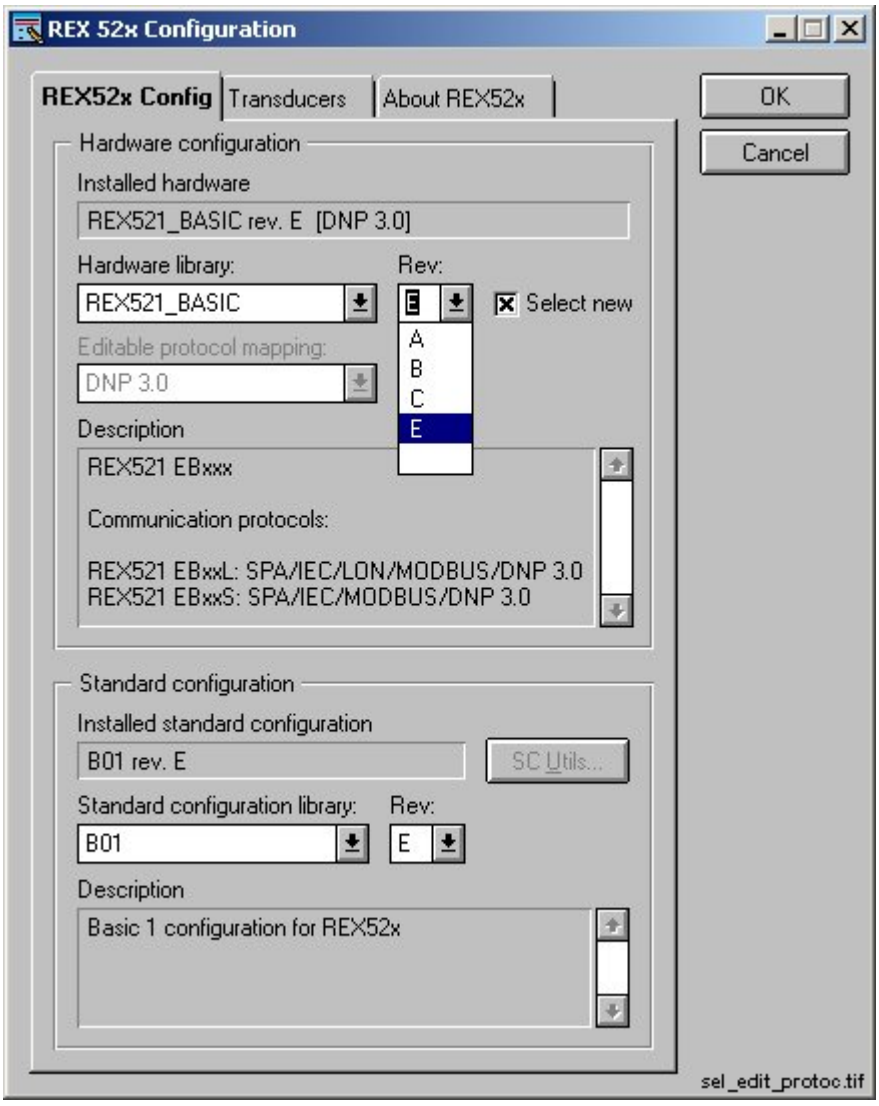


Fig. 2.4.2.2.-2 Selecting editable protocol

2.4.2.3. Standard configuration

Selecting standard configuration

The standard configuration can be selected from a list where all available standard configurations for the specific HW configuration are listed. A specific Standard configuration version can be selected from the Rev list (see Fig. 2.4.2.3.-1). The Installed standard configuration field shows the most recently installed standard configuration. The Description field shows the Standard configuration description.

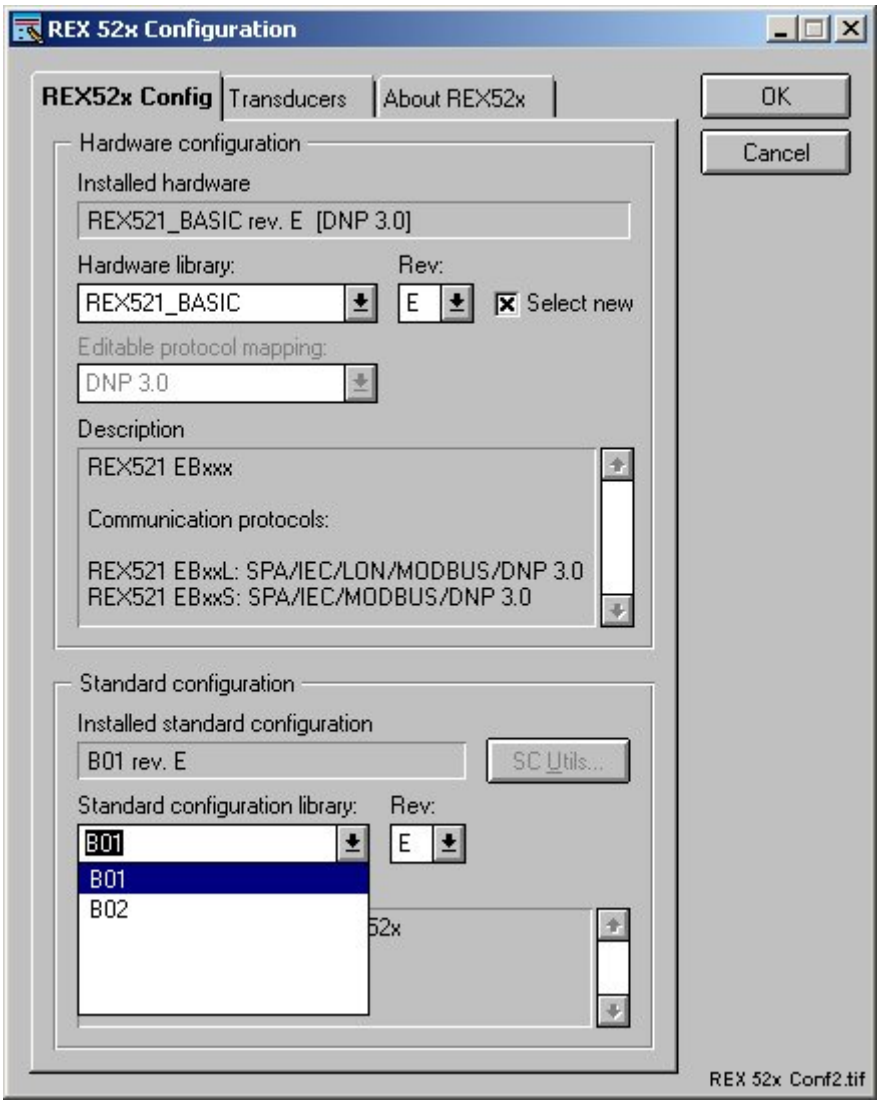
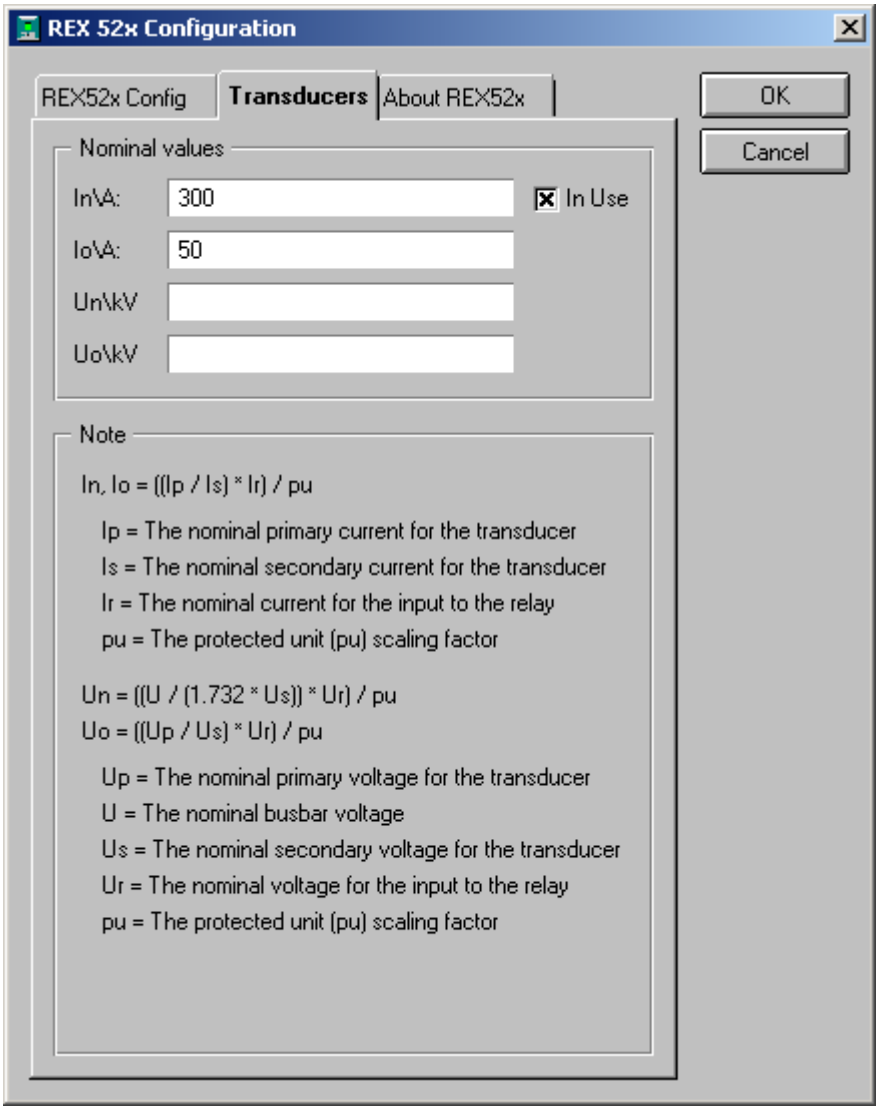


Fig. 2.4.2.3.-1 A specific standard configuration can be selected from the Standard configuration library. The Installed standard configuration field shows the most recently installed standard configuration.

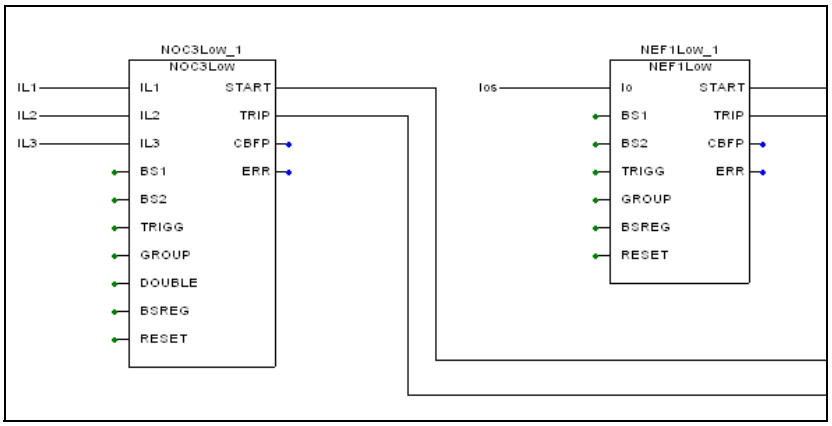
2.4.2.4. Transducer settings



Transducers

Fig. 2.4.2.4.-1 Giving transducer setting

When you set the transducer values, the expectation is that the input values of the relay function blocks are of the same type; i.e. that an I_o input on the relay function block gets the input from an I_o source. The same is expected for I_n, U_o and U_n. See example in Fig. 2.4.2.4.-2:

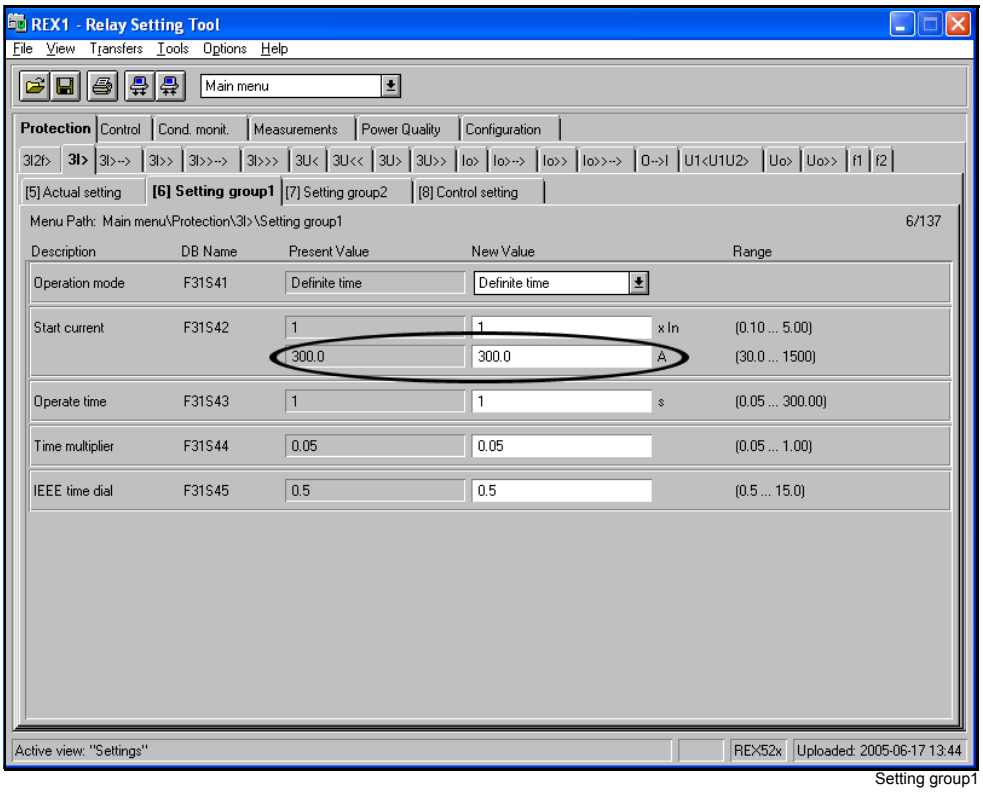


ExSampBl

Fig. 2.4.2.4.-2 Example of a function block configuration where the nominal currents are connected to the I_n inputs and the I_o current is connected to the I_o input in the function block.

If the inputs to the function block input are different from the inputs the function block normally uses, it is recommended that the transducer settings are taken out of use. In this case, remove the In Use selection (see Fig. 2.4.2.4.-1).

When the transducer settings are taken out of use, settings in the RED Relay Setting Tool can be done only by the time nominal values (see Fig. 2.4.2.4.-3).



Setting group1

Fig. 2.4.2.4.-3 The encapsulated area (primary values) is disabled when there are no transducer settings in use.

2.4.3. REJ 5xx, REU 5xx

This section describes the operation and properties of the object types REJ 5xx and REU 5xx. However, as these object types share the same operating principle, only REJ5xx object type is mentioned in this section.

2.4.3.1. General

The REJ 5xx object type configures object instances for REJ 511, REJ 521, REJ 513, REJ 523, REJ 515, REJ 525, REJ 517 and REJ 527 terminals. The software configuration determines which REJ terminal is being configured. Used function blocks determine the relay functionality. This information is stored in the application configuration.

You can use the REJ 5xx configuration dialog to select a relay unit software and to save transducer settings.

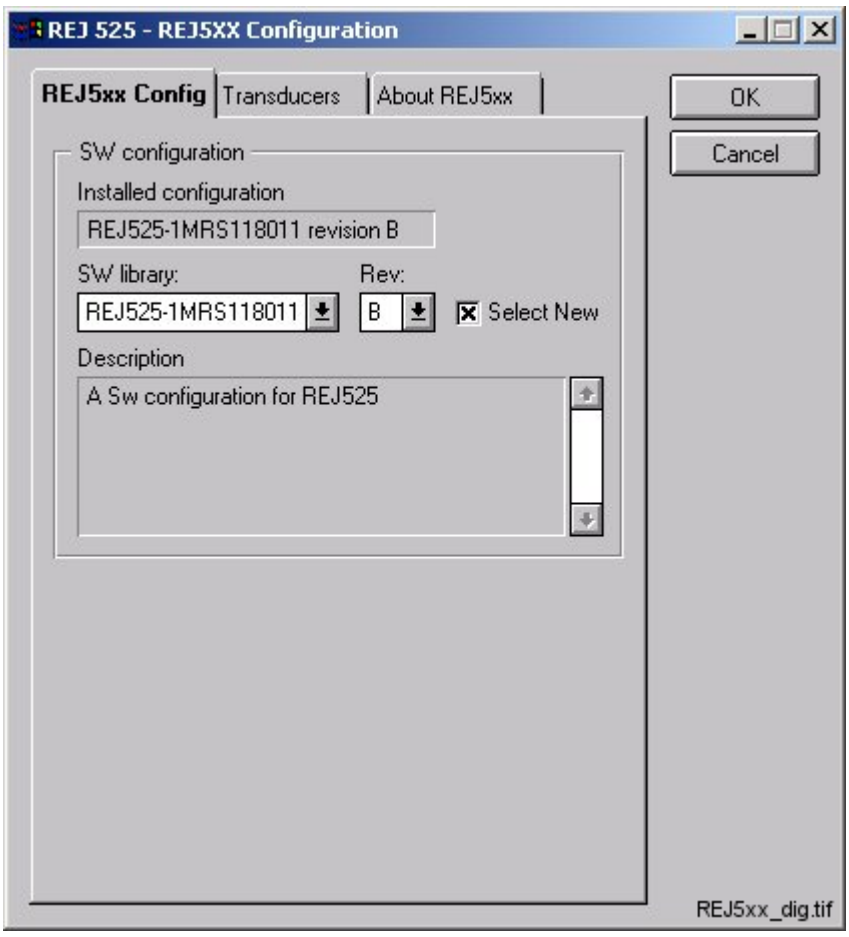


Fig. 2.4.3.1.-1 The REJ5xx Object type dialog

2.4.3.2. SW configuration

Selecting SW configuration

A new SW configuration can be selected from the SW library list. Before you select a new SW configuration, you must activate the SW library list by checking the Select New check box. A specific SW library version can be selected from the Rev list.

The Installed configuration field displays the most recently installed SW configuration.

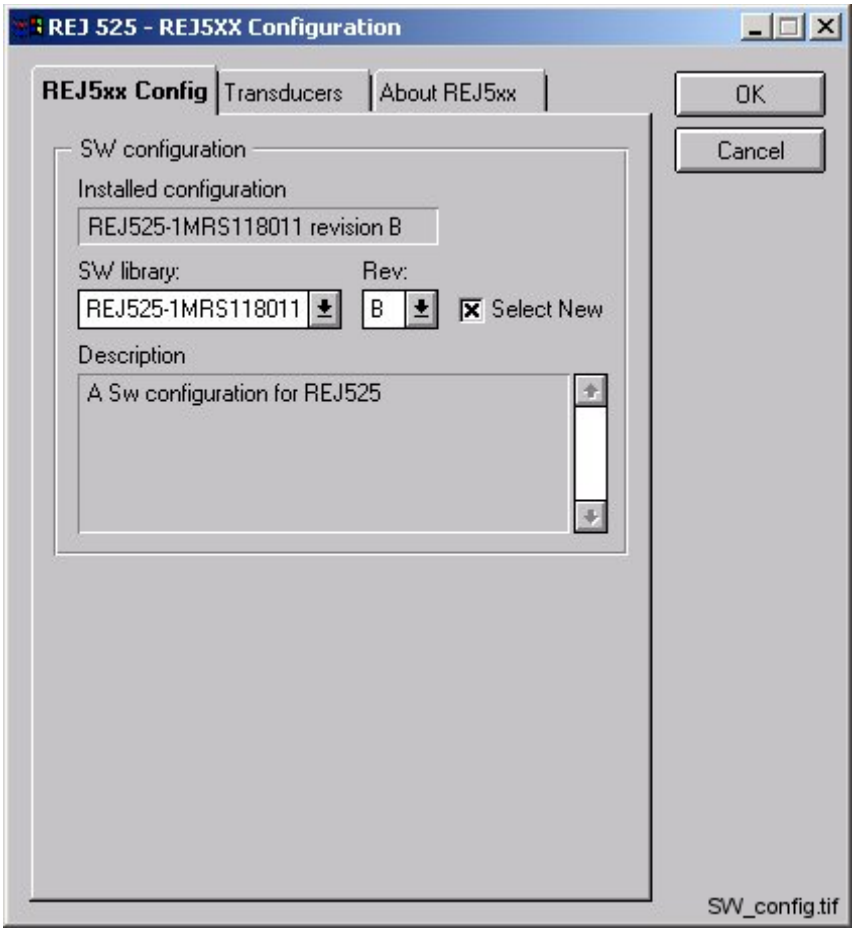
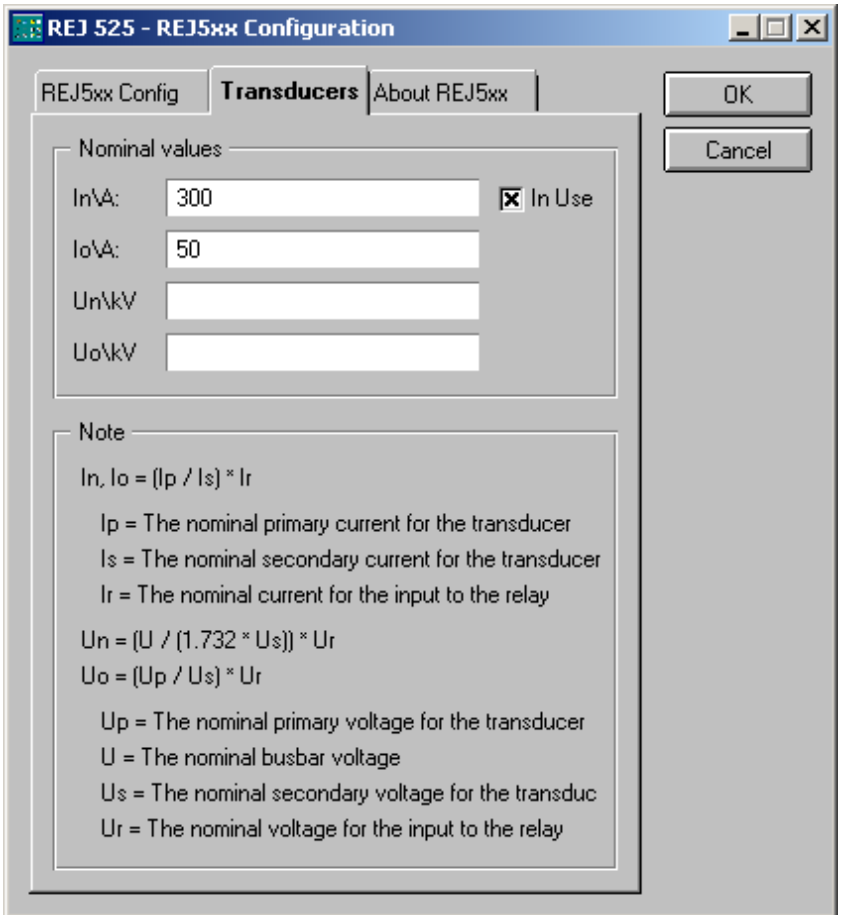


Fig. 2.4.3.2.-1 Selecting a new SW configuration

2.4.3.3. Transducer settings



TdSettings

Fig. 2.4.3.3.-1 Giving transducer settings

When the transducer settings are taken out of use, settings in the Relay Tool can be set only by time nominal values (see Fig. 2.4.3.3.-2).

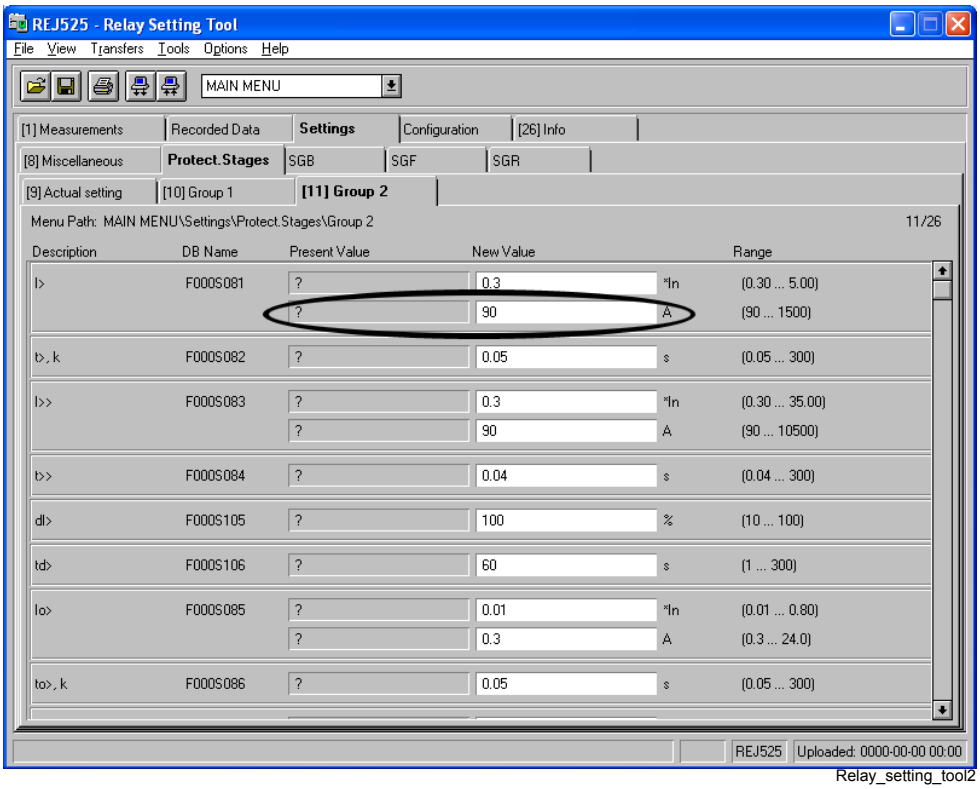


Fig. 2.4.3.3.-2 The encapsulated area (primary values) is disabled when there are no transducer settings in use.

2.4.4. REx 61x

This section describes the REx 61x object type and its properties.

2.4.4.1. General

The REx 61x object type configures object instances for REM 610, REF 610 and REU 610 relays. The software configuration determines which REx 61x relay is being configured. Used function blocks determine the relay functionality. This information is stored in the application configuration.

You can use the REx 61x configuration dialog for selecting the relay unit software and the IEC/ANSI terminology to be used by the tools, and for saving transducer settings (see Fig. 2.4.4.1.-1).

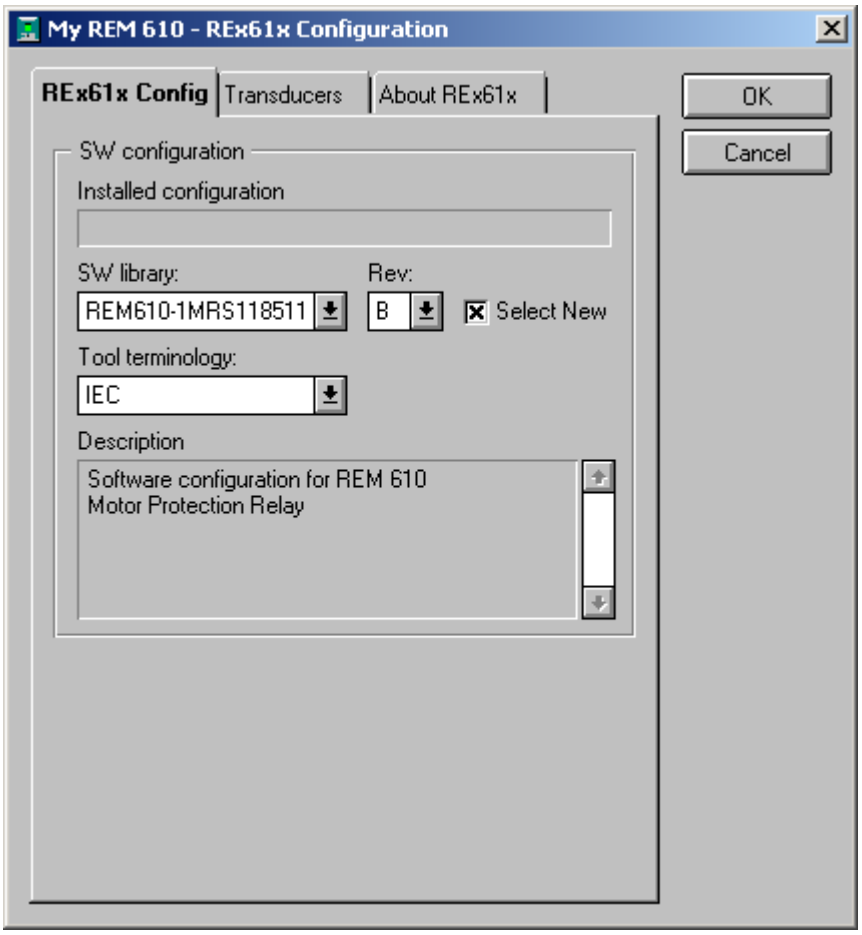


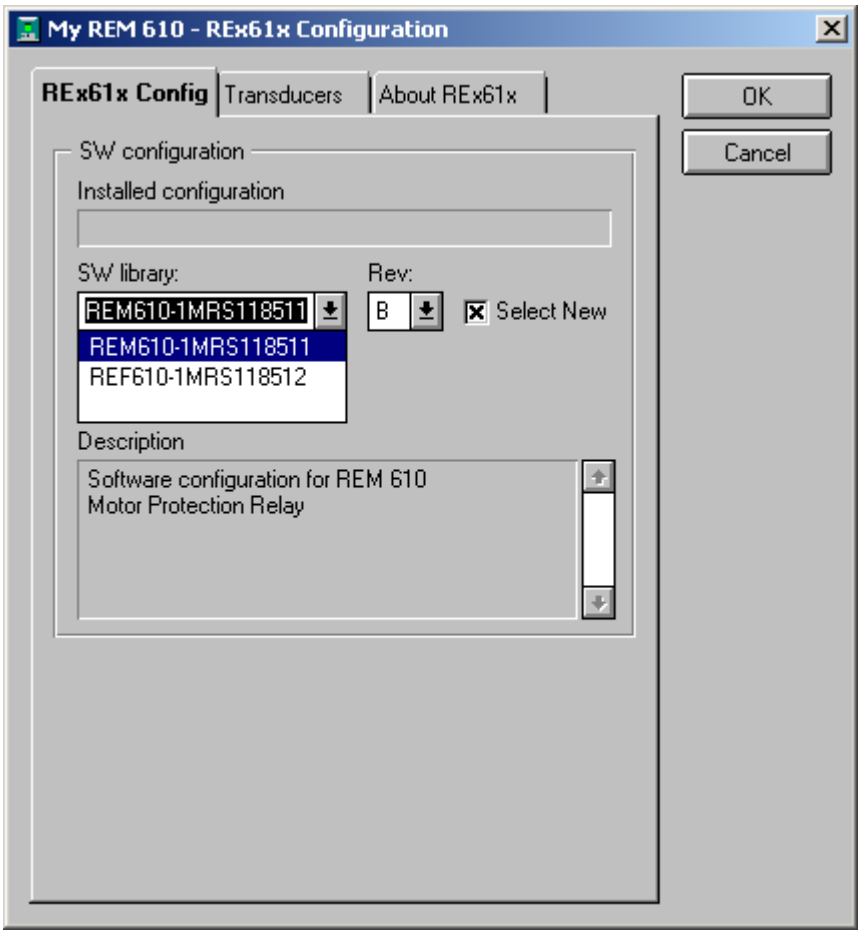
Fig. 2.4.4.1.-1 The REx 61x object type dialog

2.4.4.2. SW configuration

Selecting SW configuration

A new SW configuration can be selected from the SW library list. Before you select a new SW configuration, you must activate the SW library list by checking the Select New check box. A specific SW library version can be selected from the Rev list (see Fig. 2.4.4.2.-1).

The Installed configuration field displays the most recently installed SW Configuration.



REx61x_Configuration2

Fig. 2.4.4.2.-1 Selecting a new SW configuration

Selecting tool terminology

Some REM 610, REF 610 and REU 610 revisions support the selection of the IEC or ANSI terminology to be used by different relay tools. An example of the IEC/ ANSI terminology difference is the description for the output state F000O001: IEC = "Thermal Start" and ANSI = "49 Pickup".

The tool terminology selection concerns all the textual parameter names and values, menu texts and event texts visible for example in the Relay Setting Tool and in the Event Editor. It should be noted that this selection does not affect the relay unit in any way, thus is totally independent of the connected relay.

The tool terminology list is activated when a new SW configuration is selected. The choices are dependent on the selected SW library and its version.

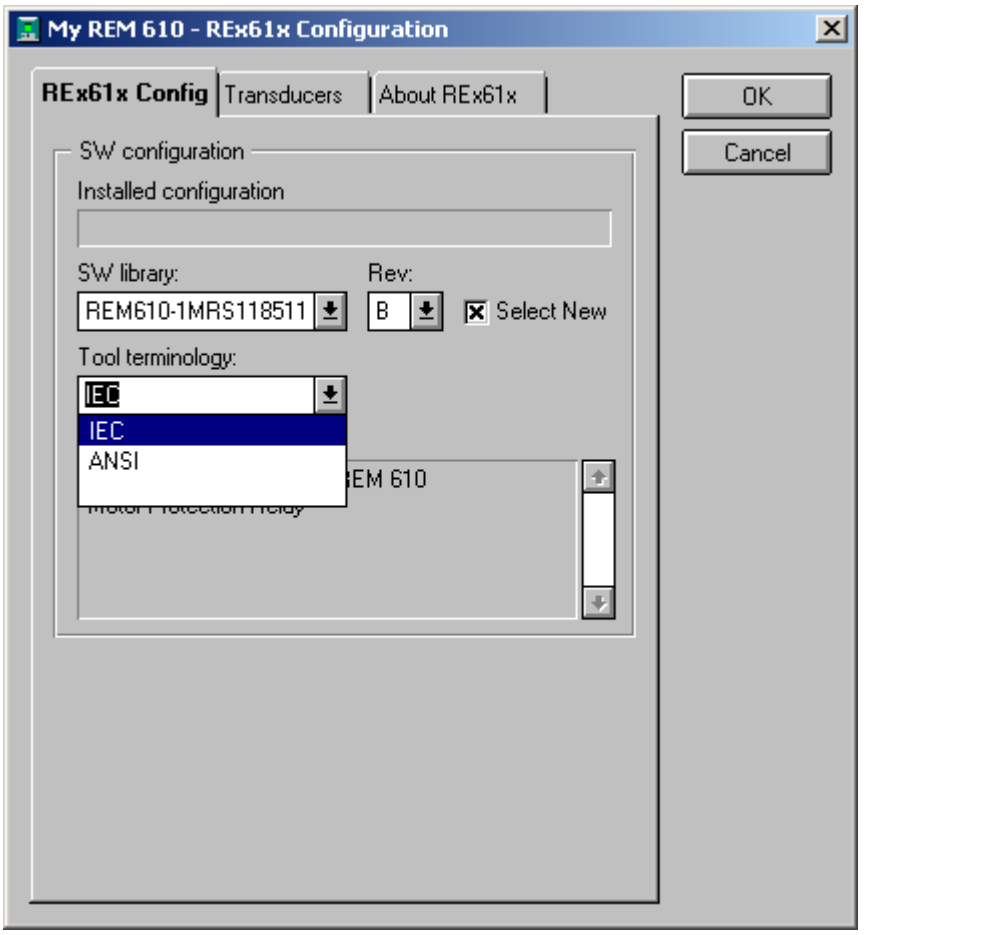


Fig. 2.4.4.2.-2 Selecting tool terminology for a new SW configuration

2.4.4.3. Transducer settings

If the inputs of the relay are connected to a transducer, instead of having a direct connection to the primary current or voltage, the In Use check box on the Transducer page must be checked. Current primary and secondary currents or voltages must also be defined (see Fig. 2.4.4.3.-1).

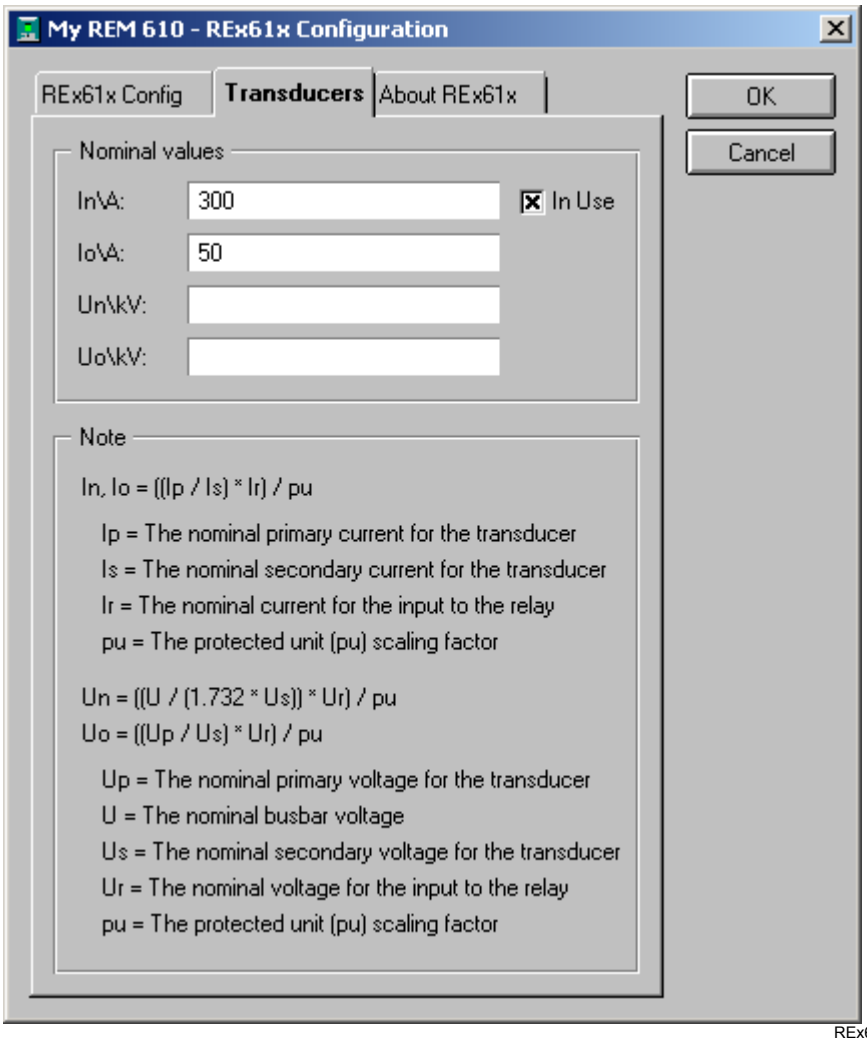
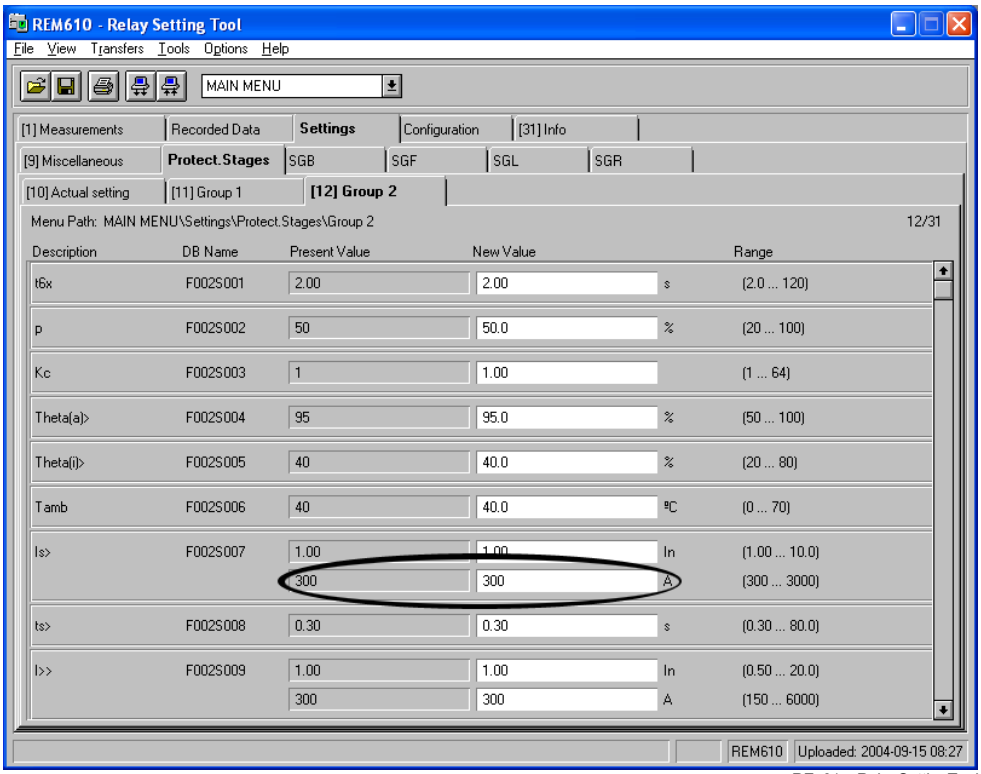


Fig. 2.4.4.3.-1 Giving transducer settings

Setting of the transducer values differs slightly between REM 610, REF 610 and REU 610. Compared to Fig. 2.4.4.3.-1 above, the protected unit scaling factor is valid only for REM 610.

When the transducer settings are taken out of use, settings in the Relay Setting Tool can be set only by time nominal values (see Fig. 2.4.4.3.-2).



REx61x_RelaySettingTool

Fig. 2.4.4.3.-2 The encapsulated area (primary values) is disabled when there are no transducer settings in use.

2.5. Configuring communication settings

2.5.1. General

The visual representation of the communication configuration dialog/page varies according to the type of the relay being configured and the environment in which the tool is invoked.

2.5.2. CAP 501/505, SMS 510

General Object Attributes Communication page is used for configuring the communication settings of the RED relay objects types in CAP 501/505 and SMS 510 environments.

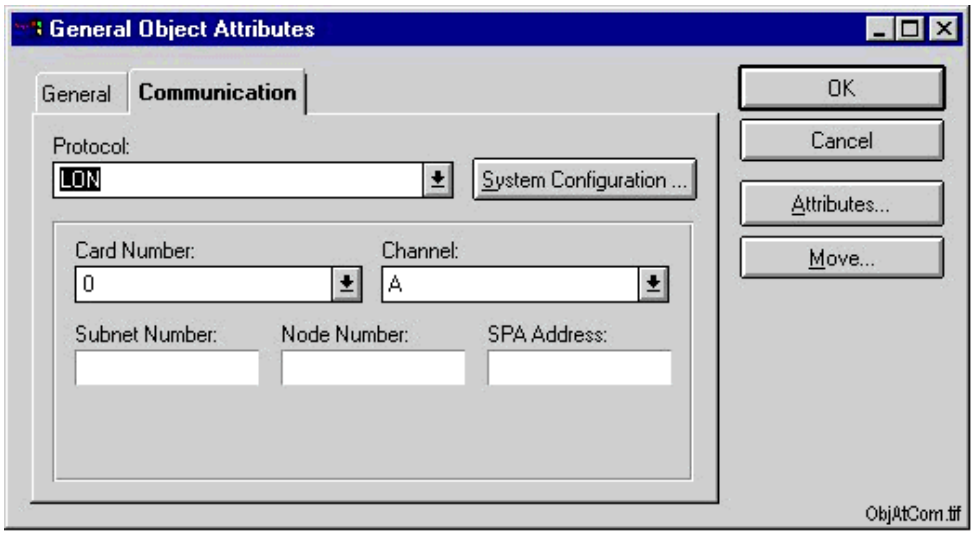


Fig. 2.5.2.-1 General Object Attributes/Communication page

2.5.2.1. Communication support

Table 2.5.2.1-1 Communication support

REF 54x	LON, SPA, SPA TCP/IP
REM 54x	LON, SPA, SPA TCP/IP
REC 52x	LON, SPA, SPA TCP/IP
RET 54x	LON, SPA, SPA TCP/IP
REX 52x	LON, SPA, SPA TCP/IP
REJ 5xx	SPA, SPA TCP/IP
REU 5xx	SPA, SPA TCP/IP
REx 61x	SPA, SPA TCP/IP

LON communication

Select Card Number, Channel and type in the appropriate values for the Subnet Number, Node Number and SPA address fields. These values should match the respective values assigned to the targeted relay unit.

CAP 501 supports SPA and SPA TCP/IP communication only.

SPA communication

Select Serial port and type in the appropriate value for the SPA address field. The value should match the respective value assigned to the targeted relay unit.

SPA TCP/IP communication

SMS 510 supports LON and SPA communication only.

Using SPA TCP/IP requires one of the following devices to be connected to CAP 501/505:

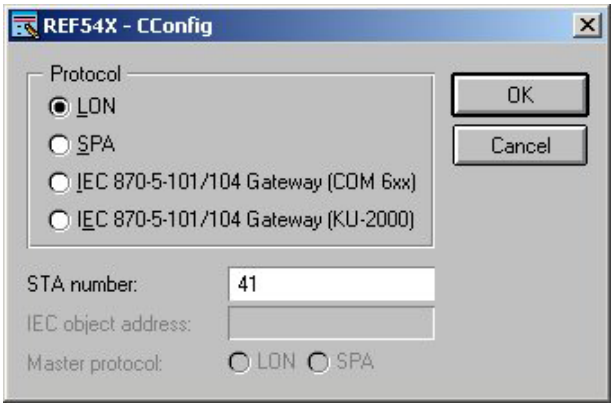
- Ethernet adapter SPA-ZC 400/402
- Serial-to-TCP/IP converter
- COM 610 communication gateway

Select Local connection and type in the appropriate values for the IP address and SPA address fields. The IP address value should match the respective value assigned to the TCP/IP device between CAP 501/505 and the targeted relay unit. The SPA address value should match the respective value assigned to the targeted relay unit.

2.5.3. LIB 500/510 in MicroSCADA

The CConfig tool is used for setting up the needed communication settings of the RED relay objects types in LIB 500/510 environments. The settings in the dialog may change depending on the type of relay. The following example concerns REF 54x relay.

- The host type can be selected
- The station addressing can be configured



IEC_conf

Fig. 2.5.3.-1 CConfig dialog for REF 54x in SYS 500

2.5.3.1. Communication support

Table 2.5.3.1-1 Communication support in LIB 500/510

Relay type	Protocols	Remarks
REF 54x	LON, SPA, IEC 60870-5-101, IEC 61850-8	1), 2)
REM 54x	LON, SPA, IEC 60870-5-101, IEC 61850-8	1), 2)
REC 52x	LON, SPA, IEC 60870-5-101	
RET 54x	LON, SPA, IEC 60870-5-101, IEC 61850-8	1), 2)
REX 52x	LON, SPA, IEC 60870-5-101, IEC 61850-8	1), 2)
REJ 5xx	SPA, IEC 61850-8	2)
REU5xx	SPA, IEC 61850-8	2)
REx 61x	SPA, IEC 61850-8	2)

Remark descriptions:

1) IEC 60870-5-101 requires either a COM 6xx or a KU-2000 gateway
2) IEC 61850-8 works only with SYS 600 and requires a SPA-ZC 40x communication gateway

Addresses

All the mentioned protocols require an appropriate value to be entered into the "STA number" field. This value must match the respective value assigned to the targeted relay unit in the system configuration.

When using the IEC 60870-5-101 protocol, either the IEC object address (COM 6xx) or the SPA unit number (KU-2000) must also be given. They must match the value configured for the gateway and relay unit in question. With COM 6xx, the master protocol which is used for communication between the relay unit and COM 6xx, must also be defined.

2.6. Application engineering information in LIB 500/510

2.6.1. General

Fig. 2.6.1.-1 Icon for standard function in LIB 500/510

Table 2.6.1-1 The file names in the package:

File Name
FRI_REF54x.DAT
FRI_REC52x.DAT
FRI_REM54x.DAT
FRI_RET54x.DAT
FRI_REJ5xx.DAT
FRI_REU5xx.DA
FRI_REX52x.DAT
FRI_REx61x.DAT

Table 2.6.1-2 The file locations in the package:

File Location in Package
SM_RED/REF54x/INST
SM_RED/REC52x/INST
SM_RED/REM54x/INST
SM_RED/RET54x/INST
SM_RED/REJ5xx/INST
SM_RED/REU5xx/INST
SM_RED/REX52x/INST
SM_RED/REx61x/INST

2.6.2. Process objects

The event process objects of RED relay units can be created with the Event Editor. For detailed information about events, see the CD-ROM "Technical Descriptions of Functions".

The contents of this paragraph applies only to the LIB 500/510 environment.

The event process objects are created according to the following procedure:

The Event Editor creates the process objects. The Event Editor checks which function blocks are included in the relay unit and presents the events of these function blocks in the Event Editor. In the Editor, you can select which events you want to include in the event reporting and those events to include in both event & alarm reporting.

The events that are masked in the relay settings will not have any corresponding process object. Select only those events of interest, because events that are not important are better not to be mixed with the events of importance, e.g. at some disturbance situation in the supervised process. (See the documentation of the Event Editor in the LIB 510 Configuration Manual).

Each channel (usually one channel corresponds to one function block) reserves 64 indexes from one process object group. This means that one process object group (seen as one logical name) can contain the events of 3 function blocks

Logical names (LN) of the process objects will be:

> LIB_OBJECT_NAME + index,
>
> where *index* = character in range A..Z or 0..9, Indexing is done automatically by the Event Editor.

For example, if a user has named the relay as "VAA_H01RE" on the SCT, the logical names of the process objects will be "VAA_H01REA", VAA_H01REB" etc.

2.6.3. Files

The files that are used for LIB 510 and RED relay types are listed in this paragraph: The contents of this paragraph applies only to the LIB500/510 environment.

2.6.3.1. REF 54x

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.1-1 Format pictures for event and alarm presentation:

File name	Name	Location *)
FORM4RE3B1.PIC	Event texts	USE
FORM4RE3B2.PIC	Event texts	USE
FORM4REDB1.PIC	Event texts	USE
FORM4REAI1.PIC	Event texts	USE
FORM4REBI1.PIC	Event texts	USE
FORM4REPC1.PIC	Event texts	USE

*) /SC/LIB4/FMOD/SM_RED/REF54x/

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.1-2 Language dependent text files:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' 1)

*) /SC/LIB4/FMOD/SM_RED/REF54x/
1)(L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the REF 54x object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.1-3 Format pictures and status texts (dynamic event texts) used by the REF 54x object type:

File name	Value (OV)	Status text
FORM4RE3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3
FORM4RE3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4REDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4REAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed
FORM4REBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated
	1 0 1 0 1 0 1	Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4REPC1.PIC (object PC events)	0 1	 Updated

2.6.3.2. REC 52x

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.2-1 Format pictures for event and alarm presentation:

File name	Name	Location *)
FORM4RC3B1.PIC	Event texts	USE [1)]
FORM4RC3B2.PIC	Event texts	USE [1)]
FORM4RCDB1.PIC	Event texts	USE [1)]
FORM4RCAI1.PIC	Event texts	USE [1)]
FORM4RCBI1.PIC	Event texts	USE [1)]
FORM4RCPC1.PIC	Event texts	USE [1)]

*) /SC/LIB4/FMOD/SM_RED/REC52x/ [1)]

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.2-2 Language dependent text files used during installation/ configuration and runtime:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' [1)]

*) /SC/LIB4/FMOD/SM_RED/REC52x/
[1)](L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the REC 52x object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.2-3 Format pictures and status texts (dynamic event texts) used by REC 52x object type:

File name	Value (OV)	Status text
FORM4RC3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3

File name	Value (OV)	Status text
FORM4RC3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4RCDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4RCAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed
FORM4RCBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4RCPC1.PIC (object PC events)	0 1	 Updated

2.6.3.3. REM 54x

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.3-1 Format pictures for event and alarm presentation:

File name	Name	Location *)
FORM4RM3B1.PIC	Event texts	USE [1)]
FORM4RM3B2.PIC	Event texts	USE [1)]
FORM4RMDB1.PIC	Event texts	USE [1)]

File name	Name	Location *)
FORM4RMAI1.PIC	Event texts	USE 1)
FORM4RMBI1.PIC	Event texts	USE 1)
FORM4RMPC1.PIC	Event texts	USE 1)

*) /SC/LIB4/FMOD/SM_RED/REM54x/ 1)

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.3-2 Language dependent text files used during installation/ configuration and runtime:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' 1)

*) /SC/LIB4/FMOD/SM_RED/REM54x/
1)(L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the REM 54x object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.3-3 Format pictures and status texts (dynamic event texts) used by REM 54x object type:

File name	Value (OV)	Status text
FORM4RM3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3
FORM4RM3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4RMDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)

File name	Value (OV)	Status text
FORM4RMAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed
FORM4RMBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4RMPC1.PIC (object PC events)	0 1	 Updated

2.6.3.4. RET 54x

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.4-1 Format pictures for event and alarm presentation:

File name	Name	Location *)
FORM4RT3B1.PIC	Event texts	USE
FORM4RT3B2.PIC	Event texts	USE
FORM4RTDB1.PIC	Event texts	USE
FORM4RTAI1.PIC	Event texts	USE
FORM4RTBI1.PIC	Event texts	USE
FORM4RTPC1.PIC	Event texts	USE

*) /SC/LIB4/FMOD/SM_RED/RET54x/

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.4-2 Language dependent text files:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' 1)

*) /SC/LIB4/FMOD/SM_RED/RET54x/
1)(L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the RET 54x object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.4-3 Format pictures and status texts (dynamic event texts) used by the RET 54x object type:

File name	Value (OV)	Status text
FORM4RT3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3
FORM4RT3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4RTDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4RTAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed

File name	Value (OV)	Status text
FORM4RTBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4RTPC1.PIC (object PC events)	0 1	 Updated

2.6.3.5. REX 52x

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.5-1 Format pictures for event and alarm presentation:

File name	Name	Location *)
FORM4RX3B1.PIC	Event texts	USE [1)]
FORM4RX3B2.PIC	Event texts	USE [1)]
FORM4RXDB1.PIC	Event texts	USE [1)]
FORM4RXAI1.PIC	Event texts	USE [1)]
FORM4RXBI1.PIC	Event texts	USE [1)]
FORM4RXPC1.PIC	Event texts	USE [1)]

*) /SC/LIB4/FMOD/SM_RED/REX52x/ [1)]

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.5-2 Language dependent text files:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' [1)]

*) /SC/LIB4/FMOD/SM_RED/REX52x/
[1)](L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by REX 52x object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.5-3 Format pictures and status texts (dynamic event texts) used by the REX 52x object type:

File name	Value (OV)	Status text
FORM4RX3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3
FORM4RX3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4RXDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4RXAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed
FORM4RXBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1	Reset Activated Off On Enabled Disabled Inactive Active Completed Started

File name	Value (OV)	Status text
	0 1 0 1 0 1 0 1	Deactivated Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4RXPC1.PIC (object PC events)	0 1	 Updated

2.6.3.6. REJ 5xx

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.6-1 Format pictures used during runtime:

File name	Name	Location *)
FORM4RJ3B1.PIC	Event texts	USE
FORM4RJ3B2.PIC	Event texts	USE
FORM4RJDB1.PIC	Event texts	USE
FORM4RJAI1.PIC	Event texts	USE
FORM4RJBI1.PIC	Event texts	USE
FORM4RJPC1.PIC	Event texts	USE

*) /SC/LIB4/FMOD/SM_RED/REJ5xx/

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.6-2 Language dependent text files used during installation/ configuration and runtime:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' 1)

*) /SC/LIB4/FMOD/SM_RED/REJ5xx/
1)(L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the REJ 5xx object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.6-3 Format pictures and status text (dynamic event texts) used by the REJ 5xx object type:

File name	Value (OV)	Status text
FORM4RJ3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3
FORM4RJ3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4RJDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4RJAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed
FORM4RJBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4RJPC1.PIC (object PC events)	0 1	 Updated

2.6.3.7. REU 5xx

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.7-1 Format pictures for event and alarm presentation:

File name	Name	Location *)
FORM4RU3B1.PIC	Event texts	USE [1)]
FORM4RU3B2.PIC	Event texts	USE [1)]
FORM4RUDB1.PIC	Event texts	USE [1)]
FORM4RUAI1.PIC	Event texts	USE [1)]
FORM4RUBI1.PIC	Event texts	USE [1)]
FORM4RUPC1.PIC	Event texts	USE [1)]

*) /SC/LIB4/FMOD/SM_RED/REU5xx/ [1)]

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.7-2 Language dependent text files used during installation/ configuration and runtime:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' [1)]

*) /SC/LIB4/FMOD/SM_RED/REU5xx/
[1)](L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the REU 5xx object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.7-3 Format pictures and status texts (dynamic event texts) used by the REU 5xx object type:

File name	Value (OV)	Status text
FORM4RU3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1,L2 and L3

File name	Value (OV)	Status text
FORM4RU3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12,U23 and U31
FORM4RUDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4RUAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed
FORM4RUBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated Activated Normal Alarm Nack Ack Unsuccessful Unsuccessful
FORM4RUPC1.PIC (object PC events)	0 1	 Updated

2.6.3.8. REx 61x

Format pictures

Format pictures used during runtime for event and alarm presentation.

Table 2.6.3.8-1 Format pictures used during runtime:

File name	Name	Location *)
FORM4RN3B1.PIC	Event texts	USE [1)]
FORM4RN3B2.PIC	Event texts	USE [1)]
FORM4RNAI1.PIC	Event texts	USE [1)]

File name	Name	Location *)
FORM4RNBI1.PIC	Event texts	USE 1)
FORM4RNDB1.PIC	Event texts	USE 1)
FORM4RNPC1.PIC	Event texts	USE 1)

*) /SC/LIB4/FMOD/SM_RED/REx61x/ 1)

Texts

The text files, used during installation/configuration and runtime, are language dependent.

Table 2.6.3.8-2 Language dependent text files used during installation/ configuration and runtime:

File name	Name	Location *)
*.TXT	Dynamic event texts	LANG'L' 1)

*) /SC/LIB4/FMOD/SM_RED/REx61x/ 1) (L = IS A VALUE >=0)

Format pictures and status texts

The following format pictures and status texts (dynamic event texts) are used by the REx 61x object type. You can add new texts into the format text files by using the Event Editor.

Table 2.6.3.8-3 Format pictures and status text (dynamic event texts) used by the REx 61x object type:

File name	Value (OV)	Status text
FORM4RN3B1.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on L1 on L2 on L1 and L2 on L3 on L3 and L1 on L2 and L3 on L1, L2 and L3
FORM4RN3B2.PIC (object 3bit/AI events)	0 1 2 3 4 5 6 7	Normal on U12 on U23 on U12 and U23 on U31 on U31 and U12 on U31 and U23 on U12, U23 and U31
FORM4RNAI1.PIC (object AI events)	0 1 2 3 4 5	Normal Low Alarm High Alarm Low Warning High Warning Alarm/warning limit changed

File name	Value (OV)	Status text
FORM4RNBI1.PIC (object BI events)	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0	Reset Activated Off On Enabled Disabled Inactive Active Completed Started Deactivated Activated Normal Alarm Nack
	1 0 1	Ack Unsuccessful Unsuccessful
FORM4RNDB1.PIC (object DB events)	0 1 2 3	Middle (00) Close (10) Open (01) Faulty (11)
FORM4RNPC1.PIC (object PC events)	0 1	 Updated

3. SPACOM relay object types

3.1. Overview

3.1.1. Description

An object type is a package that contains relay configuration descriptions, profile files, standard function pictures and data files, format pictures and texts.

SPACOM relay object type package is used in the CAP 501 Relay Setting Tools, CAP 505 Relay Product Engineering Tools, SMS 510 Substation Monitoring System and MicroSCADA application libraries LIB 500/510.

3.1.2. Communication support

Table 3.1.2-1 Supported communication protocols:

Product	Protocol
CAP 501	SPA, SPA TCP/IP
CAP 505	SPA, SPA TCP/IP
SMS 510	SPA
LIB 500/510	SPA, ANSI via SRIO, RP570 via REC200, RP571 via RTU2x0, IEC 60870-5-101 via COM 6xx, IEC 60870-5-101 via KU-2000, IEC 61850-8 via SPA-ZC 40x *)

*) IEC 61850-8 supported only with SYS 600

3.2. Basic concepts/terminology

If you are unfamiliar with the basic concepts and terminology, such as *object types*, *object type groups* or *projects*, see Section 2.3.

3.3. Installation and configuration

3.3.1. LIB 510/MicroSCADA: installing and configuring SPACOM relays picture functions

In LIB/MicroSCADA environment, the standard function of SPACOM is presented with the following icon:

Fig. 3.3.1.-1 Standard Function icon

File name: FRI_SPASM.DAT

File location in package: SM_SPACOM/SPACOM/INST

Following steps and tools are required for a SPACOM relay picture function in MicroSCADA:

1. Installation of the relay picture function (Installation Tool)
2. Configuration of the relay picture function (Standard Configuration Tool)

- Attributes
- Rack configuration (Object Configuration Tool)
- Communication settings (CConfig Tool)
- Event handling (Event Editor)
- Picture function object (Representation Tool)

3. Relay parametrization (SPACOM Relay Setting Tool)

Steps one and two are shortly described in the following sections. For more information concerning relay parametrization, see Chapter 5 in this manual.

3.3.1.1. Installing relay picture functions

LIB 500 Configuration Manual (Introduction), gives a general description of the principles for installing and configuring picture functions in LIB. For every relay terminal a separate picture function is added to the process picture. Please also see relevant relay manuals for further information.

When installing a picture function, choose LIB4/LIB 510/PROTECTION/ SPACOM in the Installation Tool. Select SPACOM and click once by mouse. After the standard function SPACOM has been highlighted, enter a Picture Function Name for the function and click the Install button. Place the function anywhere in the base picture.

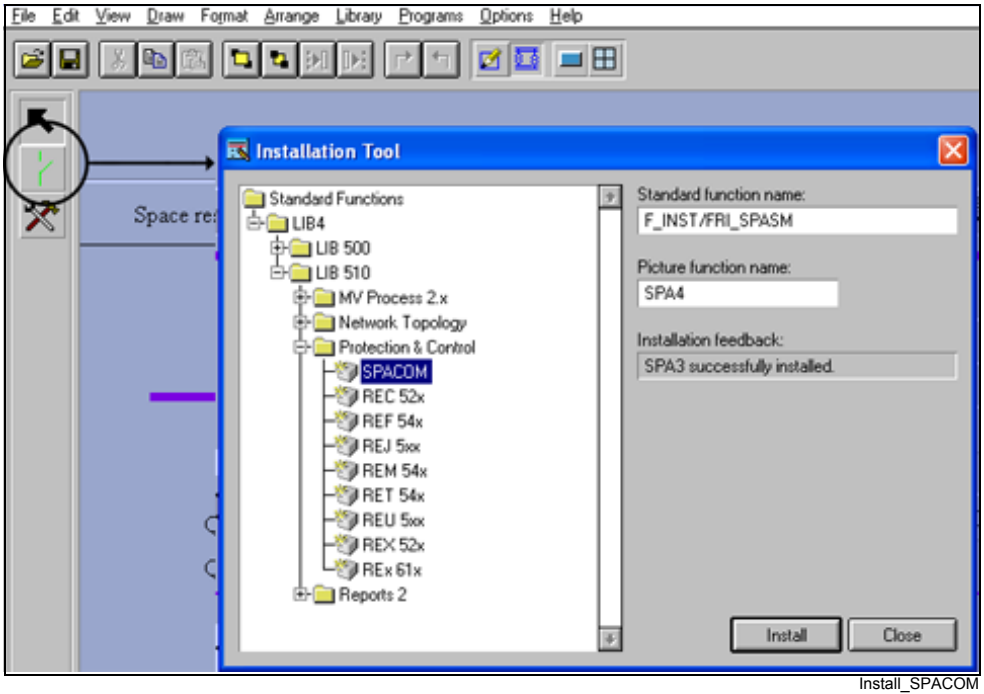


Fig. 3.3.1.1.-1 The procedure for installing a relay picture function. Relay picture function SPA3 was successfully installed; the icon is visible in the upper left corner.

3.3.1.2. Relay picture function configuration

The following flowchart shows the procedure of the relay configuration:

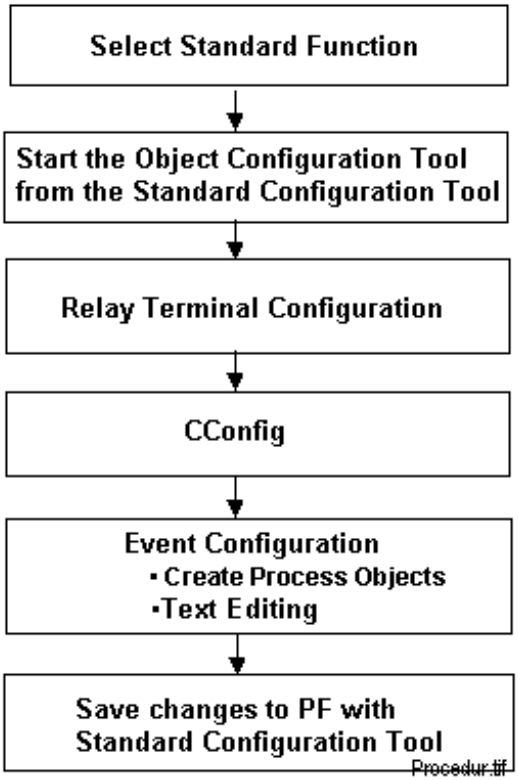


Fig. 3.3.1.2.-1 The procedure of the relay configuration

The Object Configuration tool is opened from the Tools menu of the Standard Configuration Tool. The configuration of the relay can be divided into three phases.

1. Rack and module configuration
2. Storing relay specific data to the database
3. Storing picture function data

Phases 1 and 2 are done within the Object Configuration Tool.

Phase 3, storing picture function data, is done using the Standard Configuration Tool by selecting Apply or Save.

Before starting the configuration, ensure that the base system objects concerning the stations and nodes are configured correctly.

3.3.1.3. Standard Configuration Tool functions

The pages Attributes and Tools are described in this section. The Representation Tool in the Tools menu is not described.

Select the relay picture function and start the Standard Configuration Tool. Now you can modify the configurable attributes and to start the Object Configuration Tool.

Attributes page

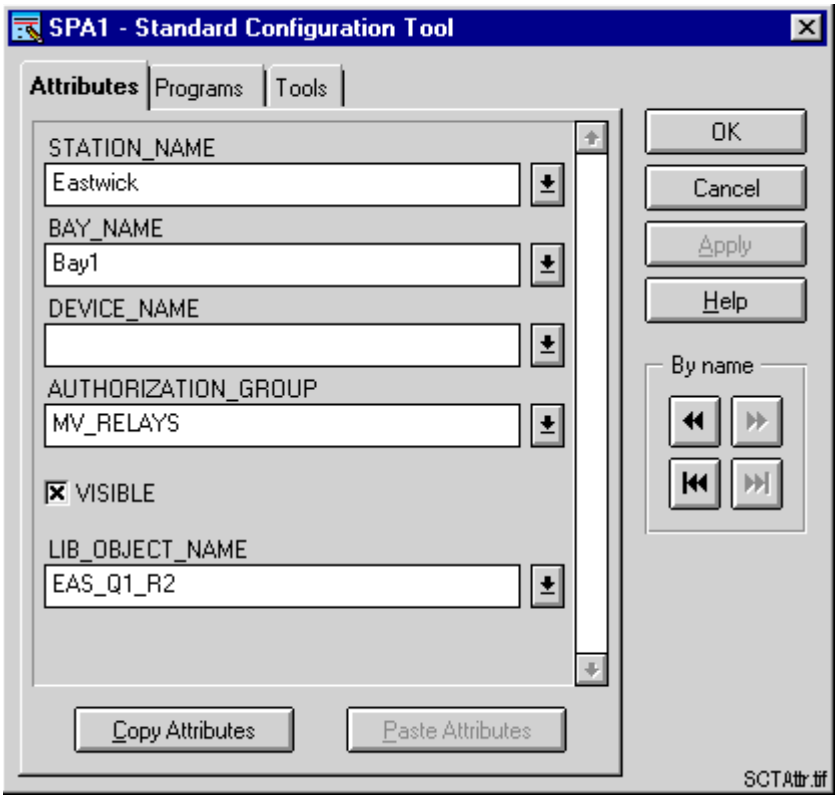


Fig. 3.3.1.3.-1 Standard Configuration Tool dialog with focus on Attributes page

The following attributes can be configured in the Standard Configuration Tool.

Table 3.3.1.3-1 Attributes that can be configured in the Standard Configuration Tool:

Configurable	Choices
STATION_NAME	The name of the substation. As a default the maximum length of the text is 9 characters. This text will be used as a substation identifier of the relay objects on the event list, alarm list, printout, database query, etc. It is very important that this text is similar to all objects within the same substation.
BAY_NAME	The name of the bay/feeder. As a default the maximum length of the text is 14 characters. This text will be used as a bay/feeder identifier of the relay objects on the event list, alarm list, printout, database query, etc. It is very important that this text is similar to all objects within the same bay/feeder.
DEVICE_NAME	The name (identifier) of the relay. As a default the maximum length of the text is 5 characters. This text will be used as an identifier of the relay on the event list, alarm list, printout, database query, etc.

Configurable	Choices
AUTHORIZATION GROUP	The authorization group used for the object.
VISIBLE	Visibility of the object.
LIB_OBJECT_NAME	Identifies the relay object. Name should be unique within the application. The logical names of event process objects will be created by using this name:LN = LIB_OBJECT_NAME + GT specific character. (GT specific character is defined by LIB500 installation tools.) Max. length of attribute: 9 characters.

Saving relay data to the picture function

After the relay has been configured using the relay configuration tools, the data has to be saved to the picture function. Save the data by using the Standard Configuration Tool commands Save or Apply.

Copying picture function data

To copy picture function data and to paste it into another picture function, use the commands Copy attributes and Paste attributes of the Standard Configuration Tool. After you have copied the picture function data, open the Object Configuration Tool and make the necessary definitions (addresses etc.).

Deleting picture functions

Picture functions that have no connections to databases can be deleted directly in the Picture Editor. To delete a picture function element:

- Select the element with the selector

- Then click at the border of the element.
- Choose Delete in the Edit menu and the element disappears. This can also be done by pressing Delete on the keyboard.

Tools page

The following tools can be started from the Tools page in the Standard Configuration Tool (see Fig. 3.3.1.3.-2):

- Object Configuration Tool for rack configuration (Function is described in a later section).
- CConfig Tool for communication settings (Function is described in a later section).
- Event Editor for event handling (Function is described in the LIB 510 Configuration Manual).
- Representation Tool for picture function symbol used for the relay object, not described.

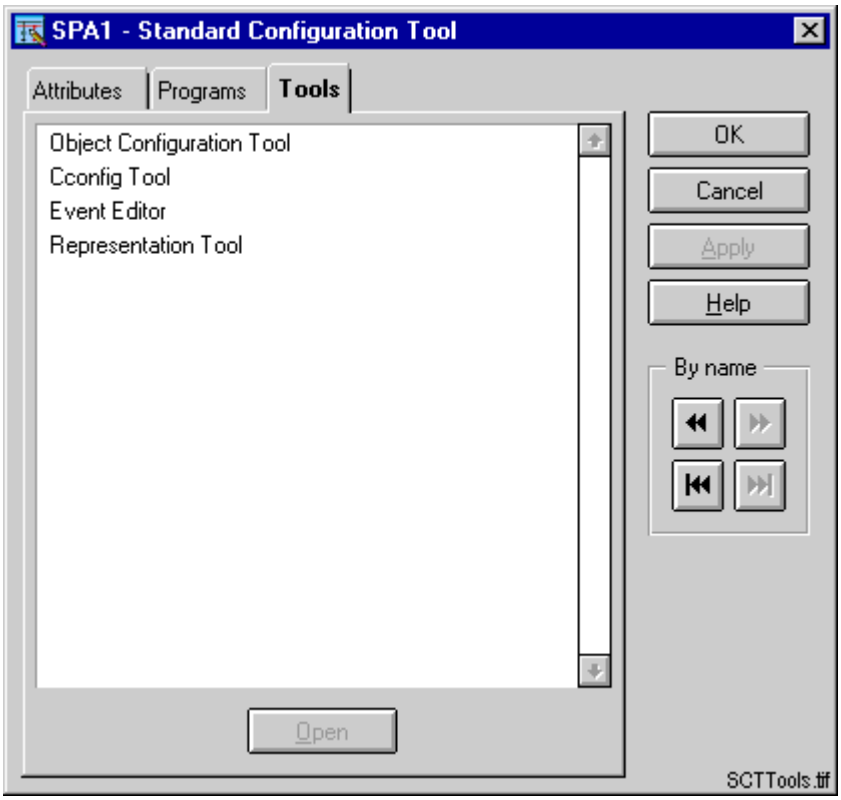


Fig. 3.3.1.3.-2 The Standard Configuration Tool dialog - Tools page

3.3.1.4. Relay parametrization

After the Relay picture function has been configured, you can set the relay module parameters with the SPACOM Relay Setting Tool. For more information, see Chapter 4 in this manual.

3.3.2. CAP 501/505 and SMS 510

In CAP 501/505 and SMS 510 environments, start the Object Configuration Tool by clicking first the Object Properties shortcut button in the toolbar. Then click the Attributes button in the General Object Attributes dialog.

3.3.3. Object Configuration Tool dialog

Rack configuration and transducers are defined in the Object type configuration dialog, see the following sections.

3.3.3.1. Rack configuration page

By clicking the Attributes button in the General Object Attributes dialog, the configuration dialog containing three tabbed pages appears on the screen (see Fig. 3.3.3.1.-1).

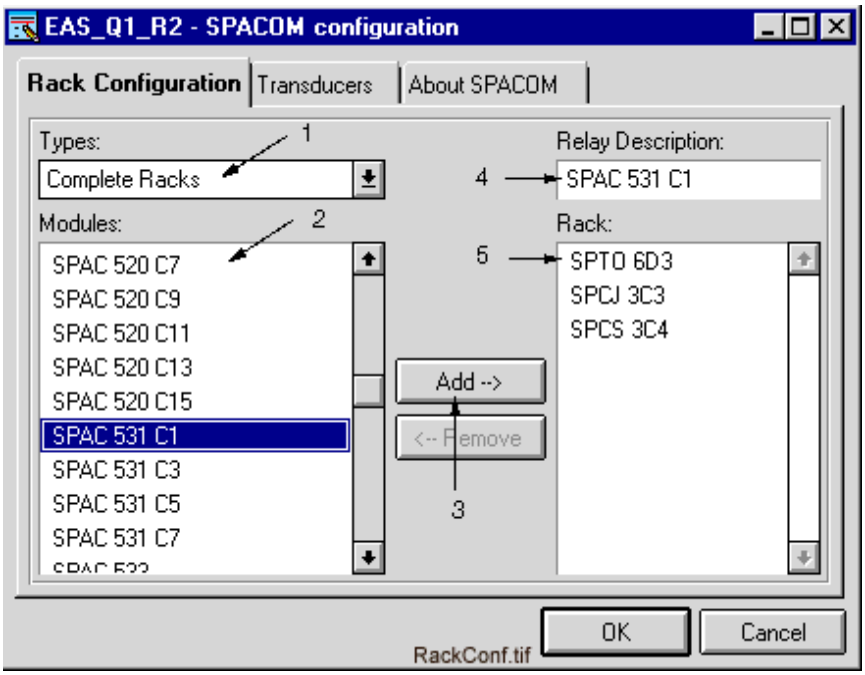


Fig. 3.3.3.1.-1 Rack Configuration dialog

Add relay/module

The type of module to be configured can be selected in the drop-down combo in the upper left-hand corner of the Rack Configuration page (see Fig. 3.3.3.1.-1, item 1). This drop-down combo box contains a list of preconfigured relays or a list of different modules depending on which type has been selected. Possible types are presented in Table 3.3.3.1-1.

Table 3.3.3.1-1 Different groups in the Types drop-down menu:

Complete racks	Predefined relay packages
Alarm Modules	SACO
Auto Reclose Mod.	SPCT
Control Modules	SPTO
Current Modules	SPCJ, SPCS, SPCP
Differential Mod.	SPCD
Motor Prot. Mod.	SPAM
Voltage Modules	SPCU
Various Modules	SPC 000, SPCF, SPEF
Disturbance recorder	SPCR

If e.g. the option Complete racks has been selected in the Types drop-down combo box (see Fig. 3.3.3.1.-1, item 1), preconfigured relays /modules can be selected in the combo box named Modules (see Fig. 3.3.3.1.-1, item 2 and Fig. 3.3.3.1.-2). Click Add (see Fig. 3.3.3.1.-1, item 3), and the relay description appears in the field named

Relay Description in the upper right-hand corner (see Fig. 3.3.3.1.-1, item 4). A list of corresponding modules is presented in the combo box named Rack (see Fig. 3.3.3.1.-1, item 5).

If the Rack combo box (see Fig. 3.3.3.1.-1, item 5) contains modules, the Relay Description field (item 4) is empty. If, in turn, you have selected the option Complete Racks, the name of the relay will automatically turn up in the Relay Description field. After the rack has been configured, it is always possible to enter a description manually into the Relay Description field.

In case modules need to be removed, click the Remove button. Click OK to execute the operation. If you wish to cancel the operation, click Cancel.

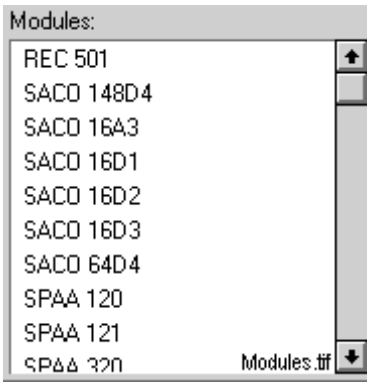


Fig. 3.3.3.1.-2 Selection of the Complete racks. The rest of the modules can be scrolled.

3.3.3.2. Transducers page

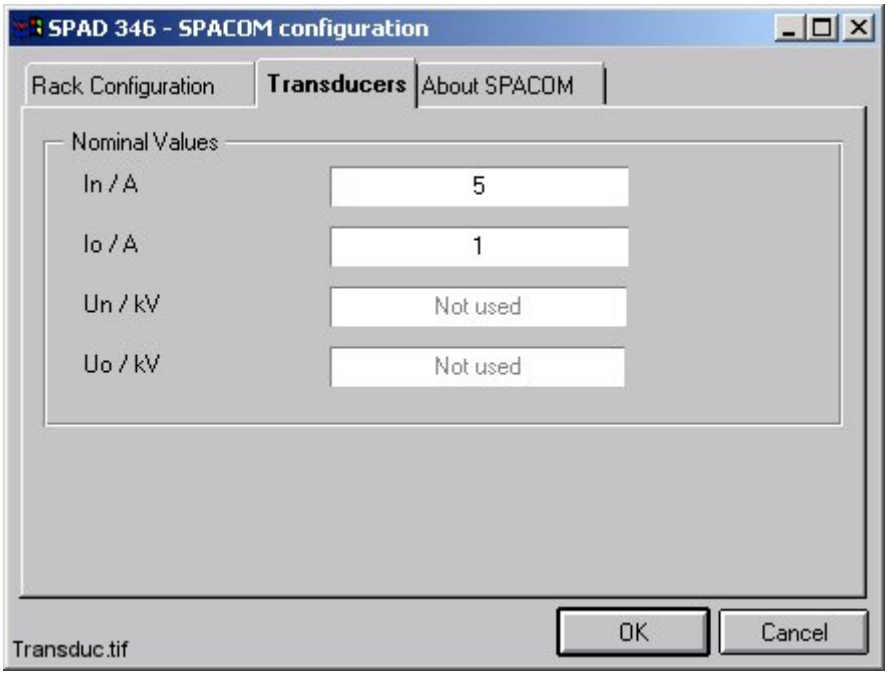


Fig. 3.3.3.2.-1 Transducers dialog

Nominal Values can be entered (and altered) in the fields on the Transducers page (see Fig. 3.3.3.2.-1). To exit the dialog, click OK. The operation may be cancelled by clicking Cancel.

Nominal values fields:

The nominal values fields represent the nominal values of the transducers of the module.

The nominal values are calculated according to the following rules:

Currents (I, I0):

$$\text{Nominal value} = \frac{Ip}{Is} \times Ir$$

Ip = The nominal primary current for the transducer

Is = The nominal secondary current for the transducer

Ir = The nominal current for the input to the SPA relay

Residual voltage (U0):

$$\text{Nominal value} = \frac{Up}{Us} \times Ur$$

or, if using the busbar voltage

$$\text{Nominal value} = \frac{U}{1,732 \times Us} \times Ur$$

Up = The nominal primary voltage for the transducer

U = The nominal busbar voltage

Us = The nominal secondary voltage for the transducer

Ur = The nominal voltage for the input to the SPA relay

Example:

The "nominal" value to be invoked is:

$$\text{Nominal value} = \frac{300A}{5A} \times 5A = 300$$

3.3.4. Communication configuration

In order for the relay to communicate with the relay tools, communication between them has to be configured. This is performed in different ways in LIB and in CAP environments (see the following sections).

3.3.4.1. LIB 510 in MicroSCADA

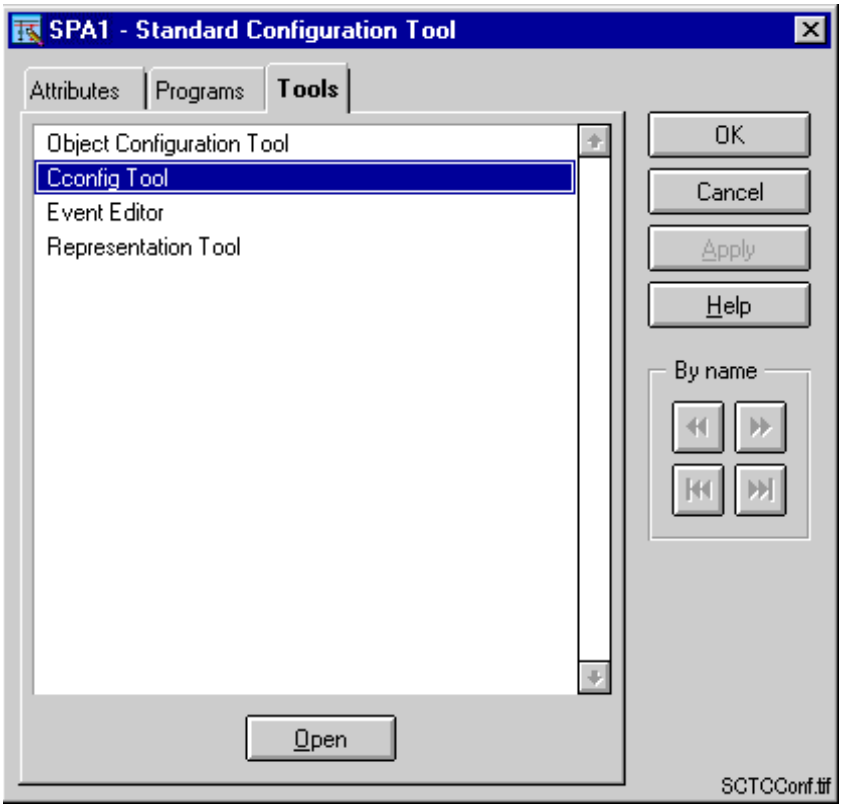


Fig. 3.3.4.1.-1 Standard Configuration Tool - Starting CConfig Tool

To start the Cconfig Tool in the Standard Configuration Tool/Tools page, double-click Cconfig Tool, or activate the name and click Open.

Protocol page

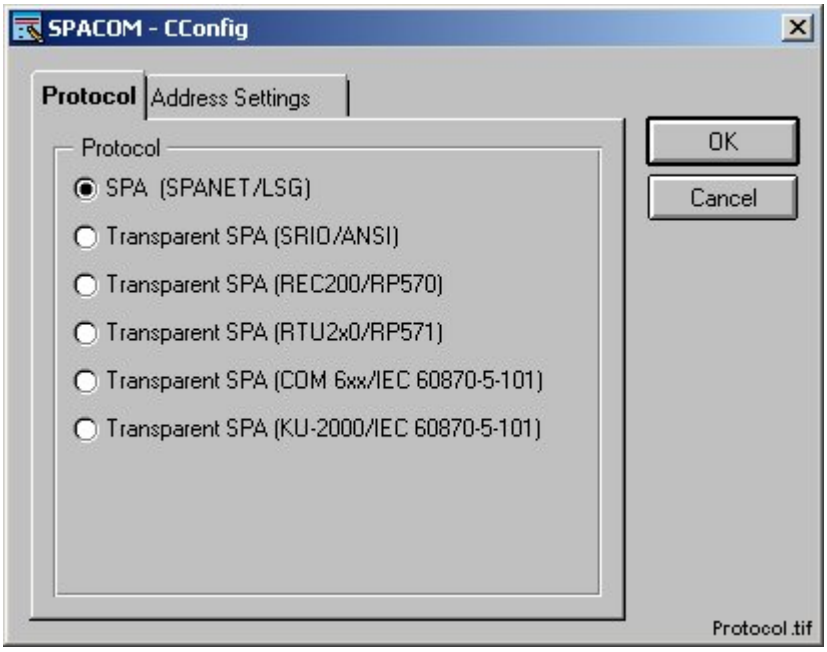


Fig. 3.3.4.1.-2 The Protocol page

The available protocols are shown on the first page named Protocol (see Fig. 3.3.4.1.-2).

Address Settings page

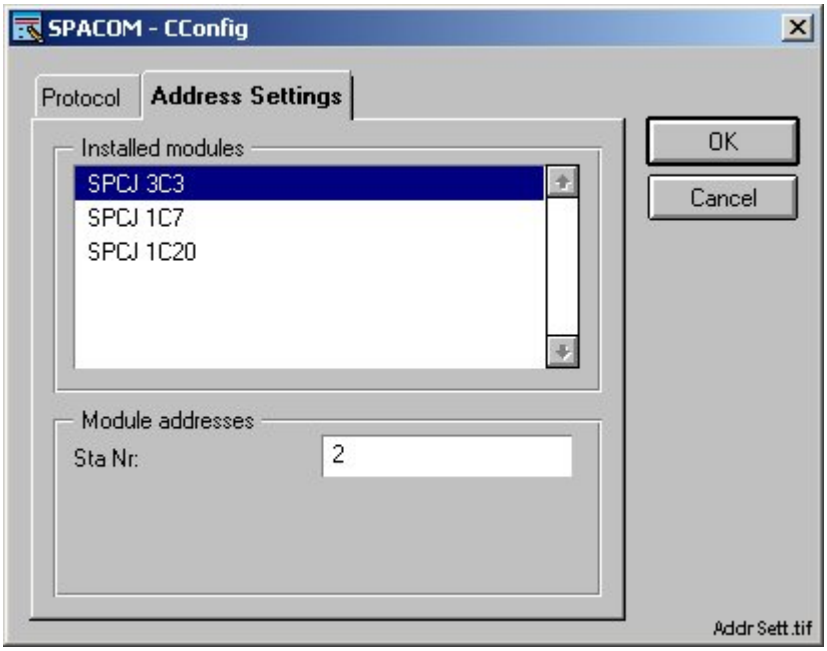


Fig. 3.3.4.1.-3 Address Settings page

On the second page named Address Settings (see Fig. 3.3.4.1.-3) it is possible to select the installed modules in the combo box. The Unit number of the Module addresses can be entered in the Sta Nr -field on the lower part of the page.

3.3.4.2. CAP 501/505 and SMS 510

In CAP 501/505 and SMS 510 environments, communication between the relay and the relay tools is configured in the General Object Attributes dialog/Communication page. To open the General Object Attributes dialog, first select a relay in the navigation tree and then click the Object Properties button in the toolbar. Select the Communication page in the General Object Attributes dialog (see Fig. 3.3.4.2.-1).

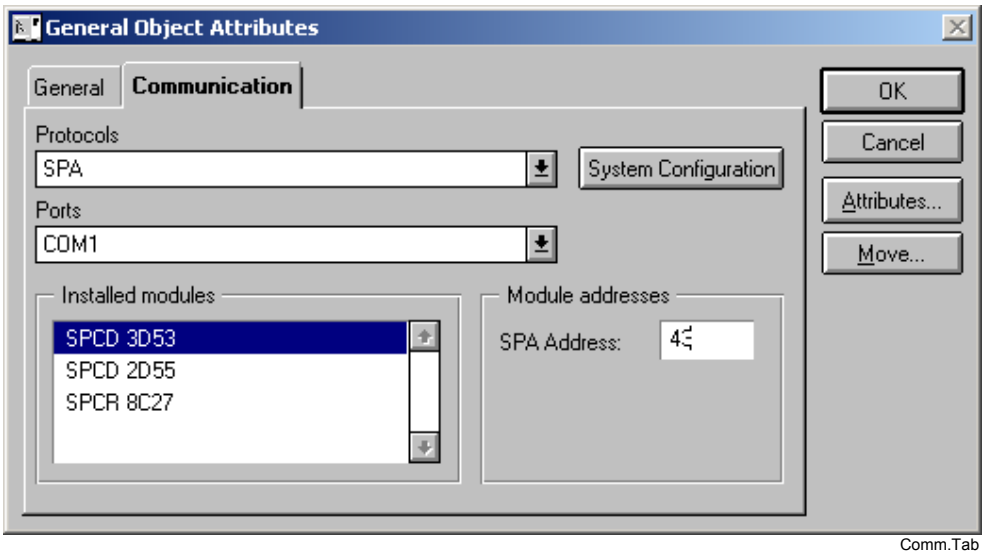


Fig. 3.3.4.2.-1 Communication page in the General Object Attributes dialog

SPA communication

Select Port and type in the appropriate value for the SPA address field. The value should match the respective value assigned to the targeted relay module.

SPA TCP/IP communication

SMS 510 supports SPA communication only.

Using SPA TCP/IP requires one of the following devices to be connected to CAP 501/505:

- SPA/Ethernet adapter SPA-ZC 402
- Serial-to-TCP/IP converter
- COM 610 communication gateway

Select TCP port and type in the appropriate values for the IP address and SPA address fields. The IP address value should match the respective value assigned to the TCP/IP device between CAP 501/505 and the targeted relay unit. The SPA address value should match the respective value assigned to the targeted relay module.

3.4. Application engineering information in LIB 510/MicroSCADA

The contents of this section concern only LIB 510/MicroSCADA environment.

3.4.1. Process objects

The process objects in SPACOM are described in Section 3.4.3.

3.4.2. Files

The files that are used for LIB 510 SPACOM are described below.

3.4.2.1. Format pictures

Format pictures used during runtime for event and alarm presentation (see Table 3.4.2.1-1).

Table 3.4.2.1-1 Format pictures used for event and alarm presentation:

Filename	Name	Location *)
FORM4FRALI.PIC	Event texts	USE 1)
FORM4UMEV.PIC	Unmapped events	USE 1)

*) SC/LIB4/FMOD/SM_SPACOM/SPACOM/ 1)

3.4.2.2. Texts

Language dependent text files are used during installation/configuration and runtime.

Table 3.4.2.2-1 Language dependent text files used during installation/ configuration and runtime:

Filename	Name	Location *)
*.TXT	Event texts	LANG'L' 1)
*.SPT	Group texts	LANG'L' 1)
*.CFG	Relay unit texts	LANG'L' 1)

*) SC/LIB4/FMOD/SM_SPACOM/ SPACOM/ 1)(L = IS A VALUE >=0)

3.4.3. Process objects

Process objects are created in the Event Editor. Event codes, Object texts and indexes are shown in Table 3.4.3.2-1 - Table 3.4.3.49-1.

3.4.3.1. Used abbreviations

Table 3.4.3.1-1 Used abbreviations:

ACT.	ACTIVATION
AR	AUTORECLOSE
BLK.	BLOCK
BS	BLOCKING SIGNAL
C	CLOSE
CB	CIRCUIT BREAKER
CH	CHANNEL
COM.	COMMAND
CS	COMMAND SIGNAL
DEF.	DEFINITE
DEL.	DELAYED
DEVI.	DEVIATION
DISC.	DISCONNECTOR
DISCON.	DISCONNECTOR
DWNW	DOWNWARD
E/F	EARTH FAULT
EXT.	EXTERNAL
H-SET	HI-SET
HSAR	HI-SPEED AUTORECLOSE
IND.	INDICATION
INHIB.	INHIBIT
INIT.	INITIALIZATION
INT.	INTERNAL
INTER.	INTERRUPTED
L-SET	LO-SET
L/R	LOCAL/REMOTE
MEAS.	MEASUREMENT
MEM.	MEMORY
O	OPEN
OSC.	OSCILLATION
OVERL.	OVERLOAD
O/C	OVERCURRENT
PARAM.	PARAMETER
PROTEC.	PROTECTION
RECONN.	RECONNECTION
REG.	REGISTER
REV.	REVERSE
SC	SYNCROCHECK

SEL.	SELECTION
SET-P.	SET-POINT
SG	SWITCH GROUP
SIGN.	SIGNAL
SSAR	SLOW-SPEED
ST.	STATE
TD	RECLAIM TIME
TN	DISCRIMINATING TIME
U.W	UPWARD
UNDEF.	UNDEFINED
UPW	UPWARD
V.	VALUE
VAL	VALUE
VC	VOLTAGE CHECK
W.OUT	WITHOUT

3.4.3.2. SPAM050C, SPAM051C and SPAM052C

Table 3.4.3.2-1 SPAM050C, SPAM051C and SPAM052C:

E code	Index	Object Text (OX+status)	
E1	120	STARTUP	BEGIN
E2	120	STARTUP	OVER
E3	121	ALARM SIGNAL	ON
E4	121	ALARM SIGNAL	RESET
E5	122	TRIP SIGNAL	ON
E6	122	TRIP SIGNAL	RESET
E7	123	RESTART INHIBIT	ON
E8	123	RESTART INHIBIT	OFF
E9	124	ALARM SIGNAL	ON
E10	124	ALARM SIGNAL	RESET
E11	125	TRIP SIGNAL	ON
E12	125	TRIP SIGNAL	RESET
E13	126	TRIP SIGNAL	ON
E14	126	TRIP SIGNAL	RESET
E15	127	ALARM SIGNAL	ON
E16	127	ALARM SIGNAL	RESET
E17	128	TRIP SIGNAL	ON
E18	128	TRIP SIGNAL	RESET
E19	129	TRIP SIGNAL	ON
E20	129	TRIP SIGNAL	RESET
E21	130	INT. RELAY FAULT	ON

E22	130	INT. RELAY FAULT OFF
E50	202	RESTARTING
E51	203	REG. OVERFLOW
E52	204	COMMUNICATION
E53	205	RESPONDS FAILED
E54	205	RESPONDS AGAIN

3.4.3.3. SPCD3C21

Table 3.4.3.3-1 SPCD3C21:

E code	Index	Object Text
E1	31	HARMONICS BLOCKING ON
E2	31	HARMONICS BLOCKING OFF
E3	32	L1 TRIP ON
E4	32	L1 TRIP OFF
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.4. SPCD3C22

Table 3.4.3.4-1 SPCD3C22:

E code	Index	Object Text
E1	33	HARMONICS BLOCKING ON
E2	33	HARMONICS BLOCKING OFF
E3	34	L2 TRIP ON
E4	34	L2 TRIP OFF
E50	184	RESTARTING
E51	185	REG. OVERFLOW
E52	186	COMMUNICATION
E53	187	RESPONDS FAILED
E54	187	RESPONDS AGAIN

3.4.3.5. SPCD3C23

Table 3.4.3.5-1 SPCD3C23:

E code	Index	Object Text
E1	35	HARMONICS BLOCKING ON
E2	35	HARMONICS BLOCKING OFF
E3	36	L3 TRIP ON

E code	Index	Object Text	
E4	36	L3 TRIP	OFF
E50	188	RESTARTING	
E51	189	REG. OVERFLOW	
E52	190	COMMUNICATION	
E53	191	RESPONDS	FAILED
E54	191	RESPONDS	AGAIN

3.4.3.6. SPCJ1C20

Table 3.4.3.6-1 SPCJ1C20:

E code	Index	Object Text	
E1	26	I1F> START	ON
E2	26	I1F> START	OFF
E3	27	BLOCKING	ON
E4	27	BLOCKING	OFF
E50	196	RESTARTING	
E51	197	REG. OVERFLOW	
E52	198	COMMUNICATION	
E53	199	RESPONDS	FAILED
E54	199	RESPONDS	AGAIN

3.4.3.7. SPCJ1C7

Table 3.4.3.7-1 SPCJ1C7:

E code	Index	Object Text	
E1	11	I0> START	ON
E2	11	I0> START	OFF
E3	12	I0> TRIP	ON
E4	12	I0> TRIP	OFF
E5	13	I0>> START	ON
E6	13	I0>> START	OFF
E7	14	I0>> TRIP	ON
E8	14	I0>> TRIP	OFF
E50	180	RESTARTING	
E51	181	REG. OVERFLOW	
E52	182	COMMUNICATION	
E53	183	RESPONDS	FAILED
E54	183	RESPONDS	AGAIN

3.4.3.8. SPCJ1C8

Table 3.4.3.8-1 SPCJ1C8:

E code	Index	Object Text
E1	15	I0> START ON
E2	15	I0> START OFF
E3	16	I0> TRIP ON
E4	16	I0> TRIP OFF
E5	17	I0>> START ON
E6	17	I0>> START OFF
E7	18	I0>> TRIP ON
E8	18	I0>> TRIP OFF
E50	184	RESTARTING
E51	185	REG. OVERFLOW
E52	186	COMMUNICATION
E53	187	RESPONDS FAILED
E54	187	RESPONDS AGAIN

3.4.3.9. SPCJ2C30

Table 3.4.3.9-1 SPCJ2C30:

E code	Index	Object Text
E1	23	D I0> TRIP ON
E2	23	D I0> TRIP OFF
E3	24	I0> START ON
E4	24	I0> START OFF
E5	25	I0> TRIP ON
E6	25	I0> TRIP OFF
E50	192	RESTARTING
E51	193	REG. OVERFLOW
E52	194	COMMUNICATION
E53	195	RESPONDS FAILED
E54	195	RESPONDS AGAIN

3.4.3.10. SPCJ3C3

Table 3.4.3.10-1 SPCJ3C3:

E code	Index	Object Text
E1	19	I> START ON
E2	19	I> START OFF
E3	20	I> TRIP ON
E4	20	I> TRIP OFF

E code	Index	Object Text
E5	21	I>> START ON
E6	21	I>> START OFF
E7	22	I>> TRIP ON
E8	22	I>> TRIP OFF
E50	188	RESTARTING
E51	189	REG. OVERFLOW
E52	190	COMMUNICATION
E53	191	RESPONDS FAILED
E54	191	RESPONDS AGAIN

3.4.3.11. SPCJ3C48

Table 3.4.3.11-1 SPCJ3C48:

E code	Index	Object Text
E1	56	I> START ON
E2	56	I> START OFF
E3	57	I> TRIP ON
E4	57	I> TRIP OFF
E5	58	I>> START ON
E6	58	I>> START OFF
E7	59	I>> TRIP ON
E8	59	I>> TRIP OFF
E9	60	I0> START ON
E10	60	I0> START OFF
E11	61	I0> TRIP ON
E12	61	I0> TRIP OFF
E50	192	RESTARTING
E51	193	REG. OVERFLOW
E52	194	COMMUNICATION
E53	195	RESPONDS FAILED
E54	195	RESPONDS AGAIN

3.4.3.12. SPCJ3D35

Table 3.4.3.12-1 SPCJ3D35:

E code	Index	Object Text
E1	40	I1> START ON
E2	40	I1> START OFF
E3	41	I1> TRIP ON
E4	41	I1> TRIP OFF

E code	Index	Object Text
E5	42	I2> START ON
E6	42	I2> START OFF
E7	43	I2> TRIP ON
E8	43	I2> TRIP OFF
E9	44	I3> START ON
E10	44	I3> START OFF
E11	45	I3> TRIP ON
E12	45	I3> TRIP OFF
E13	46	I4> START ON
E14	46	I4> START OFF
E15	47	I4> TRIP ON
E16	47	I4> TRIP OFF
E17	48	OUTPUT SS1 ON
E18	48	OUTPUT SS1 OFF
E19	49	OUTPUT TS1 ON
E20	49	OUTPUT TS1 OFF
E21	50	OUTPUT SS2 ON
E22	50	OUTPUT SS2 OFF
E23	51	OUTPUT TS2 ON
E24	51	OUTPUT TS2 OFF
E25	52	OUTPUT SS3 ON
E26	52	OUTPUT SS3 OFF
E27	53	OUTPUT TS3 ON
E28	53	OUTPUT TS3 OFF
E29	54	OUTPUT SS4 ON
E30	54	OUTPUT SS4 OFF
E31	55	OUTPUT TS4 ON
E32	55	OUTPUT TS4 OFF
E50	188	RESTARTING
E51	189	REG. OVERFLOW
E52	190	COMMUNICATION
E53	191	RESPONDS FAILED
E54	191	RESPONDS AGAIN

3.4.3.13. SPCJ4D24

Table 3.4.3.13-1 SPCJ4D24:

E code	Index	Object Text
E1	32	I> START ON
E2	32	I> START OFF
E3	33	I> TRIP ON
E4	33	I> TRIP OFF
E5	34	I>> START ON
E6	34	I>> START OFF
E7	35	I>> TRIP ON
E8	35	I>> TRIP OFF
E9	36	I0> START ON
E10	36	I0> START OFF
E11	37	I0> TRIP ON
E12	37	I0> TRIP OFF
E13	38	I0>> START ON
E14	38	I0>> START OFF
E15	39	I0>> TRIP ON
E16	39	I0>> TRIP OFF
E17	40	OUTPUT TS1 ON
E18	40	OUTPUT TS1 OFF
E19	41	OUTPUT SS1 ON
E20	41	OUTPUT SS1 OFF
E21	42	OUTPUT SS2 ON
E22	42	OUTPUT SS2 OFF
E23	43	OUTPUT SS3 ON
E24	43	OUTPUT SS3 OFF
E25	44	OUTPUT TS2 ON
E26	44	OUTPUT TS2 OFF
E50	204	RESTARTING
E51	205	REG. OVERFLOW
E52	206	COMMUNICATION
E53	207	RESPONDS FAILED
E54	207	RESPONDS AGAIN

3.4.3.14. SPCJ4D29

Table 3.4.3.14-1 SPCJ4D29:

E code	Index	Object Text
E1	45	I> START ON
E2	45	I> START OFF
E3	46	I> TRIP ON
E4	46	I> TRIP OFF
E5	47	I>> START ON
E6	47	I>> START OFF
E7	48	I>> TRIP ON
E8	48	I>> TRIP OFF
E9	49	I0> START ON
E10	49	I0> START OFF
E11	50	I0> TRIP ON
E12	50	I0> TRIP OFF
E13	51	I0>> START ON
E14	51	I0>> START OFF
E15	52	I0>> TRIP ON
E16	52	I0>> TRIP OFF
E17	53	OUTPUT TS1 ON
E18	53	OUTPUT TS1 OFF
E19	54	OUTPUT SS1 ON
E20	54	OUTPUT SS1 OFF
E21	55	OUTPUT SS2 ON
E22	55	OUTPUT SS2 OFF
E23	56	OUTPUT SS3 ON
E24	56	OUTPUT SS3 OFF
E25	57	OUTPUT TS2 ON
E26	57	OUTPUT TS2 OFF
E50	208	RESTARTING
E51	209	REG. OVERFLOW
E52	210	COMMUNICATION
E53	211	RESPONDS FAILED
E54	211	RESPONDS AGAIN

3.4.3.15. SPCJ4D34

Table 3.4.3.15-1 SPCJ4D34:

E code	Index	Object Text
E1	58	ENGINE START ON
E2	58	ENGINE START OFF
E3	59	ST. THERMAL OVERL.
E4	59	ST. THERMAL OVERL. RESET
E5	60	TR. THERMAL ALARM
E6	60	TR. THERMAL ALARM RESET
E7	61	TR. THERMAL OVERL.
E8	61	TR. THERMAL OVERL. RESET
E9	62	IS START ON
E10	62	IS START OFF
E11	63	IS TRIP ON
E12	63	IS TRIP OFF
E13	64	I>> START ON
E14	64	I>> START OFF
E15	65	I>> TRIP ON
E16	65	I>> TRIP OFF
E17	66	I0 START ON
E18	66	I0 START OFF
E19	67	I0 TRIP ON
E20	67	I0 TRIP OFF
E21	68	ID START ON
E22	68	ID START OFF
E23	69	ID TRIP ON
E24	69	ID TRIP OFF
E25	70	I< START ON
E26	70	I< START OFF
E27	71	I< TRIP ON
E28	71	I< TRIP OFF
E29	72	EXT. TRIP SIGNAL ON
E30	72	EXT. TRIP SIGNAL OFF
E31	73	RESTARTING INHIBIT
E32	73	RESTARTING INHIBIT RESET
E33	74	OUTPUT TS1 ON
E34	74	OUTPUT TS1 OFF
E35	75	OUTPUT SS1 ON
E36	75	OUTPUT SS1 OFF

E code	Index	Object Text
E37	76	OUTPUT SS2 ON
E38	76	OUTPUT SS2 OFF
E39	77	OUTPUT SS3 ON
E40	77	OUTPUT SS3 OFF
E41	78	OUTPUT TS2 ON
E42	78	OUTPUT TS2 OFF
E50	212	RESTARTING
E51	213	REG. OVERFLOW
E52	214	COMMUNICATION
E53	215	RESPONDS FAILED
E54	215	RESPONDS AGAIN

3.4.3.16. SPCJ4D36

Table 3.4.3.16-1 SPCJ4D36:

E code	Index	Object Text
E1	27	I> START ON
E2	27	I> START OFF
E3	28	I> TRIP ON
E4	28	I> TRIP OFF
E5	29	I>> START ON
E6	29	I>> START OFF
E7	30	I>> TRIP ON
E8	30	I>> TRIP OFF
E9	31	I0> START ON
E10	31	I0> START OFF
E11	32	I0> TRIP ON
E12	32	I0> TRIP OFF
E13	33	I0>> START ON
E14	33	I0>> START OFF
E15	34	I0>> TRIP ON
E16	34	I0>> TRIP OFF
E17	35	OUTPUT TS1 ON
E18	35	OUTPUT TS1 OFF
E19	36	OUTPUT SS1 ON
E20	36	OUTPUT SS1 OFF
E21	37	OUTPUT SS2 ON
E22	37	OUTPUT SS2 OFF
E23	38	OUTPUT SS3 ON

E code	Index	Object Text
E24	38	OUTPUT SS3 OFF
E25	39	OUTPUT TS2 ON
E26	39	OUTPUT TS2 OFF
E50	184	RESTARTING
E51	185	REG. OVERFLOW
E52	186	COMMUNICATION
E53	187	RESPONDS FAILED
E54	187	RESPONDS AGAIN

3.4.3.17. SPCJ4D40

Table 3.4.3.17-1 SPCJ4D40:

E code	Index	Object Text
E1	79	IB> START ON
E2	79	IB> START OFF
E3	80	IB> TRIP ON
E4	80	IB> TRIP OFF
E5	81	IA> START ON
E6	81	IA> START OFF
E7	82	IA> TRIP ON
E8	82	IA> TRIP OFF
E9	83	I< START ON
E10	83	I< START OFF
E11	84	I< TRIP ON
E12	84	I< TRIP OFF
E13	85	ID1> START ON
E14	85	ID1> START OFF
E15	86	ID1> TRIP ON
E16	86	ID1> TRIP OFF
E17	87	ID2> START ON
E18	87	ID2> START OFF
E19	88	ID2> TRIP ON
E20	88	ID2> TRIP OFF
E21	89	EXT. TRIP SIGNAL ON
E22	89	EXT. TRIP SIGNAL OFF
E23	90	RECONN. INHIBIT ON
E24	90	RECONN. INHIBIT OFF
E25	91	OUTPUT TS1 ON
E26	91	OUTPUT TS1 OFF

E code	Index	Object Text
E27	92	OUTPUT SS1 ON
E28	92	OUTPUT SS1 OFF
E29	93	OUTPUT SS2 ON
E30	93	OUTPUT SS2 OFF
E31	94	OUTPUT SS3 ON
E32	94	OUTPUT SS3 OFF
E33	95	OUTPUT TS2 ON
E34	95	OUTPUT TS2 OFF
E50	216	RESTARTING
E51	217	REG. OVERFLOW
E52	218	COMMUNICATION
E53	219	RESPONDS FAILED
E54	219	RESPONDS AGAIN

3.4.3.18. SPCJ4D44

Table 3.4.3.18-1 SPCJ4D44:

E code	Index	Object Text
E1	96	I> START ON
E2	96	I> START OFF
E3	97	I> TRIP ON
E4	97	I> TRIP OFF
E5	98	I>> START ON
E6	98	I>> START OFF
E7	99	I>> TRIP ON
E8	99	I>> TRIP OFF
E9	100	I01> START ON
E10	100	I01> START OFF
E11	101	I01> TRIP ON
E12	101	I01> TRIP OFF
E13	102	U0> START ON
E14	102	U0> START OFF
E15	103	I02>> TRIP ON
E16	103	I02>> TRIP OFF
E17	104	OUTPUT TS1 ON
E18	104	OUTPUT TS1 OFF
E19	105	OUTPUT SS1 ON
E20	105	OUTPUT SS1 OFF
E21	106	OUTPUT SS2 ON

E code	Index	Object Text
E22	106	OUTPUT SS2 OFF
E23	107	OUTPUT SS3 ON
E24	107	OUTPUT SS3 OFF
E25	108	OUTPUT TS2 ON
E26	108	OUTPUT TS2 OFF
E50	220	RESTARTING
E51	221	REG. OVERFLOW
E52	222	COMMUNICATION
E53	223	RESPONDS FAILED
E54	223	RESPONDS AGAIN

3.4.3.19. SACO16A3

Table 3.4.3.19-1 SACO16A3:

E code	Index	Object Text
E1	150	HI SET-POINT VAL. ACTIVE
E2	150	HI SET-POINT VAL. RESET
E3	151	BLK. SET-POINT VAL. ACTIVE
E4	151	BLK. SET-POINT VAL. RESET
E7	153	PARAM. MEM. INIT. START
E8	153	PARAM. MEM. INIT. EXEC
E10	154	INT. UNIT FAULT
E13	156	EVENT REG. OVERFLOW
E22	157	EARTH-FAULT ACTIVE
E23	157	EARTH-FAULT RESET
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN
Channel 1		
E1	11	CH1 HI SET-P. VAL. START
E2	11	CH1 HI SET-P. VAL. RESET
E3	12	CH1 HI TRIP SET-P V START
E4	12	CH1 HI TRIP SET-P V RESET
E5	13	CH1 LO SET-P. VAL. START
E6	13	CH1 LO SET-P. VAL. RESET
E7	14	CH1 LO TRIP SET-P V START
E8	14	CH1 LO TRIP SET-P V RESET

E code	Index	Object Text
E15	15	CH1 MEAS. DEVI. REG UPWARDS
E16	15	CH1 MEAS. DEVI. REG DOWNWARDS
E20	16	CH1 MEAS. RANGE UPW ACTIVE
E21	17	CH1 MEAS. RANGE DWNW ACTIVE
E23	18	CH1 TRIP. IND. OSC. ALARM
E24	16	CH1 MEAS. RANGE UPW RESET
E25	17	CH1 MEAS. RANGE DWNW RESET
Channel 2		
E1	19	CH2 HI SET-P. VAL. START
E2	19	CH2 HI SET-P. VAL. RESET
E3	20	CH2 HI TRIP SET-P V START
E4	20	CH2 HI TRIP SET-P V RESET
E5	21	CH2 LO SET-P. VAL. START
E6	21	CH2 LO SET-P. VAL. RESET
E7	22	CH2 LO TRIP SET-P V START
E8	22	CH2 LO TRIP SET-P V RESET
E15	23	CH2 MEAS. DEVI. REG UPWARDS
E16	23	CH2 MEAS. DEVI. REG DOWNWARDS
E20	24	CH2 MEAS. RANGE UPW ACTIVE
E21	25	CH2 MEAS. RANGE DWNW ACTIVE
E23	26	CH2 TRIP. IND. OSC. ALARM
E24	24	CH2 MEAS. RANGE UPW RESET
E25	25	CH2 MEAS. RANGE DWNW RESET
Channel 3		
E1	27	CH3 HI SET-P. VAL. START
E2	27	CH3 HI SET-P. VAL. RESET
E3	28	CH3 HI TRIP SET-P V START
E4	28	CH3 HI TRIP SET-P V RESET
E5	29	CH3 LO SET-P. VAL. START
E6	29	CH3 LO SET-P. VAL. RESET
E7	30	CH3 LO TRIP SET-P V START
E8	30	CH3 LO TRIP SET-P V RESET
E15	31	CH3 MEAS. DEVI. REG UPWARDS
E16	31	CH3 MEAS. DEVI. REG DOWNWARDS
E20	32	CH3 MEAS. RANGE UPW ACTIVE
E21	33	CH3 MEAS. RANGE DWNW ACTIVE
E23	34	CH3 TRIP. IND. OSC. ALARM
E24	32	CH3 MEAS. RANGE UPW RESET
E25	33	CH3 MEAS. RANGE DWNW RESET

E code	Index	Object Text
Channel 4		
E1	35	CH4 HI SET-P. VAL. START
E2	35	CH4 HI SET-P. VAL. RESET
E3	36	CH4 HI TRIP SET-P V START
E4	36	CH4 HI TRIP SET-P V RESET
E5	37	CH4 LO SET-P. VAL. START
E6	37	CH4 LO SET-P. VAL. RESET
E7	38	CH4 LO TRIP SET-P V START
E8	38	CH4 LO TRIP SET-P V RESET
E15	39	CH4 MEAS. DEVI. REG UPWARDS
E16	39	CH4 MEAS. DEVI. REG DOWNWARDS
E20	40	CH4 MEAS. RANGE UPW ACTIVE
E21	41	CH4 MEAS. RANGE DWNW ACTIVE
E23	42	CH4 TRIP. IND. OSC. ALARM
E24	40	CH4 MEAS. RANGE UPW RESET
E25	41	CH4 MEAS. RANGE DWNW RESET
Channel 5		
E1	43	CH5 HI SET-P. VAL. START
E2	43	CH5 HI SET-P. VAL. RESET
E3	44	CH5 HI TRIP SET-P V START
E4	44	CH5 HI TRIP SET-P V RESET
E5	45	CH5 LO SET-P. VAL. START
E6	45	CH5 LO SET-P. VAL. RESET
E7	46	CH5 LO TRIP SET-P V START
E8	46	CH5 LO TRIP SET-P V RESET
E15	47	CH5 MEAS. DEVI. REG UPWARDS
E16	47	CH5 MEAS. DEVI. REG DOWNWARDS
E20	48	CH5 MEAS. RANGE UPW ACTIVE
E21	49	CH5 MEAS. RANGE DWNW ACTIVE
E23	50	CH5 TRIP. IND. OSC. ALARM
E24	48	CH5 MEAS. RANGE U.W RESET
E25	49	CH5 MEAS. RANGE DWNW RESET
Channel 6		
E1	51	CH6 HI SET-P. VAL. START
E2	51	CH6 HI SET-P. VAL. RESET
E3	52	CH6 HI TRIP SET-P V START
E4	52	CH6 HI TRIP SET-P V RESET
E5	53	CH6 LO SET-P. VAL. START
E6	53	CH6 LO SET-P. VAL. RESET

E code	Index	Object Text
E7	54	CH6 LO TRIP SET-P V START
E8	54	CH6 LO TRIP SET-P V RESET
E15	55	CH6 MEAS. DEVI. REG UPWARDS
E16	55	CH6 MEAS. DEVI. REG DOWNWARDS
E20	56	CH6 MEAS. RANGE UPW ACTIVE
E21	57	CH6 MEAS. RANGE DWNW ACTIVE
E23	58	CH6 TRIP. IND. OSC. ALARM
E24	56	CH6 MEAS. RANGE UPW RESET
E25	57	CH6 MEAS. RANGE DWNW RESET
Channel 7		
E1	59	CH7 HI SET-P. VAL. START
E2	59	CH7 HI SET-P. VAL. RESET
E3	60	CH7 HI TRIP SET-P V START
E4	60	CH7 HI TRIP SET-P V RESET
E5	61	CH7 LO SET-P. VAL. START
E6	61	CH7 LO SET-P. VAL. RESET
E7	62	CH7 LO TRIP SET-P V START
E8	62	CH7 LO TRIP SET-P V RESET
E15	63	CH7 MEAS. DEVI. REG UPWARDS
E16	63	CH7 MEAS. DEVI. REG DOWNWARDS
E20	64	CH7 MEAS. RANGE UPW ACTIVE
E21	65	CH7 MEAS. RANGE DWNW ACTIVE
E23	66	CH7 TRIP. IND. OSC. ALARM
E24	64	CH7 MEAS. RANGE UPW RESET
E25	65	CH7 MEAS. RANGE DWNW RESET
Channel 8		
E1	67	CH8 HI SET-P. VAL. START
E2	67	CH8 HI SET-P. VAL. RESET
E3	68	CH8 HI TRIP SET-P V START
E4	68	CH8 HI TRIP SET-P V RESET
E5	69	CH8 LO SET-P. VAL. START
E6	69	CH8 LO SET-P. VAL. RESET
E7	70	CH8 LO TRIP SET-P V START
E8	70	CH8 LO TRIP SET-P V RESET
E15	71	CH8 MEAS. DEVI. REG UPWARDS
E16	71	CH8 MEAS. DEVI. REG DOWNWARDS
E20	72	CH8 MEAS. RANGE UPW ACTIVE
E21	73	CH8 MEAS. RANGE DWNW ACTIVE
E23	74	CH8 TRIP. IND. OSC. ALARM

E code	Index	Object Text
E24	72	CH8 MEAS. RANGE UPW RESET
E25	73	CH8 MEAS. RANGE DWNW RESET
Channel 9		
E1	75	CH9 HI SET-P. VAL. START
E2	75	CH9 HI SET-P. VAL. RESET
E3	76	CH9 HI TRIP SET-P V START
E4	76	CH9 HI TRIP SET-P V RESET
E5	77	CH9 LO SET-P. VAL. START
E6	77	CH9 LO SET-P. VAL. RESET
E7	78	CH9 LO TRIP SET-P V START
E8	78	CH9 LO TRIP SET-P V RESET
E15	79	CH9 MEAS. DEVI. REG UPWARDS
E16	79	CH9 MEAS. DEVI. REG DOWNWARDS
E20	80	CH9 MEAS. RANGE UPW ACTIVE
E21	81	CH9 MEAS. RANGE DWNW ACTIVE
E23	82	CH9 TRIP. IND. OSC. ALARM
E24	80	CH9 MEAS. RANGE UPW RESET
E25	81	CH9 MEAS. RANGE DWNW RESET
Channel 10		
E1	83	CH10 HI SET-P. VAL. START
E2	83	CH10 HI SET-P. VAL. RESET
E3	84	CH10 HI TRIP SET-P V START
E4	84	CH10 HI TRIP SET-P V RESET
E5	85	CH10 LO SET-P. VAL. START
E6	85	CH10 LO SET-P. VAL. RESET
E7	86	CH10 LO TRIP SET-P V START
E8	86	CH10 LO TRIP SET-P V RESET
E15	87	CH10 MEAS. DEVI. REG UPWARDS
E16	87	CH10 MEAS. DEVI. REG DOWNWARDS
E20	88	CH10 MEAS. RANGE UPW ACTIVE
E21	89	CH10 MEAS. RANGE DWNW ACTIVE
E23	90	CH10 TRIP. IND. OSC. ALARM
E24	88	CH10 MEAS. RANGE UPW RESET
E25	89	CH10 MEAS. RANGE DWNW RESET
Channel 11		
E1	91	CH11 HI SET-P. VAL. START
E2	91	CH11 HI SET-P. VAL. RESET
E3	92	CH11 HI TRIP SET-P V START
E4	92	CH11 HI TRIP SET-P V RESET

E code	Index	Object Text
E5	93	CH11 LO SET-P. VAL. START
E6	93	CH11 LO SET-P. VAL. RESET
E7	94	CH11 LO TRIP SET-P V START
E8	94	CH11 LO TRIP SET-P V RESET
E15	95	CH11 MEAS. DEVI. REG UPWARDS
E16	95	CH11 MEAS. DEVI. REG DOWNWARDS
E20	96	CH11 MEAS. RANGE UPW ACTIVE
E21	97	CH11 MEAS. RANGE DWNW ACTIVE
E23	98	CH11 TRIP. IND. OSC. ALARM
E24	96	CH11 MEAS. RANGE UPW RESET
E25	97	CH11 MEAS. RANGE DWNW RESET
Channel 12		
E1	99	CH12 HI SET-P. VAL. START
E2	99	CH12 HI SET-P. VAL. RESET
E3	100	CH12 HI TRIP SET-P V START
E4	100	CH12 HI TRIP SET-P V RESET
E5	101	CH12 LO SET-P. VAL. START
E6	101	CH12 LO SET-P. VAL. RESET
E7	102	CH12 LO TRIP SET-P V START
E8	102	CH12 LO TRIP SET-P V RESET
E15	103	CH12 MEAS. DEVI. REG UPWARDS
E16	103	CH12 MEAS. DEVI. REG DOWNWARDS
E20	104	CH12 MEAS. RANGE UPW ACTIVE
E21	105	CH12 MEAS. RANGE DWNW ACTIVE
E23	106	CH12 TRIP. IND. OSC. ALARM
E24	104	CH12 MEAS. RANGE UPW RESET
E25	105	CH12 MEAS. RANGE DWNW RESET
Channel 13		
E1	107	CH13 HI SET-P. VAL. START
E2	107	CH13 HI SET-P. VAL. RESET
E3	108	CH13 HI TRIP SET-P V START
E4	108	CH13 HI TRIP SET-P V RESET
E5	109	CH13 LO SET-P. VAL. START
E6	109	CH13 LO SET-P. VAL. RESET
E7	110	CH13 LO TRIP SET-P V START
E8	110	CH13 LO TRIP SET-P V RESET
E15	111	CH13 MEAS. DEVI. REG UPWARDS
E16	111	CH13 MEAS. DEVI. REG DOWNWARDS
E20	112	CH13 MEAS. RANGE UPW ACTIVE

E code	Index	Object Text
E21	113	CH13 MEAS. RANGE DWNW ACTIVE
E23	114	CH13 TRIP. IND. OSC. ALARM
E24	112	CH13 MEAS. RANGE UPW RESET
E25	113	CH13 MEAS. RANGE DWNW RESET
Channel 14		
E1	115	CH14 HI SET-P. VAL. START
E2	115	CH14 HI SET-P. VAL. RESET
E3	116	CH14 HI TRIP SET-P V START
E4	116	CH14 HI TRIP SET-P V RESET
E5	117	CH14 LO SET-P. VAL. START
E6	117	CH14 LO SET-P. VAL. RESET
E7	118	CH14 LO TRIP SET-P V START
E8	118	CH14 LO TRIP SET-P V RESET
E15	119	CH14 MEAS. DEVI. REG UPWARDS
E16	119	CH14 MEAS. DEVI. REG DOWNWARDS
E20	120	CH14 MEAS. RANGE UPW ACTIVE
E21	121	CH14 MEAS. RANGE DWNW ACTIVE
E23	122	CH14 TRIP. IND. OSC. ALARM
E24	120	CH14 MEAS. RANGE UPW RESET
E25	121	CH14 MEAS. RANGE DWNW RESET
Channel 15		
E1	123	CH15 HI SET-P. VAL. START
E2	123	CH15 HI SET-P. VAL. RESET
E3	124	CH15 HI TRIP SET-P V START
E4	124	CH15 HI TRIP SET-P V RESET
E5	125	CH15 LO SET-P. VAL. START
E6	125	CH15 LO SET-P. VAL. RESET
E7	126	CH15 LO TRIP SET-P V START
E8	126	CH15 LO TRIP SET-P V RESET
E15	127	CH15 MEAS. DEVI. REG UPWARDS
E16	127	CH15 MEAS. DEVI. REG DOWNWARDS
E20	128	CH15 MEAS. RANGE UPW ACTIVE
E21	129	CH15 MEAS. RANGE DWNW ACTIVE
E23	130	CH15 TRIP. IND. OSC. ALARM
E24	128	CH15 MEAS. RANGE UPW RESET
E25	129	CH15 MEAS. RANGE DWNW RESET
Channel 16		
E1	131	CH16 HI SET-P. VAL. START
E2	131	CH16 HI SET-P. VAL. RESET

E code	Index	Object Text
E3	132	CH16 HI TRIP SET-P V START
E4	132	CH16 HI TRIP SET-P V RESET
E5	133	CH16 LO SET-P. VAL. START
E6	133	CH16 LO SET-P. VAL. RESET
E7	134	CH16 LO TRIP SET-P V START
E8	134	CH16 LO TRIP SET-P V RESET
E15	135	CH16 MEAS. DEVI. REG UPWARDS
E16	135	CH16 MEAS. DEVI. REG DOWNWARDS
E20	136	CH16 MEAS. RANGE UPW ACTIVE
E21	137	CH16 MEAS. RANGE DWNW ACTIVE
E23	138	CH16 TRIP. IND. OSC. ALARM
E24	136	CH16 MEAS. RANGE UPW RESET
E25	137	CH16 MEAS. RANGE DWNW RESET

3.4.3.20. SACO16D2

Table 3.4.3.20-1 SACO16D2:

E code	Index	Object Text
E10	125	INT. UNIT FAULT
E13	126	EVENT REG. OVERFLOW
E50	220	RESTARTING
E51	221	REG. OVERFLOW
E52	222	COMMUNICATION
E53	223	RESPONDS FAILED
E54	223	RESPONDS AGAIN
Channel 1		
E1	91	CH1 ALARM
E2	91	CH1 RESET
E3	91	CH1 ALARM
E4	91	CH1 RESET
Channel 2		
E1	92	CH2 ALARM
E2	92	CH2 RESET
E3	92	CH2 ALARM
E4	92	CH2 RESET
Channel 3		
E1	93	CH3 ALARM
E2	93	CH3 RESET

E code	Index	Object Text
E3	93	CH3 ALARM
E4	93	CH3 RESET
Channel 4		
E1	94	CH4 ALARM
E2	94	CH4 RESET
E3	94	CH4 ALARM
E4	94	CH4 RESET
Channel 5		
E1	95	CH5 ALARM
E2	95	CH5 RESET
E3	95	CH5 ALARM
E4	95	CH5 RESET
Channel 6		
E1	96	CH6 ALARM
E2	96	CH6 RESET
E3	96	CH6 ALARM
E4	96	CH6 RESET
Channel 7		
E1	97	CH7 ALARM
E2	97	CH7 RESET
E3	97	CH7 ALARM
E4	97	CH7 RESET
Channel 8		
E1	98	CH8 ALARM
E2	98	CH8 RESET
E3	98	CH8 ALARM
E4	98	CH8 RESET
Channel 9		
E1	99	CH9 ALARM
E2	99	CH9 RESET
E3	99	CH9 ALARM
E4	99	CH9 RESET
Channel 10		
E1	100	CH10 ALARM
E2	100	CH10 RESET
E3	100	CH10 ALARM
E4	100	CH10 RESET
Channel 11		
E1	101	CH11 ALARM

E code	Index	Object Text
E2	101	CH11 RESET
E3	101	CH11 ALARM
E4	101	CH11 RESET
Channel 12		
E1	102	CH12 ALARM
E2	102	CH12 RESET
E3	102	CH12 ALARM
E4	102	CH12 RESET
Channel 13		
E1	103	CH13 ALARM
E2	103	CH13 RESET
E3	103	CH13 ALARM
E4	103	CH13 RESET
Channel 14		
E1	104	CH14 ALARM
E2	104	CH14 RESET
E3	104	CH14 ALARM
E4	104	CH14 RESET
Channel 15		
E1	105	CH15 ALARM
E2	105	CH15 RESET
E3	105	CH15 ALARM
E4	105	CH15 RESET
Channel 16		
E1	106	CH16 ALARM
E2	106	CH16 RESET
E3	106	CH16 ALARM
E4	106	CH16 RESET

3.4.3.21. SACO16D1B

E code	Index	Object Text
E10	79	INT. UNIT FAULT
E13	80	EVENT REG. OVERFLOW
E50	194	RESTARTING
E51	195	REG. OVERFLOW
E52	196	COMMUNICATION
E53	197	RESPONDS FAILED
E54	197	RESPONDS AGAIN

Channel 1			
E1	81	CH1	ALARM
E2	81	CH1	RESET
E3	81	CH1	ALARM
E4	81	CH1	RESET
Channel 2			
E1	82	CH2	ALARM
E2	82	CH2	RESET
E3	82	CH2	ALARM
E4	82	CH2	RESET
Channel 3			
E1	83	CH3	ALARM
E2	83	CH3	RESET
E3	83	CH3	ALARM
E4	83	CH3	RESET
Channel 4			
E1	84	CH4	ALARM
E2	84	CH4	RESET
E3	84	CH4	ALARM
E4	84	CH4	RESET
Channel 5			
E1	85	CH5	ALARM
E2	85	CH5	RESET
E3	85	CH5	ALARM
E4	85	CH5	RESET
Channel 6			
E1	86	CH6	ALARM
E2	86	CH6	RESET
E3	86	CH6	ALARM
E4	86	CH6	RESET
Channel 7			
E1	87	CH7	ALARM
E2	87	CH7	RESET
E3	87	CH7	ALARM
E4	87	CH7	RESET
Channel 8			
E1	88	CH8	ALARM
E2	88	CH8	RESET
E3	88	CH8	ALARM
E4	88	CH8	RESET

Channel 9		
E1	89	CH9 ALARM
E2	89	CH9 RESET
E3	89	CH9 ALARM
E4	89	CH9 RESET
Channel 10		
E1	90	CH10 ALARM
E2	90	CH10 RESET
E3	90	CH10 ALARM
E4	90	CH10 RESET
Channel 11		
E1	91	CH11 ALARM
E2	91	CH11 RESET
E3	91	CH11 ALARM
E4	91	CH11 RESET
Channel 12		
E1	92	CH12 ALARM
E2	92	CH12 RESET
E3	92	CH12 ALARM
E4	92	CH12 RESET
Channel 13		
E1	93	CH13 ALARM
E2	93	CH13 RESET
E3	93	CH13 ALARM
E4	93	CH13 RESET
Channel 14		
E1	94	CH14 ALARM
E2	94	CH14 RESET
E3	94	CH14 ALARM
E4	94	CH14 RESET
Channel 15		
E1	95	CH15 ALARM
E2	95	CH15 RESET
E3	95	CH15 ALARM
E4	95	CH15 RESET
Channel 16		
E1	96	CH16 ALARM
E2	96	CH16 RESET
E3	96	CH16 ALARM
E4	96	CH16 RESET

3.4.3.22. SACO16D2B

Table 3.4.3.22-1 SACO16D2B:

E code	Index	Object Text
E10	100	INT. UNIT FAULT
E13	101	EVENT REG. OVERFLOW
E50	198	RESTARTING
E51	199	REG. OVERFLOW
E52	200	COMMUNICATION
E53	201	RESPONDS FAILED
E54	201	RESPONDS AGAIN
Channel 1		
E1	102	CH1 ALARM
E2	102	CH1 RESET
E3	102	CH1 ALARM
E4	102	CH1 RESET
Channel 2		
E1	103	CH2 ALARM
E2	103	CH2 RESET
E3	103	CH2 ALARM
E4	103	CH2 RESET
Channel 3		
E1	104	CH3 ALARM
E2	104	CH3 RESET
E3	104	CH3 ALARM
E4	104	CH3 RESET
Channel 4		
E1	105	CH4 ALARM
E2	105	CH4 RESET
E3	105	CH4 ALARM
E4	105	CH4 RESET
Channel 5		
E1	106	CH5 ALARM
E2	106	CH5 RESET
E3	106	CH5 ALARM
E4	106	CH5 RESET
Channel 6		
E1	107	CH6 ALARM
E2	107	CH6 RESET
E3	107	CH6 ALARM

E code	Index	Object Text
E4	107	CH6 RESET
Channel 7		
E1	108	CH7 ALARM
E2	108	CH7 RESET
E3	108	CH7 ALARM
E4	108	CH7 RESET
Channel 8		
E1	109	CH8 ALARM
E2	109	CH8 RESET
E3	109	CH8 ALARM
E4	109	CH8 RESET
Channel 9		
E1	110	CH9 ALARM
E2	110	CH9 RESET
E3	110	CH9 ALARM
E4	110	CH9 RESET
Channel 10		
E1	111	CH10 ALARM
E2	111	CH10 RESET
E3	111	CH10 ALARM
E4	111	CH10 RESET
Channel 11		
E1	112	CH11 ALARM
E2	112	CH11 RESET
E3	112	CH11 ALARM
E4	112	CH11 RESET
Channel 12		
E1	113	CH12 ALARM
E2	113	CH12 RESET
E3	113	CH12 ALARM
E4	113	CH12 RESET
Channel 13		
E1	114	CH13 ALARM
E2	114	CH13 RESET
E3	114	CH13 ALARM
E4	114	CH13 RESET
Channel 14		
E1	115	CH14 ALARM
E2	115	CH14 RESET

E code	Index	Object Text
E3	115	CH14 ALARM
E4	115	CH14 RESET
Channel 15		
E1	116	CH15 ALARM
E2	116	CH15 RESET
E3	116	CH15 ALARM
E4	116	CH15 RESET
Channel 16		
E1	117	CH16 ALARM
E2	117	CH16 RESET
E3	117	CH16 ALARM
E4	117	CH16 RESET

3.4.3.23. SPCP3C2

Table 3.4.3.23-1 SPCP3C2:

E code	Index	Object Text
E1	61	U>, U>> START ON
E2	61	U>, U>> START OFF
E3	62	U>, U>> TRIP ON
E4	62	U>, U>> TRIP OFF
E5	63	REV. POWER START ON
E6	63	REV. POWER START OFF
E7	64	REV. POWER TRIP ON
E8	64	REV. POWER TRIP OFF
E50	200	RESTARTING
E51	201	REG. OVERFLOW
E52	202	COMMUNICATION
E53	203	RESPONDS FAILED
E54	203	RESPONDS AGAIN

3.4.3.24. SPCS2D37

Table 3.4.3.24-1 SPCS2D37:

E code	Index	Object Text
E1	11	I01> START ON
E2	11	I01> START OFF
E3	12	I01> FIRST TRIP ON
E4	12	I01> FIRST TRIP OFF

E code	Index	Object Text
E7	14	I01> SECOND TRIP ON
E8	14	I01> SECOND TRIP OFF
E9	15	I02> START ON
E10	15	I02> START OFF
E11	16	I02> TRIP ON
E12	16	I02> TRIP OFF
E13	17	I03> START ON
E14	17	I03> START OFF
E15	18	I03> TRIP ON
E16	18	I03> TRIP OFF
E17	19	OUTPUT SS1 ON
E18	19	OUTPUT SS1 OFF
E19	20	OUTPUT TS1 ON
E20	20	OUTPUT TS1 OFF
E21	21	OUTPUT SS2 ON
E22	21	OUTPUT SS2 OFF
E23	22	OUTPUT TS2 ON
E24	22	OUTPUT TS2 OFF
E25	23	OUTPUT SS3 ON
E26	23	OUTPUT SS3 OFF
E27	24	OUTPUT TS3 ON
E28	24	OUTPUT TS3 OFF
E29	25	OUTPUT SS4 ON
E30	25	OUTPUT SS4 OFF
E31	26	OUTPUT TS4 ON
E32	26	OUTPUT TS4 OFF
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.25. SPCS3C4

Table 3.4.3.25-1 SPCS3C4:

E code	Index	Object Text
E1	28	IF> START ON
E2	28	IF> START OFF
E3	29	IF> TRIP ON

E code	Index	Object Text
E4	29	IF> TRIP OFF
E5	30	IF>> START ON
E6	30	IF>> START OFF
E7	31	IF>> TRIP ON
E8	31	IF>> TRIP OFF
E50	200	RESTARTING
E51	201	REG. OVERFLOW
E52	202	COMMUNICATION
E53	203	RESPONDS FAILED
E54	203	RESPONDS AGAIN

3.4.3.26. SPCS4D11

Table 3.4.3.26-1 SPCS4D11:

E code	Index	Object Text
E1	109	I> START FORWARD ON
E2	109	I> START FORWARD OFF
E3	110	I> START REVERSE ON
E4	110	I> START REVERSE OFF
E5	111	I> TRIP ON
E6	111	I> TRIP OFF
E7	112	I>> START ON
E8	112	I>> START OFF
E9	113	I>> TRIP ON
E10	113	I>> TRIP OFF
E11	114	I>>> START ON
E12	114	I>>> START OFF
E13	115	I>>> TRIP ON
E14	115	I>>> TRIP OFF
E15	116	
E16	116	
E17	117	OUTPUT TS1 ON
E18	117	OUTPUT TS1 OFF
E19	118	OUTPUT SS1 ON
E20	118	OUTPUT SS1 OFF
E21	119	OUTPUT SS2 ON
E22	119	OUTPUT SS2 OFF
E23	120	OUTPUT SS3 ON
E24	120	OUTPUT SS3 OFF

E code	Index	Object Text
E25	121	OUTPUT TS2 ON
E26	121	OUTPUT TS2 OFF
E50	224	RESTARTING
E51	225	REG. OVERFLOW
E52	226	COMMUNICATION
E53	227	RESPONDS FAILED
E54	227	RESPONDS AGAIN

3.4.3.27. SPCS4D12

Table 3.4.3.27-1 SPCS4D12:

E code	Index	Object Text
E1	122	I> START FORWARD ON
E2	122	I> START FORWARD OFF
E3	123	I> START REVERSE ON
E4	123	I> START REVERSE OFF
E5	124	I> TRIP ON
E6	124	I> TRIP OFF
E7	125	I>> START ON
E8	125	I>> START OFF
E9	126	I>> TRIP ON
E10	126	I>> TRIP OFF
E11	127	I>>> START ON
E12	127	I>>> START OFF
E13	128	I>>> TRIP ON
E14	128	I>>> TRIP OFF
E15	129	
E16	129	
E17	130	OUTPUT TS1 ON
E18	130	OUTPUT TS1 OFF
E19	131	OUTPUT SS1 ON
E20	131	OUTPUT SS1 OFF
E21	132	OUTPUT SS2 ON
E22	132	OUTPUT SS2 OFF
E23	133	OUTPUT SS3 ON
E24	133	OUTPUT SS3 OFF
E25	134	OUTPUT TS2 ON
E26	134	OUTPUT TS2 OFF
E50	228	RESTARTING

E code	Index	Object Text
E51	229	REG. OVERFLOW
E52	230	COMMUNICATION
E53	231	RESPONDS FAILED
E54	231	RESPONDS AGAIN

3.4.3.28. SPCS4D13

Table 3.4.3.28-1 SPCS4D13:

E code	Index	Object Text
E1	135	I> START FORWARD ON
E2	135	I> START FORWARD OFF
E3	136	I> START REVERSE ON
E4	136	I> START REVERSE OFF
E5	137	I> TRIP ON
E6	137	I> TRIP OFF
E7	138	I>> START ON
E8	138	I>> START OFF
E9	139	I>> TRIP ON
E10	139	I>> TRIP OFF
E11	140	I>>> START ON
E12	140	I>>> START OFF
E13	141	I>>> TRIP ON
E14	141	I>>> TRIP OFF
E15	142	
E16	142	
E17	143	OUTPUT TS1 ON
E18	143	OUTPUT TS1 OFF
E19	144	OUTPUT SS1 ON
E20	144	OUTPUT SS1 OFF
E21	145	OUTPUT SS2 ON
E22	145	OUTPUT SS2 OFF
E23	146	OUTPUT SS3 ON
E24	146	OUTPUT SS3 OFF
E25	147	OUTPUT TS2 ON
E26	147	OUTPUT TS2 OFF
E50	232	RESTARTING
E51	233	REG. OVERFLOW

E code	Index	Object Text
E52	234	COMMUNICATION
E53	235	RESPONDS FAILED
E54	235	RESPONDS AGAIN

3.4.3.29.‘ SPCT2C17

Table 3.4.3.29-1 SPCT2C17:

E code	Index	Object Text
E1	151	AR START ON
E2	151	AR START OFF
E3	152	CLOSING CB
E4	152	CLOSING CB RESET
E5	153	ALARM
E6	153	ALARM RESET
E7	154	OPENING CB
E8	154	OPENING CB RESET
E9	155	DEF. TRIPPING CB
E10	156	MANUAL OPENING CB
E11	156	MANUAL OPENING CB RESET
E50	216	RESTARTING
E51	217	REG. OVERFLOW
E52	218	COMMUNICATION
E53	219	RESPONDS FAILED
E54	219	RESPONDS AGAIN

3.4.3.30. SPCT2C5

Table 3.4.3.30-1 SPCT2C5:

E code	Index	Object Text
E1	65	AR START ON
E2	65	AR START OFF
E3	66	CLOSING CB
E4	66	CLOSING CB RESET
E5	67	ALARM
E6	67	ALARM RESET
E7	68	OPENING CB
E8	68	OPENING CB RESET
E50	197	RESTARTING
E51	198	REG. OVERFLOW

E code	Index	Object Text
E52	199	COMMUNICATION
E53	200	RESPONDS FAILED
E54	200	RESPONDS AGAIN

3.4.3.31. SPCT2D38

Table 3.4.3.31-1 SPCT2D38:

E code	Index	Object Text
E1	70	HSAR START ON
E2	70	HSAR START OFF
E3	71	HSAR STARTED BY AR1
E4	72	HSAR STARTED BY AR2
E5	73	HSAR STARTED BY AR3
E6	74	SSAR START ON
E7	74	SSAR START OFF
E8	75	SSAR STARTED BY AR1
E9	76	SSAR STARTED BY AR2
E10	77	SSAR STARTED BY AR3
E11	78	DELAYED SSAR STARTED
E12	78	DELAYED SSAR RESET
E13	79	DEL. SSAR ST. BY AR1
E14	80	DEL. SSAR ST. BY AR2
E15	81	DEL. SSAR ST. BY AR3
E16	82	AUTO RECLOSE ON
E17	82	AUTO RECLOSE OFF
E18	83	AR INHIBITED
E19	83	AR RESETTED
E20	84	CB TRIPPING FAILED
E21	85	CB CLOSING ACTIVATED
E22	85	CB CLOSING RESET
E23	86	CB OPEN FAILED
E24	87	ARF ON
E25	87	ARF OFF
E26	88	DEF. CB TRIPPING
E27	89	NON-AR CB CLOSING
E28	90	NON-PROTEC. CB OPEN.
E50	201	RESTARTING
E51	202	REG. OVERFLOW

E code	Index	Object Text
E52	203	COMMUNICATION
E53	204	RESPONDS FAILED
E54	204	RESPONDS AGAIN

3.4.3.32. SPCT2D46

Table 3.4.3.32-1 SPCT2D46:

E code	Index	Object Text
E1	91	HSAR FORWARD STARTED
E2	91	HSAR FORWARD RESET
E3	92	HSAR STARTED BY AR1
E4	93	HSAR STARTED BY AR2
E5	94	HSAR STARTED BY AR3
E6	95	SSAR START ON
E7	95	SSAR START OFF
E8	96	SSAR STARTED BY AR1
E9	97	SSAR STARTED BY AR2
E10	98	SSAR STARTED BY AR3
E11	99	TD TIME STARTED
E12	99	TD TIME RESET
E13	100	TN TIME STARTED
E14	100	TN TIME RESET
E15	101	DEFINITE CB TRIPPING
E16	102	DEF. CB TRIP. BY AR1
E17	103	DEF. CB TRIP. BY AR2
E18	104	DEF. CB TRIP. BY AR3
E19	105	AUTO RECLOSE ON
E20	105	AUTO RECLOSE OFF
E21	106	CB CLOSING ACTIVATED
E22	106	CB CLOSING RESET
E23	107	CB OPEN FAILED
E24	108	CB CLOSING FAILED
E25	109	AR INTERRUPTED
E26	110	INT. BLOCKING RESET
E27	111	NON-AR CB CLOSING
E28	112	NON-PROTEC. CB OPEN.
E50	205	RESTARTING
E51	206	REG. OVERFLOW

E52	207	COMMUNICATION
E53	208	RESPONDS FAILED
E54	208	RESPONDS AGAIN

3.4.3.33. SPCU1C1

Table 3.4.3.33-1 SPCU1C1:

E code	Index	Object Text
E1	11	U> START ON
E2	11	U> START OFF
E3	12	U> TRIP ON
E4	12	U> TRIP OFF
E5	13	U< START ON
E6	13	U< START OFF
E7	14	U< TRIP ON
E8	14	U< TRIP OFF
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.34. SPCU1C6

Table 3.4.3.34-1 SPCU1C6:

E code	Index	Object Text
E1	15	U0> START ON
E2	15	U0> START OFF
E3	16	U0> TRIP ON
E4	16	U0> TRIP OFF
E5	17	U0>> START ON
E6	17	U0>> START OFF
E7	18	U0>> TRIP ON
E8	18	U0>> TRIP OFF
E50	184	RESTARTING
E51	185	REG. OVERFLOW
E52	186	COMMUNICATION
E53	187	RESPONDS FAILED
E54	187	RESPONDS AGAIN

3.4.3.35. SPCU1D39

Table 3.4.3.35-1 SPCU1D39:

E code	Index	Object Text
E9	119	U0> START ON
E10	119	U0> START OFF
E11	120	U0> FIRST TRIP ON
E12	120	U0> FIRST TRIP OFF
E17	123	OUTPUT SS1 ON
E18	123	OUTPUT SS1 OFF
E19	124	OUTPUT TS1 ON
E20	124	OUTPUT TS1 OFF
E21	125	OUTPUT SS2 ON
E22	125	OUTPUT SS2 OFF
E23	126	OUTPUT TS2 ON
E24	126	OUTPUT TS2 OFF
E25	127	OUTPUT SS3 ON
E26	127	OUTPUT SS3 OFF
E27	128	OUTPUT TS3 ON
E28	128	OUTPUT TS3 OFF
E29	129	OUTPUT SS4 ON
E30	129	OUTPUT SS4 OFF
E31	130	OUTPUT TS4 ON
E32	130	OUTPUT TS4 OFF
E50	209	RESTARTING
E51	210	REG. OVERFLOW
E52	211	COMMUNICATION
E53	212	RESPONDS FAILED
E54	212	RESPONDS AGAIN

3.4.3.36. SPCU1D47

Table 3.4.3.36-1 SPCU1D47:

E code	Index	Object Text
E9	135	U0> START ON
E10	135	U0> START OFF
E11	136	U0> FIRST TRIP ON
E12	136	U0> FIRST TRIP OFF
E17	139	OUTPUT SS1 ON
E18	139	OUTPUT SS1 OFF
E19	140	OUTPUT TS1 ON

E code	Index	Object Text
E20	140	OUTPUT TS1 OFF
E21	141	OUTPUT SS2 ON
E22	141	OUTPUT SS2 OFF
E23	142	OUTPUT TS2 ON
E24	142	OUTPUT TS2 OFF
E25	143	OUTPUT SS3 ON
E26	143	OUTPUT SS3 OFF
E27	144	OUTPUT TS3 ON
E28	144	OUTPUT TS3 OFF
E29	145	OUTPUT SS4 ON
E30	145	OUTPUT SS4 OFF
E31	146	OUTPUT TS4 ON
E32	146	OUTPUT TS4 OFF
E50	213	RESTARTING
E51	214	REG. OVERFLOW
E52	215	COMMUNICATION
E53	216	RESPONDS FAILED
E54	216	RESPONDS AGAIN

3.4.3.37. SPCU3C14

Table 3.4.3.37-1 SPCU3C14:

E code	Index	Object Text
E1	19	U> START ON
E2	19	U> START OFF
E3	20	U> TRIP ON
E4	20	U> TRIP OFF
E5	21	U< START ON
E6	21	U< START OFF
E7	22	U< TRIP ON
E8	22	U< TRIP OFF
E50	188	RESTARTING
E51	189	REG. OVERFLOW
E52	190	COMMUNICATION
E53	191	RESPONDS FAILED
E54	191	RESPONDS AGAIN

3.4.3.38. SPCU3C15

Table 3.4.3.38-1 SPCU3C15:

E code	Index	Object Text
E1	23	U< START ON
E2	23	U< START OFF
E3	24	U< TRIP ON
E4	24	U< TRIP OFF
E5	25	3U<< START ON
E6	25	3U<< START OFF
E7	26	3U<< TRIP ON
E8	26	3U<< TRIP OFF
E50	192	RESTARTING
E51	193	REG. OVERFLOW
E52	194	COMMUNICATION
E53	195	RESPONDS FAILED
E54	195	RESPONDS AGAIN

3.4.3.39. SPCU3D45

Table 3.4.3.39-1 SPCU3D45:

E code	Index	Object Text
E1	150	SC13 START ON
E2	150	SC13 START OFF
E3	151	SC13 CLOSE ON
E4	152	VC13 START ON
E5	152	VC13 START OFF
E6	153	VC13 CLOSE ON
E7	154	SC23 START ON
E8	154	SC23 START OFF
E9	155	SC23 CLOSE ON
E10	156	VC23 START ON
E11	156	VC23 START OFF
E12	157	VC23 CLOSE ON
E13	158	BS13 ON
E14	158	BS13 OFF
E15	159	CS13 ON
E16	159	CS13 OFF
E17	160	BS23 ON
E18	160	BS23 OFF
E19	161	CS23 ON

E code	Index	Object Text
E20	161	CS23 OFF
E21	162	CB13 ON
E22	162	CB13 OFF
E23	163	CB23 ON
E24	163	CB23 OFF
E25	164	ALARM ON
E26	164	ALARM OFF
E50	217	RESTARTING
E51	218	REG. OVERFLOW
E52	219	COMMUNICATION
E53	220	RESPONDS FAILED
E54	220	RESPONDS AGAIN

3.4.3.40. SPTO1C1

Table 3.4.3.40-1 SPTO1C1:

E code	Index	Object Text
E1	10	EARTHING DISCON. OPEN
E2	10	EARTHING DISCON. CLOSED
E3	10	EARTHING DISCON. UNDEF.
Channel 1		
E1	21	CB 1 OPEN
E2	21	CB 1 CLOSE
E3	21	CB 1 UNDEF.
E4	24	TRUCK 1 OPEN
E5	24	TRUCK 1 CLOSE
E6	24	TRUCK 1 UNDEF.
E7	27	CH1 CONTROL BLOCKED
E8	28	CH1 CONTROL FAILURE
E9	29	CH1 NOT IN ALERT ST.
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.41. SPTO1C4

Table 3.4.3.41-1 SPTO1C4:

E code	Index	Object Text
E1	11	EARTHING DISCON. OPEN
E2	11	EARTHING DISCON. CLOSED
E3	11	EARTHING DISCON. UNDEF.
Channel 1		
E1	12	CB 1 OPEN
E2	12	CB 1 CLOSE
E3	12	CB 1 UNDEF.
E4	13	BUSBAR DISC. 1 OPEN
E5	13	BUSBAR DISC. 1 CLOSE
E6	13	BUSBAR DISC. 1 UNDEF.
E7	14	CB1 CONTROL BLOCKED
E8	15	CB1 CONTROL FAILURE
E9	16	CB1 NOT IN ALERT ST.
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.42. SPTO1D2

Table 3.4.3.42-1 SPTO1D2:

E code	Index	Object Text
E1	10	KEY SWITCH L/R
E2	10	KEY SWITCH L/R
E3	12	TEST SWITCH (SG1/1) ON
E4	12	TEST SWITCH (SG1/1) OFF
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN
Channel 1		
E1	55	CH1 STATUS OPEN
E2	55	CH1 STATUS CLOSED
E3	55	CH1 STATUS UNDEF.

E code	Index	Object Text
E4	55	CH1 STATUS UNDEF.
E5	59	CH1 OPEN ACTIVATED
E6	59	CH1 OPEN RESET
E7	61	CH1 CLOSE ACTIVATED
E8	61	CH1 CLOSE RESET
E9	63	CH1 ACTIV. INHIB.
E10	64	CH1 ACTIV. FAILED
E11	65	CH1 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 2		
E1	66	CH2 STATUS OPEN
E2	66	CH2 STATUS CLOSED
E3	66	CH2 STATUS UNDEF.
E4	66	CH2 STATUS UNDEF.
E5	70	CH2 OPEN ACTIVATED
E6	70	CH2 OPEN RESET
E7	72	CH2 CLOSE ACTIVATED
E8	72	CH2 CLOSE RESET
E9	74	CH2 ACTIV. INHIB.
E10	75	CH2 ACTIV. FAILED
E11	76	CH2 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 3		
E1	77	CH3 STATUS OPEN
E2	77	CH3 STATUS CLOSED
E3	77	CH3 STATUS UNDEF.
E4	77	CH3 STATUS UNDEF.
E5	81	CH3 OPEN ACTIVATED
E6	81	CH3 OPEN RESET
E7	83	CH3 CLOSE ACTIVATED
E8	83	CH3 CLOSE RESET
E9	85	CH3 ACTIV. INHIB.
E10	86	CH3 ACTIV. FAILED
E11	87	CH3 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 4		
E1	88	CH4 INPUT ACTIVATED
E2	88	CH4 INPUT RESET
E3	90	CH4 SIGNAL 1 .. 3 ACTIVATED
E4	90	CH4 SIGNAL 1 .. 3 RESET
Channel 5		
E1	92	CH5 INPUT ACTIVATED

E code	Index	Object Text
E2	92	CH5 INPUT RESET
E3	94	CH5 SIGNAL 1 .. 3 ACTIVATED
E4	94	CH5 SIGNAL 1 .. 3 RESET
Channel 6		
E1	96	CH6 INPUT ACTIVATED
E2	96	CH6 INPUT RESET
E3	98	CH6 SIGNAL 1 .. 3 ACTIVATED
E4	98	CH6 SIGNAL 1 .. 3 RESET
Channel 7		
E1	100	CH7 INPUT ACTIVATED
E2	100	CH7 INPUT RESET
E3	102	CH7 SIGNAL 1 .. 3 ACTIVATED
E4	102	CH7 SIGNAL 1 .. 3 RESET
Channel 8		
E1	104	CH8 INPUT ACTIVATED
E2	104	CH8 INPUT RESET
E3	106	CH8 SIGNAL 1 .. 3 ACTIVATED
E4	106	CH8 SIGNAL 1 .. 3 RESET
Channel 9		
E1	108	CH9 INPUT ACTIVATED
E2	108	CH9 INPUT RESET
E3	110	CH9 SIGNAL 1 .. 3 ACTIVATED
E4	110	CH9 SIGNAL 1 .. 3 RESET
Channel 10		
E1	112	CH10 INPUT ACTIVATED
E2	112	CH10 INPUT RESET
E3	114	CH10 SIGNAL 1 .. 3 ACTIVATED
E4	114	CH10 SIGNAL 1 .. 3 RESET
Channel 11		
E1	116	CH11 INPUT ACTIVATED
E2	116	CH11 INPUT RESET
E3	118	CH11 SIGNAL 1 .. 3 ACTIVATED
E4	118	CH11 SIGNAL 1 .. 3 RESET
Channel 12		
E1	120	CH12 INPUT ACTIVATED
E2	120	CH12 INPUT RESET
E3	122	CH12 SIGNAL 1 .. 3 ACTIVATED
E4	122	CH12 SIGNAL 1 .. 3 RESET
Channel 13		

E code	Index	Object Text
E1	124	CH13 INPUT ACTIVATED
E2	124	CH13 INPUT RESET
E3	126	CH13 SIGNAL 1 .. 3 ACTIVATED
E4	126	CH13 SIGNAL 1 .. 3 RESET

3.4.3.43. SPTO1D5

Table 3.4.3.43-1 SPTO1D5:

E code	Index	Object Text
E1	20	KEY SWITCH L/R
E2	20	KEY SWITCH L/R
E3	21	TEST SWITCH (SG1/1) ON
E4	21	TEST SWITCH (SG1/1) OFF
E50	184	RESTARTING
E51	185	REG. OVERFLOW
E52	186	COMMUNICATION
E53	187	RESPONDS FAILED
E54	187	RESPONDS AGAIN
Channel 1		
E1	22	CH1 STATUS OPEN
E2	22	CH1 STATUS CLOSED
E3	22	CH1 STATUS UNDEF.
E4	22	CH1 STATUS UNDEF.
E5	23	CH1 OPEN ACTIVATED
E6	23	CH1 OPEN RESET
E7	24	CH1 CLOSE ACTIVATED
E8	24	CH1 CLOSE RESET
E9	25	CH1 ACTIV. INHIB.
E10	26	CH1 ACTIV. FAILED
E11	27	CH1 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 2		
E1	28	CH2 STATUS OPEN
E2	28	CH2 STATUS CLOSED
E3	28	CH2 STATUS UNDEF.
E4	28	CH2 STATUS UNDEF.
E5	29	CH2 OPEN ACTIVATED
E6	29	CH2 OPEN RESET
E7	30	CH2 CLOSE ACTIVATED
E8	30	CH2 CLOSE RESET

E code	Index	Object Text
E9	31	CH2 ACTIV. INHIB.
E10	32	CH2 ACTIV. FAILED
E11	33	CH2 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 3		
E1	34	CH3 STATUS OPEN
E2	34	CH3 STATUS CLOSED
E3	34	CH3 STATUS UNDEF.
E4	34	CH3 STATUS UNDEF.
E5	35	CH3 OPEN ACTIVATED
E6	35	CH3 OPEN RESET
E7	36	CH3 CLOSE ACTIVATED
E8	36	CH3 CLOSE RESET
E9	37	CH3 ACTIV. INHIB.
E10	38	CH3 ACTIV. FAILED
E11	39	CH3 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 4		
E1	40	CH4 INPUT ACTIVATED
E2	40	CH4 INPUT RESET
E3	41	CH4 SIGNAL 1 .. 3 ACTIVATED
E4	41	CH4 SIGNAL 1 .. 3 RESET
Channel 5		
E1	42	CH5 INPUT ACTIVATED
E2	42	CH5 INPUT RESET
E3	43	CH5 SIGNAL 1 .. 3 ACTIVATED
E4	43	CH5 SIGNAL 1 .. 3 RESET
Channel 6		
E1	44	CH6 INPUT ACTIVATED
E2	44	CH6 INPUT RESET
E3	45	CH6 SIGNAL 1 .. 3 ACTIVATED
E4	45	CH6 SIGNAL 1 .. 3 RESET
Channel 7		
E1	46	CH7 INPUT ACTIVATED
E2	46	CH7 INPUT RESET
E3	47	CH7 SIGNAL 1 .. 3 ACTIVATED
E4	47	CH7 SIGNAL 1 .. 3 RESET
Channel 8		
E1	48	CH8 INPUT ACTIVATED
E2	48	CH8 INPUT RESET
E3	49	CH8 SIGNAL 1 .. 3 ACTIVATED

E code	Index	Object Text
E4	49	CH8 SIGNAL 1 .. 3 RESET
Channel 9		
E1	50	CH9 INPUT ACTIVATED
E2	50	CH9 INPUT RESET
E3	51	CH9 SIGNAL 1 .. 3 ACTIVATED
E4	51	CH9 SIGNAL 1 .. 3 RESET
Channel 10		
E1	52	CH10 INPUT ACTIVATED
E2	52	CH10 INPUT RESET
E3	53	CH10 SIGNAL 1 .. 3 ACTIVATED
E4	53	CH10 SIGNAL 1 .. 3 RESET
Channel 11		
E1	54	CH11 INPUT ACTIVATED
E2	54	CH11 INPUT RESET
E3	55	CH11 SIGNAL 1 .. 3 ACTIVATED
E4	55	CH11 SIGNAL 1 .. 3 RESET
Channel 12		
E1	56	CH12 INPUT ACTIVATED
E2	56	CH12 INPUT RESET
E3	57	CH12 SIGNAL 1 .. 3 ACTIVATED
E4	57	CH12 SIGNAL 1 .. 3 RESET
Channel 13		
E1	58	CH13 INPUT ACTIVATED
E2	58	CH13 INPUT RESET
E3	59	CH13 SIGNAL 1 .. 3 ACTIVATED
E4	59	CH13 SIGNAL 1 .. 3 RESET

3.4.3.44. SPTO1D6

Table 3.4.3.44-1 SPTO1D6:

E code	Index	Object Text
E1	10	KEY SWITCH L/R
E2	10	KEY SWITCH L/R
E3	12	TEST SWITCH (SG1/1) ON
E4	12	TEST SWITCH (SG1/1) OFF
E5	14	SWICH (SG1/2) ON
E6	14	SWICH (SG1/2) OFF
E7	16	TRIP CIRCUIT FAILURE
E8	16	TRIP CIRCUIT FAILURE RESET

E code	Index	Object Text
E9	18	CURRENT INPUT FAIL.
E10	18	CURRENT INPUT FAIL. RESET
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN
Channel 1		
E1	55	CH1 STATUS OPEN
E2	55	CH1 STATUS CLOSED
E3	55	CH1 STATUS UNDEF.
E4	55	CH1 STATUS UNDEF.
E5	59	CH1 OPEN ACTIVATED
E6	59	CH1 OPEN RESET
E7	61	CH1 CLOSE ACTIVATED
E8	61	CH1 CLOSE RESET
E9	63	CH1 ACTIV. INHIB.
E10	64	CH1 ACTIV. FAILED
E11	65	CH1 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 2		
E1	66	CH2 STATUS OPEN
E2	66	CH2 STATUS CLOSED
E3	66	CH2 STATUS UNDEF.
E4	66	CH2 STATUS UNDEF.
E5	70	CH2 OPEN ACTIVATED
E6	70	CH2 OPEN RESET
E7	72	CH2 CLOSE ACTIVATED
E8	72	CH2 CLOSE RESET
E9	74	CH2 ACTIV. INHIB.
E10	75	CH2 ACTIV. FAILED
E11	76	CH2 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 3		
E1	77	CH3 STATUS OPEN
E2	77	CH3 STATUS CLOSED
E3	77	CH3 STATUS UNDEF.
E4	77	CH3 STATUS UNDEF.
E5	81	CH3 OPEN ACTIVATED
E6	81	CH3 OPEN RESET
E7	83	CH3 CLOSE ACTIVATED

E code	Index	Object Text
E8	83	CH3 CLOSE RESET
E9	85	CH3 ACTIV. INHIB.
E10	86	CH3 ACTIV. FAILED
E11	87	CH3 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 4		
E1	88	CH4 INPUT ACTIVATED
E2	88	CH4 INPUT RESET
E3	90	CH4 SIGNAL 1 .. 4 ACTIVATED
E4	90	CH4 SIGNAL 1 .. 4 RESET
Channel 5		
E1	92	CH5 INPUT ACTIVATED
E2	92	CH5 INPUT RESET
E3	94	CH5 SIGNAL 1 .. 4 ACTIVATED
E4	94	CH5 SIGNAL 1 .. 4 RESET
Channel 6		
E1	96	CH6 INPUT ACTIVATED
E2	96	CH6 INPUT RESET
E3	98	CH6 SIGNAL 1 .. 4 ACTIVATED
E4	98	CH6 SIGNAL 1 .. 4 RESET
Channel 7		
E1	100	CH7 INPUT ACTIVATED
E2	100	CH7 INPUT RESET
E3	102	CH7 SIGNAL 1 .. 4 ACTIVATED
E4	102	CH7 SIGNAL 1 .. 4 RESET
Channel 8		
E1	104	CH8 INPUT ACTIVATED
E2	104	CH8 INPUT RESET
E3	106	CH8 SIGNAL 1 .. 4 ACTIVATED
E4	106	CH8 SIGNAL 1 .. 4 RESET
Channel 9		
E1	108	CH9 INPUT ACTIVATED
E2	108	CH9 INPUT RESET
E3	110	CH9 SIGNAL 1 .. 4 ACTIVATED
E4	110	CH9 SIGNAL 1 .. 4 RESET
Channel 10		
E1	112	CH10 INPUT ACTIVATED
E2	112	CH10 INPUT RESET
E3	114	CH10 SIGNAL 1 .. 4 ACTIVATED
E4	114	CH10 SIGNAL 1 .. 4 RESET

E code	Index	Object Text
Channel 11		
E1	116	CH11 INPUT ACTIVATED
E2	116	CH11 INPUT RESET
E3	118	CH11 SIGNAL 1 .. 4 ACTIVATED
E4	118	CH11 SIGNAL 1 .. 4 RESET
Channel 12		
E1	120	CH12 INPUT ACTIVATED
E2	120	CH12 INPUT RESET
E3	122	CH12 SIGNAL 1 .. 4 ACTIVATED
E4	122	CH12 SIGNAL 1 .. 4 RESET
Channel 13		
E1	124	CH13 INPUT ACTIVATED
E2	124	CH13 INPUT RESET
E3	126	CH13 SIGNAL 1 .. 4 ACTIVATED
E4	126	CH13 SIGNAL 1 .. 4 RESET

3.4.3.45. SPTO2C2

Table 3.4.3.45-1 SPTO2C2:

E code	Index	Object Text
E1	10	EARTHING DISCON. OPEN
E2	10	EARTHING DISCON. CLOSED
E3	10	EARTHING DISCON. UNDEF.
Channel 1		
E1	21	CB 1 OPEN
E2	21	CB 1 CLOSE
E3	21	CB 1 UNDEF.
E4	24	TRUCK 1 OPEN
E5	24	TRUCK 1 CLOSE
E6	24	TRUCK 1 UNDEF.
E7	27	CH1 CONTROL BLOCKED
E8	28	CH1 CONTROL FAILURE
E9	29	CH1 NOT IN ALERT ST.
Channel 2		
E1	30	CB 2 OPEN
E2	30	CB 2 CLOSE
E3	30	CB 2 UNDEF.
E4	33	TRUCK 2 OPEN
E5	33	TRUCK 2 CLOSE

E code	Index	Object Text
E6	33	TRUCK 2 UNDEF.
E7	36	CH2 CONTROL BLOCKED
E8	37	CH2 CONTROL FAILURE
E9	38	CH2 NOT IN ALERT ST.
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.46. SPTO6D3

Table 3.4.3.46-1 SPTO6D3:

E code	Index	Object Text
E1	10	KEY SWITCH L/R
E2	10	KEY SWITCH L/R
E3	12	TEST SWITCH (SG1/1) ON
E4	12	TEST SWITCH (SG1/1) OFF
E5	14	AUTO-RECLOSE ON
E6	14	AUTO-RECLOSE OFF
E7	16	AR INTERRUPTED
E8	17	AR INTER. BY O COM.
E9	18	AR INTER. BY ARINH
E10	19	FAILED C COM. BY AR
E11	20	SHOT 1 IN PROGRESS
E12	21	CB CLOSED BY SHOT 1
E13	22	SHOT 1 BY SIGN. AR1
E14	23	SHOT 1 BY SIGN. AR2
E15	24	SHOT 1 BY SIGN. AR3
E16	25	SHOT 2 IN PROGRESS
E17	26	CB CLOSED BY SHOT 2
E18	27	SHOT 2 BY SIGN. AR1
E19	28	SHOT 2 BY SIGN. AR2
E20	29	SHOT 2 BY SIGN. AR3
E21	30	SHOT 3 IN PROGRESS
E22	31	CB CLOSED BY SHOT 3
E23	32	SHOT 3 BY SIGN. AR1
E24	33	SHOT 3 BY SIGN. AR2

E code	Index	Object Text
E25	34	SHOT 3 BY SIGN. AR3
E26	35	SHOT 4 IN PROGRESS
E27	36	CB CLOSED BY SHOT 4
E28	37	SHOT 4 BY SIGN. AR1
E29	38	SHOT 4 BY SIGN. AR2
E30	39	SHOT 4 BY SIGN. AR3
E31	40	SHOT 5 IN PROGRESS
E32	41	CB CLOSED BY SHOT 5
E33	42	SHOT 5 BY SIGN. AR1
E34	43	SHOT 5 BY SIGN. AR2
E35	44	SHOT 5 BY SIGN. AR3
E36	45	FINAL TRIP BY AR1
E37	46	FINAL TRIP BY AR2
E38	47	FINAL TRIP BY AR3
E39	48	FINAL TRIP BY H-SET
E40	49	FINAL TRIP BY L-SET
E41	50	FINAL TRIP BY E/F
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN
Channel 1		
E1	55	CH1 STATUS OPEN
E2	55	CH1 STATUS CLOSED
E3	55	CH1 STATUS UNDEF.
E4	55	CH1 STATUS UNDEF.
E5	59	CH1 OPEN ACTIVATED
E6	59	CH1 OPEN RESET
E7	61	CH1 CLOSE ACTIVATED
E8	61	CH1 CLOSE RESET
E9	63	CH1 ACTIV. INHIB.
E10	64	CH1 ACTIV. FAILED
E11	65	CH1 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 2		
E1	66	CH2 STATUS OPEN
E2	66	CH2 STATUS CLOSED
E3	66	CH2 STATUS UNDEF.
E4	66	CH2 STATUS UNDEF.

E code	Index	Object Text
E5	70	CH2 OPEN ACTIVATED
E6	70	CH2 OPEN RESET
E7	72	CH2 CLOSE ACTIVATED
E8	72	CH2 CLOSE RESET
E9	74	CH2 ACTIV. INHIB.
E10	75	CH2 ACTIV. FAILED
E11	76	CH2 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 3		
E1	77	CH3 STATUS OPEN
E2	77	CH3 STATUS CLOSED
E3	77	CH3 STATUS UNDEF.
E4	77	CH3 STATUS UNDEF.
E5	81	CH3 OPEN ACTIVATED
E6	81	CH3 OPEN RESET
E7	83	CH3 CLOSE ACTIVATED
E8	83	CH3 CLOSE RESET
E9	85	CH3 ACTIV. INHIB.
E10	86	CH3 ACTIV. FAILED
E11	87	CH3 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 4		
E1	88	CH4 STATUS OPEN
E2	88	CH4 STATUS CLOSED
E3	88	CH4 STATUS UNDEF.
E4	88	CH4 STATUS UNDEF.
E5	92	CH4 OPEN ACTIVATED
E6	92	CH4 OPEN RESET
E7	94	CH4 CLOSE ACTIVATED
E8	94	CH4 CLOSE RESET
E9	96	CH4 ACTIV. INHIB.
E10	97	CH4 ACTIV. FAILED
E11	98	CH4 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 5		
E1	99	CH5 STATUS OPEN
E2	99	CH5 STATUS CLOSED
E3	99	CH5 STATUS UNDEF.
E4	99	CH5 STATUS UNDEF.
E5	103	CH5 OPEN ACTIVATED
E6	103	CH5 OPEN RESET
E7	105	CH5 CLOSE ACTIVATED

E code	Index	Object Text
E8	105	CH5 CLOSE RESET
E9	107	CH5 ACTIV. INHIB.
E10	108	CH5 ACTIV. FAILED
E11	109	CH5 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 6		
E1	110	CH6 STATUS OPEN
E2	110	CH6 STATUS CLOSED
E3	110	CH6 STATUS UNDEF.
E4	110	CH6 STATUS UNDEF.
E5	114	CH6 OPEN ACTIVATED
E6	114	CH6 OPEN RESET
E7	116	CH6 CLOSE ACTIVATED
E8	116	CH6 CLOSE RESET
E9	118	CH6 ACTIV. INHIB.
E10	119	CH6 ACTIV. FAILED
E11	120	CH6 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 7		
E1	121	CH7 STATUS OPEN
E2	121	CH7 STATUS CLOSED
E3	121	CH7 STATUS UNDEF.
E4	121	CH7 STATUS UNDEF.
E5	125	CH7 OPEN ACTIVATED
E6	125	CH7 OPEN RESET
E7	127	CH7 CLOSE ACTIVATED
E8	127	CH7 CLOSE RESET
E9	129	CH7 ACTIV. INHIB.
E10	130	CH7 ACTIV. FAILED
E11	131	CH7 ATTEMPT TO ACTIV. WITHOUT SEL.
Channel 8		
E1	132	CH8 INPUT ACTIVATED
E2	132	CH8 INPUT RESET
E3	134	CH8 SIGNAL 5 OR 6 ACTIVATED
E4	134	CH8 SIGNAL 5 OR 6 RESET
Channel 9		
E1	136	CH9 INPUT ACTIVATED
E2	136	CH9 INPUT RESET
E3	138	CH9 SIGNAL 5 OR 6 ACTIVATED
E4	138	CH9 SIGNAL 5 OR 6 RESET
Channel 10		

E code	Index	Object Text
E1	140	CH10 INPUT ACTIVATED
E2	140	CH10 INPUT RESET
E3	142	CH10 SIGNAL 5 OR 6 ACTIVATED
E4	142	CH10 SIGNAL 5 OR 6 RESET
Channel 11		
E1	144	CH11 INPUT ACTIVATED
E2	144	CH11 INPUT RESET
E3	146	CH11 SIGNAL 5 OR 6 ACTIVATED
E4	146	CH11 SIGNAL 5 OR 6 RESET
Channel 12		
E1	148	CH12 INPUT ACTIVATED
E2	148	CH12 INPUT RESET
E3	150	CH12 SIGNAL 5 OR 6 ACTIVATED
E4	150	CH12 SIGNAL 5 OR 6 RESET
Channel 13		
E1	152	CH13 INPUT ACTIVATED
E2	152	CH13 INPUT RESET
E3	154	CH13 SIGNAL 5 OR 6 ACTIVATED
E4	154	CH13 SIGNAL 5 OR 6 RESET
Channel 14		
E1	156	CH14 INPUT ACTIVATED
E2	156	CH14 INPUT RESET
E3	158	CH14 SIGNAL 5 OR 6 ACTIVATED
E4	158	CH14 SIGNAL 5 OR 6 RESET
Channel 15		
E1	160	CH15 INPUT ACTIVATED
E2	160	CH15 INPUT RESET
E3	162	CH15 SIGNAL 5 OR 6 ACTIVATED
E4	162	CH15 SIGNAL 5 OR 6 RESET
Channel 16		
E1	164	CH16 INPUT ACTIVATED
E2	164	CH16 INPUT RESET
E3	166	CH16 SIGNAL 5 OR 6 ACTIVATED
E4	166	CH16 SIGNAL 5 OR 6 RESET
Channel 17		
E1	168	CH17 INPUT ACTIVATED
E2	168	CH17 INPUT RESET
E3	170	CH17 SIGNAL 5 OR 6 ACTIVATED
E4	170	CH17 SIGNAL 5 OR 6 RESET

3.4.3.47. SPTO12D4

Table 3.4.3.47-1 SPTO12D4:

E code	Index	Object Text	
E50	190	RESTARTING	
E51	191	REG. OVERFLOW	
E52	192	COMMUNICATION	
E53	193	RESPONDS	FAILED
E54	193	RESPONDS	AGAIN
Channel 1			
E1	63	CH1 STATUS	CLOSED
E2	63	CH1 STATUS	OPEN
E3	63	CH1 STATUS	UNDEF.
E4	63	CH1 STATUS	UNDEF.
Channel 2			
E1	64	CH2 STATUS	CLOSED
E2	64	CH2 STATUS	OPEN
Channel 3			
E1	65	CH3 STATUS	CLOSED
E2	65	CH3 STATUS	OPEN
E3	65	CH3 STATUS	UNDEF.
E4	65	CH3 STATUS	UNDEF.
Channel 4			
E1	66	CH4 STATUS	CLOSED
E2	66	CH4 STATUS	OPEN
Channel 5			
E1	67	CH5 STATUS	CLOSED
E2	67	CH5 STATUS	OPEN
E3	67	CH5 STATUS	UNDEF.
E4	67	CH5 STATUS	UNDEF.
Channel 6			
E1	68	CH6 STATUS	CLOSED
E2	68	CH6 STATUS	OPEN
Channel 7			
E1	69	CH7 STATUS	CLOSED
E2	69	CH7 STATUS	OPEN
E3	69	CH7 STATUS	UNDEF.
E4	69	CH7 STATUS	UNDEF.
Channel 8			
E1	70	CH8 STATUS	CLOSED

E code	Index	Object Text	
E2	70	CH8 STATUS	OPEN
Channel 9			
E1	71	CH9 STATUS	CLOSED
E2	71	CH9 STATUS	OPEN
E3	71	CH9 STATUS	UNDEF.
E4	71	CH9 STATUS	UNDEF.
Channel 10			
E1	72	CH10 STATUS	CLOSED
E2	72	CH10 STATUS	OPEN
Channel 11			
E1	73	CH11 STATUS	CLOSED
E2	73	CH11 STATUS	OPEN
E3	73	CH11 STATUS	UNDEF.
E4	73	CH11 STATUS	UNDEF.
Channel 12			
E1	74	CH12 STATUS	CLOSED
E2	74	CH12 STATUS	OPEN
Channel 13			
E1	75	CH13 STATUS	CLOSED
E2	75	CH13 STATUS	OPEN
E3	75	CH13 STATUS	UNDEF.
E4	75	CH13 STATUS	UNDEF.
Channel 14			
E1	76	CH14 STATUS	CLOSED
E2	76	CH14 STATUS	OPEN
Channel 15			
E1	77	CH15 STATUS	CLOSED
E2	77	CH15 STATUS	OPEN
E3	77	CH15 STATUS	UNDEF.
E4	77	CH15 STATUS	UNDEF.
Channel 16			
E1	78	CH16 STATUS	CLOSED
E2	78	CH16 STATUS	OPEN

3.4.3.48. REC 501

Table 3.4.3.48-1 REC 501:

E code	Index	Object Text
E1	11	INPUT I1
E2	11	INPUT I1
E3	12	INPUT I2
E4	12	INPUT I2
E5	13	INPUT I3
E6	13	INPUT I3
E7	14	INPUT I4
E8	14	INPUT I4
E10	15	INPUT I5
E11	15	INPUT I5
E12	16	BATTERY VOLTAGE LOW
E13	16	BATTERY VOLTAGE NORMAL
E14	17	POWER SUPPLY TEMP. HIGH
E15	17	POWER SUPPLY TEMP. NORMAL
E16	18	AUX. SUPPLY CONNECTION
E17	18	AUX. SUPPLY CONNECTION
E18	19	INTERMDT COUNTER 1 NEW VALUE
E19	20	INTERMDT COUNTER 2 NEW VALUE
E20	21	PERIOD COUNTER 1 NEW VALUE
E21	22	PERIOD COUNTER 2 NEW VALUE
E30	17	OUTPUT O1
E31	17	OUTPUT O1
E32	18	OUTPUT O2
E33	18	OUTPUT O2
E34	19	OUTPUT O3
E35	20	OUTPUT O3
E36	21	OUTPUT O4
E37	22	OUTPUT O4
Channel 1		
E40	27	OBJECT 1 STATUS->10
E41	27	OBJECT 1 STATUS->01
E42	27	OBJECT 1 STATUS->11
E43	27	OBJECT 1 STATUS->00
E44	28	OBJECT 1,OPEN COMMAND
E45	29	OBJECT 1,CLOSE COMMAND
Channel 2		

E code	Index	Object Text
E40	30	OBJECT 2 STATUS->10
E41	30	OBJECT 2 STATUS->01
E42	30	OBJECT 2 STATUS->11
E43	30	OBJECT 2 STATUS->00
E44	31	OBJECT 2,OPEN COMMAND
E45	32	OBJECT 2,CLOSE COMMAND
E50	180	RESTARTING
E51	181	REG. OVERFLOW
E52	182	COMMUNICATION
E53	183	RESPONDS FAILED
E54	183	RESPONDS AGAIN

3.4.3.49. SPCF 1D15

Table 3.4.3.49-1 SPCF 1D15:

E code	Index	Object Text
E1	35	STAGE 1 ON
E2	35	STAGE 1 OFF
E3	36	STAGE 1 TIMER 1 TRIP ON
E4	36	STAGE 1 TIMER 1 TRIP OFF
E5	37	STAGE 1 TIMER 2 TRIP ON
E6	37	STAGE 1 TIMER 2 TRIP OFF
E7	38	STAGE 2 ON
E8	38	STAGE 2 OFF
E9	39	STAGE 2 TIMER 1 TRIP ON
E10	39	STAGE 2 TIMER 1 TRIP OFF
E11	40	STAGE 2 TIMER 2 TRIP ON
E12	40	STAGE 2 TIMER 2 TRIP OFF
E13	41	STAGE 3 ON
E14	41	STAGE 3 OFF
E15	42	STAGE 3 TIMER 1 TRIP ON
E16	42	STAGE 3 TIMER 1 TRIP OFF
E17	43	STAGE 3 TIMER 2 TRIP ON
E18	43	STAGE 3 TIMER 2 TRIP OFF
E19	44	STAGE 4 ON
E20	44	STAGE 4 OFF
E21	45	STAGE 4 TIMER 1 TRIP ON
E22	45	STAGE 4 TIMER 1 TRIP OFF
E23	46	STAGE 4 TIMER 2 TRIP ON

E code	Index	Object Text
E24	46	STAGE 4 TIMER 2 TRIP OFF
E25	47	OUTPUT SS1 ON
E26	47	OUTPUT SS1 OFF
E27	48	OUTPUT SS2 ON
E28	48	OUTPUT SS2 OFF
E29	49	OUTPUT SS3 ON
E30	49	OUTPUT SS3 OFF
E31	50	OUTPUT SS4 ON
E32	50	OUTPUT SS4 OFF
E33	51	OUTPUT TS1 ON
E34	51	OUTPUT TS1 OFF
E35	52	OUTPUT TS2 ON
E36	52	OUTPUT TS2 OFF
E37	53	OUTPUT TS3 ON
E38	53	OUTPUT TS3 OFF
E39	54	OUTPUT TS4 ON
E40	54	OUTPUT TS4 OFF
E41	55	RECOVERY FUNCTION ON
E42	55	RECOVERY FUNCTION OFF
E43	56	RECOV.FUNC INTRRPTD
E44	57	RECOV.FUNC OPERATING
E45	58	RECOV.FUNC RESET
E50	185	RESTARTING
E51	186	REG. OVERFLOW
E52	187	COMMUNICATION
E53	188	RESPONDS FAILED
E54	188	RESPONDS AGAIN

3.4.4. Format pictures and status texts

Table 3.4.4-1 Format pictures and status texts:

Filename	Value	Status text
FORM4FRALI.PIC	0 1 2 3 4 5	Normal Alarm Remote Local Off On
FORM4UMEV.PIC		Unmapped event

4. SPACOM Relay Setting Tool

4.1. Description

The SPACOM Relay Setting Tool is used for monitoring and setting parameter data of the SPACOM relays. This tool is used for relay units regarding parametrization.

4.1.1. Target systems

- Relay units based on SPACOM object type

4.1.2. Features/options

- On-line parametrization
- Off-line parametrization
- Upload/Download all parameters
- Upload/Download group of parameters
- Selection of setting group
- Reset of registers
- Authorization support in LIB 500/510
- Printing
- Comparison of relay and setting tool parameters

4.2. Tool environments

Depending on software environment, the SPACOM Relay Setting Tool can be started in different ways:

- In LIB 510/MicroSCADA, the Relay Setting Tool can be started from the relay symbol (push button) in the station picture (see Fig. 4.2.1.-1).
- In CAP 501/505 and SMS 510, you can use a tree navigator and select a relay. After this a list of tools is displayed and you can double-click the item Relay Setting Tool (see Fig. 4.2.2.-1).

4.2.1. Starting from LIB 510 in MicroSCADA

The relay units are displayed as push buttons in station pictures as seen in Fig. 4.2.1.-1 ("push button"). The relay functions can also be installed to be selected from the control panel of the bay function.

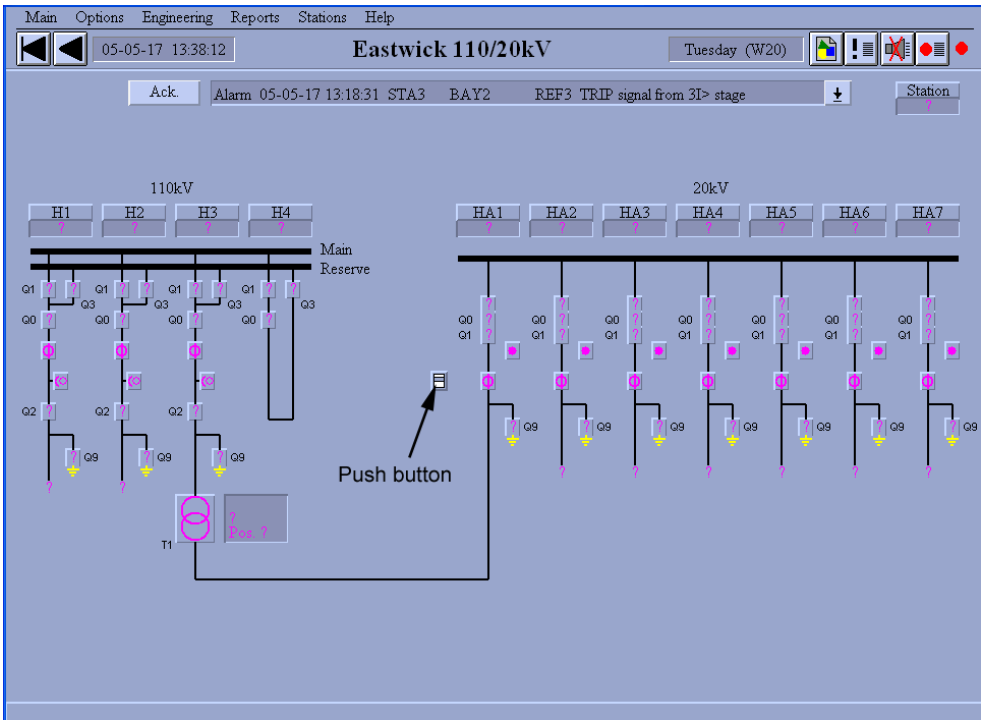


Fig. 4.2.1.-1 Station picture provided with a relay unit push button

By clicking the push button of any relay unit, the Relay Tool main view opens (see Fig. 4.2.1.-1).

4.2.2. Starting from CAP 501/505, SMS 510

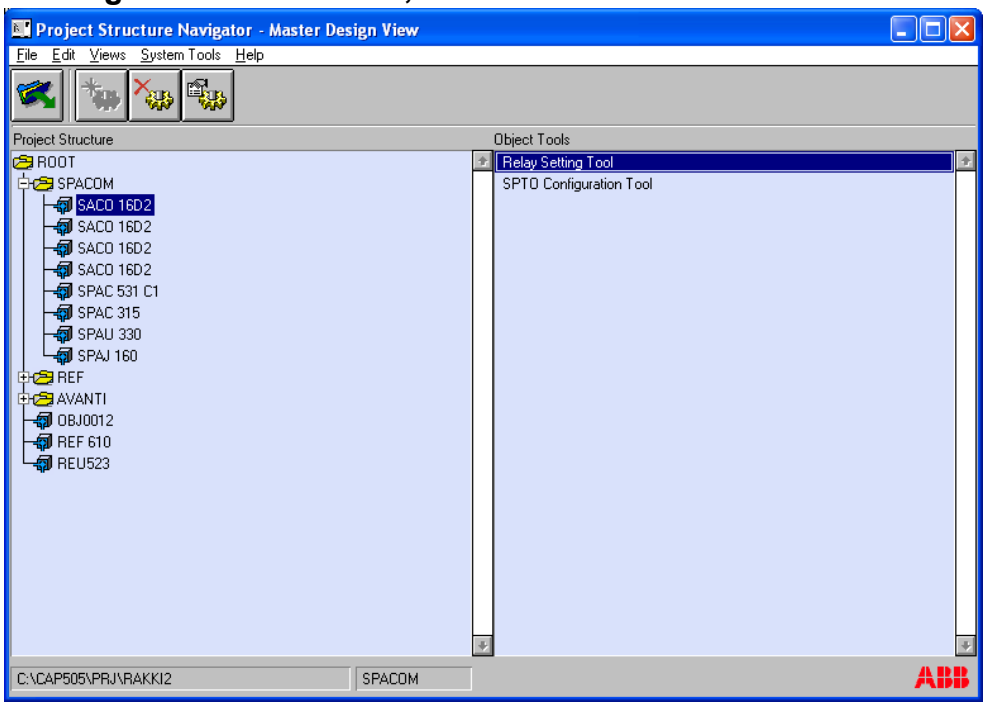


Fig. 4.2.2.-1 Starting Relay Setting Tool from the Project Structure Navigator

4.3. Relay Setting Tool

4.3.1. Main view

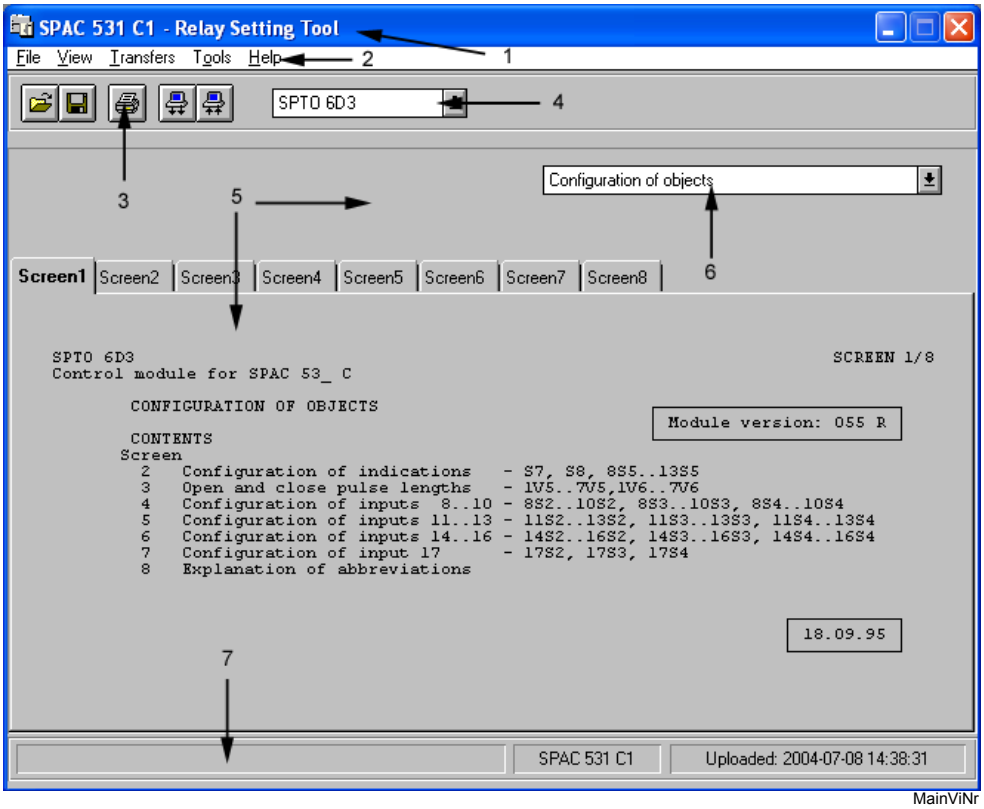


Fig. 4.3.1.-1 Relay Setting Tool main overview

1. Title Bar
2. Main Menu
3. Toolbar
4. Module Selection Box
5. Tool Area
6. Parameter Group List Box
7. Status Bar

The Relay Setting Tool automatically selects the first module of the relay to the module list (see Fig. 4.3.1.-1, item 4) and the first parameter group item from the parameter group list (see Fig. 4.3.1.-1, item 6). After that the tool opens the data for selections.

The tool uses the internal parameter file (values.ini) for storing the parameter values. The parameter file is created with the default values by the relay configuration dialog when the relay is installed into the project structure. The Relay Setting Tool maintains the file. The parameter values are updated to the parameter file every time when uploading is performed. All the values displayed by the tool are read from the parameter file. For example, if the user uploads parameter values, they are first updated to the file and after that read from the file to the tool.

1 Title bar

In LIB/MicroSCADA environment, the title bar shows the following information:

- Name of the application. Shown in LIB500/MicroSCADA application only
- Monitor number. Shown in LIB500/MicroSCADA application only
- Name of the object that the tool is using
- The name of the tool, for example Relay Setting Tool

2 Main menu

The main menu contains functions and commands for the Relay Tool.

3 Toolbar

The toolbar is a bar with buttons that perform some of the most common tasks. These functions are described in more detail further on in connection to File menu and Transfers menu.

Table 4.3.1-1 The toolbar buttons and their functions.

Button	Functionality
	Import (importing of parameter values)
	Export (saving of parameter values into the directory)
	Printing
	Download parameters (data sent to the relay)
	Upload parameters (data received from the relay)

4 Module Selection

The Module Selection box beside the toolbar buttons shows a list of installed modules. If there is more than one module of the same type, an instance number (like #2) is added to the module name. By selecting a module from the drop-down combo list, the user can focus the operations to the selected module.

5 Tool area

The tool area consists of a drop-down combo box and numbered pages. The tool area displays the selected view. The view is selected from the View menu. The default view is the Setting Tool.

The Relay Setting Tool (Settings, Registers, Setting Tool) is displayed on this part of the HSI. The Settings and Registers views present the most frequently used information from the relay. The Setting Tool function offers a complete tool for monitoring and configuring the relay.

6 Parameter Group List Box

The Parameter Group List box shows a list of parameters and current values. Click the drop-down combo box to select the values you wish to change.

7 Status bar

The status bar shows information about the current status of the tool. The status bar has the following fields:

1. Information about the relay type, e.g. SPAC 531
2. Upload status of the parameters. The status may be:

- Uploaded 0000-00-00 00:00, when the parameter values of the selected parameter group/view have been read from the default file or they have been imported.
- Uploaded 1999-10-08 10:17, when the parameter values of the selected parameter group/view have been read from the relay.

4.4. Using Relay Setting Tool

This section describes the submenus and commands that are available in the Relay Tool menus.

4.4.1. File menu

The File menu contains the functions belonging to the file handling.

Fig. 4.4.1.-1 The File menu

4.4.1.1. Importing

With the help of the Import dialog (see Fig. 4.4.1.1.-1) it is possible to read parameter values from the selected file that will be used by the Relay Setting Tool. The imported parameter values replace the old values in the parameter file.

To import parameters, select the desired file and directory and click Open. To exit the dialog without executing the importing process, click Cancel.

Access: Authorization level 2.

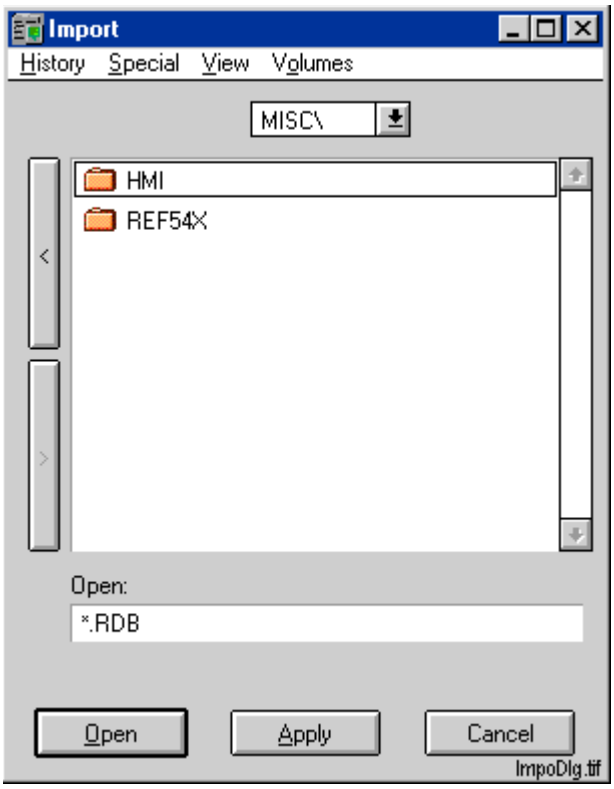


Fig. 4.4.1.1.-1 Import dialog

4.4.1.2. Exporting

Parameter values can be saved into files with the help of the Export dialog (see Fig. 4.4.1.2.-1). To export parameter values, select the desired file and directory by clicking the relevant fields. Enter the name of the directory/file into the field named Save as, and click the Save button. To exit the dialog without executing the exporting operation, click Cancel.

Access: Authorization level 2.

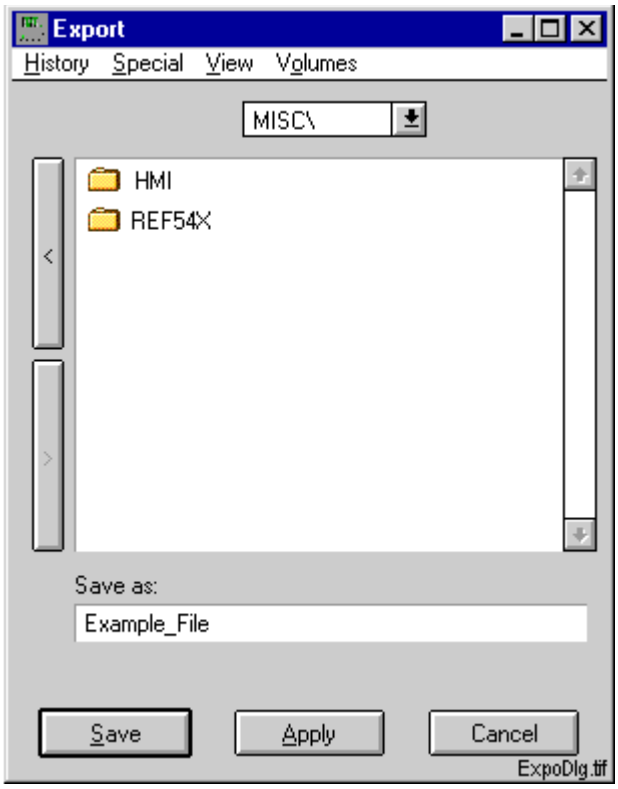


Fig. 4.4.1.2.-1 Export dialog

4.4.1.3. Page Setup

Before printing, the margins (Top, Left, Bottom, Right) can be defined. The Page Setup dialog (see Fig. 4.4.1.3.-1) can be found by clicking the Page Setup option in the File menu. The margins can be set in this dialog by selecting the appropriate values on the list. Confirm the set margins by clicking OK. Click Cancel to cancel.

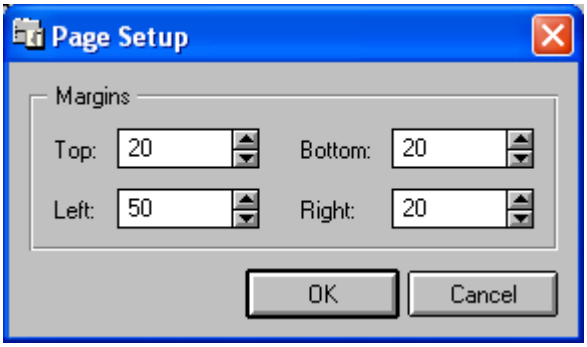


Fig. 4.4.1.3.-1 Page Setup dialog

4.4.1.4. Print Setup

Setup for the printer and for the paper is defined in the Print Setup dialog (see Fig. 4.4.1.4.-1) which is also found in the File menu. Click OK to confirm setup. Click Cancel to cancel.

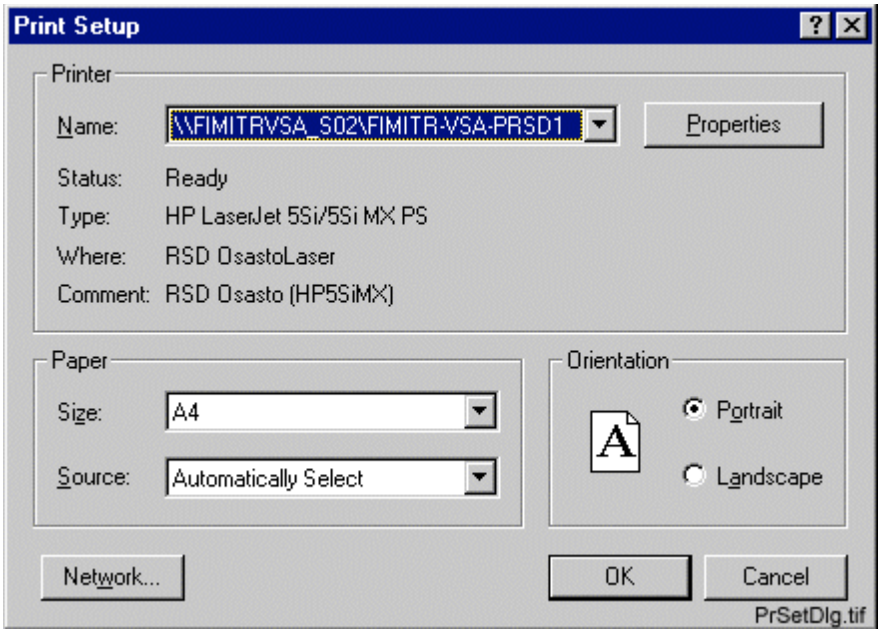
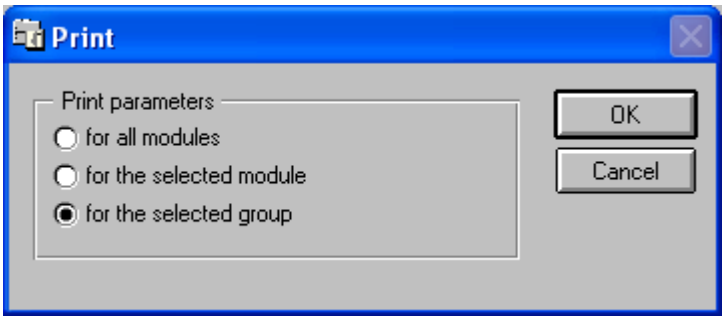


Fig. 4.4.1.4.-1 Print Setup dialog.

If you cancel printing in the Print dialog (see Fig. 4.4.1.5.-1), cancellation has to be selected separately for each page that has been selected for printing. For example, if pages 1-3 has been selected for printing, cancellation is requested for pages 1, 2, and 3 separately.

4.4.1.5. Printing

It is possible to print parameter data of selected relay to the printer. In the Print dialog (see Fig. 4.4.1.5.-1) printing can be selected either for all modules, only for the selected module or for the selected group. To start the printing process, select the desired alternative by clicking the relevant option button and click OK. To exit the Print dialog without making any selection, click Cancel.



PrDig

Fig. 4.4.1.5.-1 Print dialog

The following information is included in the printed document:

- Object identification
- Date and time of parameter value upload
- Parameter values including both installed and edited values
- Date and time of printing
- Description of the type of the relay
- Description of the relay module

Access: No limitations. The print may look as in the following:

Table 4.4.1.5-1 Relay parameters - Present and New Values:

Parameter	**Parameter Name**	**Present Value**	**New Value**
Type designation of the module	F	SPCD 2D55	SPCD 2D55
V150 - Select valid setting group. Main or second	V150	1	1
V180 – Settings for rated frequency (Hz part)	V180	050	050
V181 - Setting for rated frequency	V181	000	000
Module version	V205	124 A	124 A

Table 4.4.1.5-2 Footer of the printout:

Object PM_SPAC	Module Name SPCD 3D53		
Project Application Sost -	Object Type SPACOM ver. 1.1		
Printed 99-05-03 09:13:27			Page 1 (1)

Printouts can be made from a Visual SCIL tool, such as the SPACOM Relay Setting Tool, to a local or network printer defined in the operating system. Depending on which context the MicroSCADA monitor is opened in, the available printers and the needed configuration work may differ. This varies in different MicroSCADA technology products, as described in the following sections.

CAP 501, CAP 505 and SMS 510

In CAP 501, CAP 505 and SMS 510 tools are always opened in accordance with the current user that has logged in to the operating system. In this case, all the printers that are provided by the operating system for the user are available also for printing from SPACOM Relay Setting Tools.

LIB 510/MicroSCADA

In these products a monitor is by default opened in accordance with the MicroSCADA user, i.e. the user with the user name "MicroSCADA". In this case only local printers can be used for printing from SPACOM Relay Setting Tool. Local printers are:

- Printers connected directly to computer's serial or parallel port
- Network printers defined as local port

The procedure how to define a network printer as local port is described in the SYS 500 System Management User's Guide.

If a monitor is opened from a command prompt or from SCIL with an operating system call, it can be opened to the context of the current operating system user. This requires that the command line option start_as_logon_user is used when opening the monitor. Further details for the opening of monitors can be found in the SYS 500 System Management User's Guide. When a monitor is opened in accordance with of the current operating system user, printers can be used as in CAP 501, CAP 505 and SMS 510.

When local printers are used, the MicroSCADA user should have access to these printers.

4.4.1.6. Exit

By selecting the Exit option, the program exits the Relay Setting Tool and returns to the Project Structure Navigator (see Fig. 4.2.2.-1) in CAP 501/505 and SMS 510 environment. In LIB 510/MicroSCADA environment, the Relay Setting Tool window is closed.

4.4.2. View menu

The parameter data can be viewed and set in the view menus. The View menu contains three views (Settings, Registers, Setting Tool), which each shows a different subset of the parameters of the selected module.

By default, when the SPACOM Relay Setting Tool is started, the Setting Tool view is opened to the tool area. The check mark in the View menu indicates which view is currently selected (see Fig. 4.4.2.-1).

Fig. 4.4.2.-1 View menu

4.4.2.1. Settings

By selecting Settings in the View menu, the active view is closed and the Settings view is opened (which is not necessarily supported by all modules).

The Settings view shows the values of the most important setting parameters.The settings parameters are fetched from the parameter file. Both main and second setting groups are shown and the active setting group is indicated. Values cannot be edited in Settings view.

If the parameter values from the default file have been used or the values have been imported, the tool shows the "?" character instead of the value. The character "?" indicates that the values shown on the screen are not the ones stored in the relay. An example of the Settings view is shown in Fig. 4.4.2.1.-1.

Access: No limitations

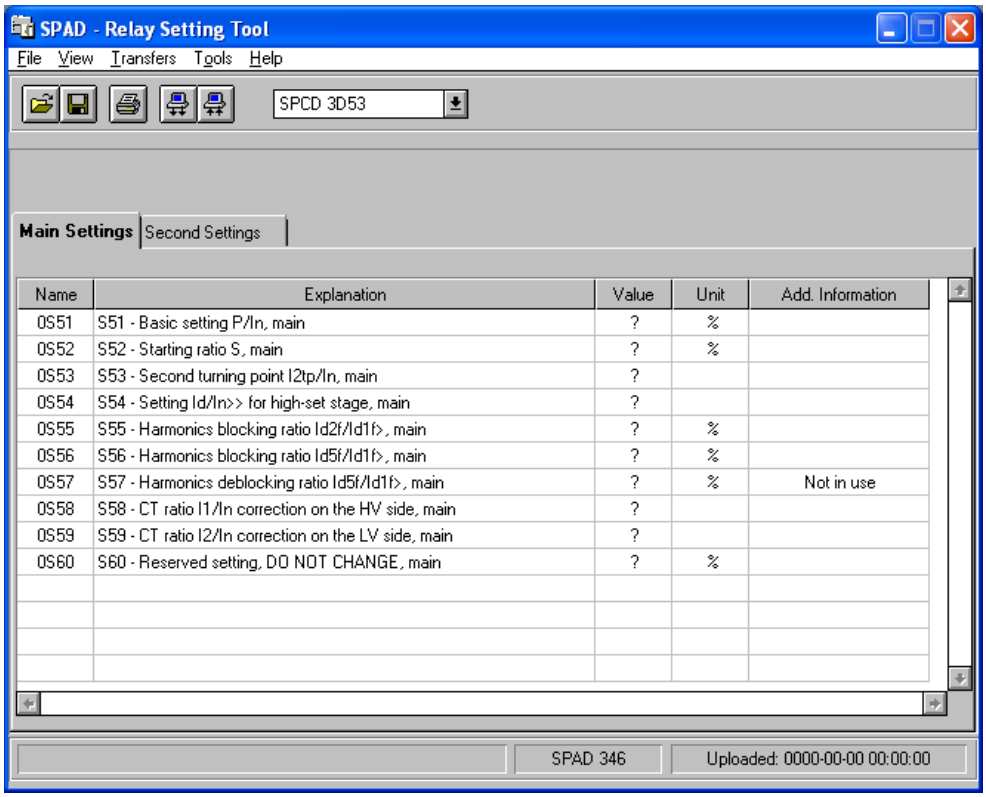


Fig. 4.4.2.1.-1 Settings View – Main Settings page

4.4.2.2. Registers

By selecting Registers (which is not necessarily supported by all modules) in the View menu, the active view is closed and the Registers view is opened on the tool area.

The Registers view shows the values of the registration parameters and they are fetched from the parameter file. It is not possible to edit the values. If the parameter values from the default file have been used or the values have been imported, the tool

shows the "?" character instead of the value. The character "?" indicates that the values shown on the screen are not the ones stored in the relay. An example of the Registers view is shown in Fig. 4.4.2.2.-1.

Access: No limitations

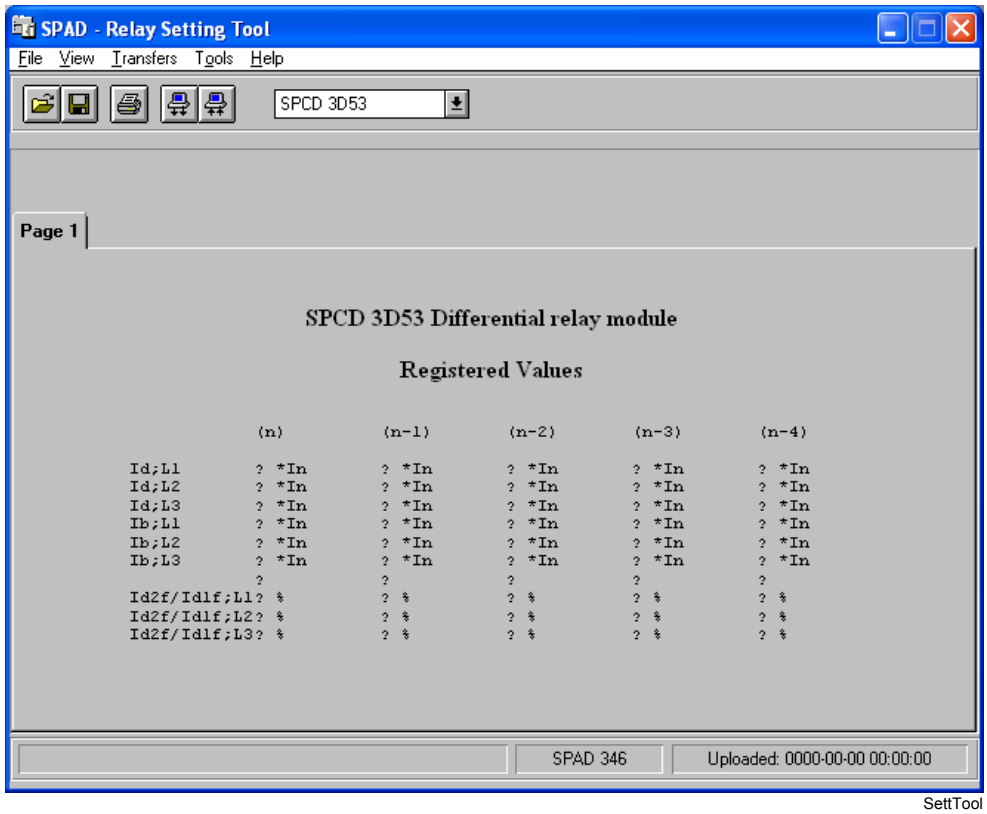
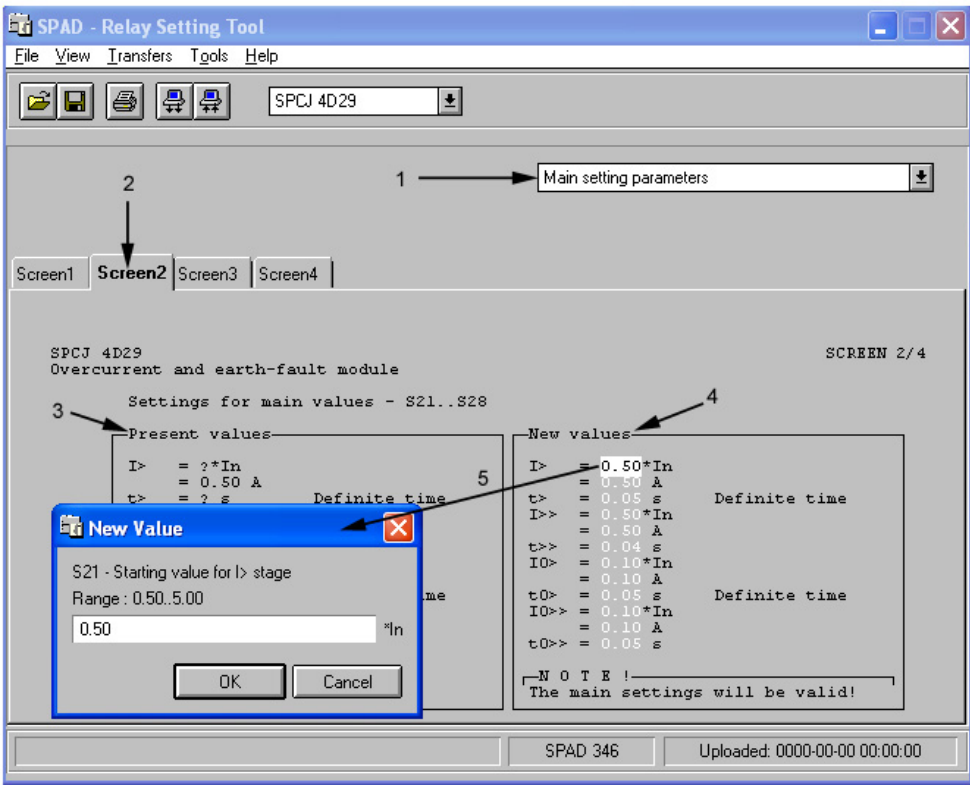


Fig. 4.4.2.2.-1 Registers View for SPCD 3D53

4.4.2.3. Setting Tool

By selecting Setting Tool in the View menu, the Setting Tool is opened on the tool area. The Setting Tool is the default view.

Setting Tool view



MainSett

Fig. 4.4.2.3.-1 Setting Tool view

The Setting Tool view consists of the following parts (see Fig. 4.4.2.3.-1):

1 Parameter group selection

Each module contains a number of parameter groups. In the Setting Tool, a list of the function groups available for the relay module can be seen in the parameter group selection.

2 Settings notebook

After selecting the parameter group, the parameters of the selected parameter group are displayed in a settings notebook. The number of pages depends on which group is selected in the group selection box. If a new group is selected, the Setting Tool notebook is updated.

3 Present values field

The values that are currently used are shown in the relay Present values field. If the parameter values from the default file have been used or the values have been imported, the tool displays the "?" character instead of the present values to indicate that the values shown on the screen are not the ones stored in the relay.

4 New values field

The values given by the user are shown in the New values field. When you click the values displayed in this field, the input dialog opens, where you can give the new values.

5 Value input dialog

The values are given in separate dialogs. There can be different kinds of dialogs depending on parameter type.

Storing principle

The values of the parameters are stored in the parameter files. A parameter file contains two kinds of values for each parameter:

- Present value. A value that is currently used in the relay. The present value should always be valid and consistent with the value stored in the relay.
- New value. A value that can be edited by the user. New value may differ from the value stored in the relay.

The parameter files are created during the configuration process of the relay object by the configuration dialog of the object type. When the files are created, the values from the default files are used. The parameter values in the parameter files are maintained automatically by the tool.

Parametrization

You can set the parameters by using the Setting Tool view. Parameter settings can be changed by clicking the New Value field, after which a dialog named New Value appears on the screen. The allowed range for the values is given in the dialog. The new value can be entered in the field. Give the new value and click <Enter> or OK. To exit the dialog without confirming the new value, click Cancel.

After changing the values, the changes can be downloaded to the relay. If the changes have not been downloaded when closing the tool, the tool asks whether the changes are to be saved to the parameter file or discarded. Downloading or saving the changes is not allowed if the user has not been authorized to do the parametrization.

If there are only two alternatives, clicking with the mouse button will toggle between the two alternatives. If there are multiple choices, a dialog with a list is presented for selection (see Fig. 4.4.2.3.-2). If the relay module is protected with a password, the password is prompted before saving the changes. An example of main settings for output relay matrix switches of the module SPCJ 4D29 is shown in Fig. Fig. 4.4.2.3.-3.

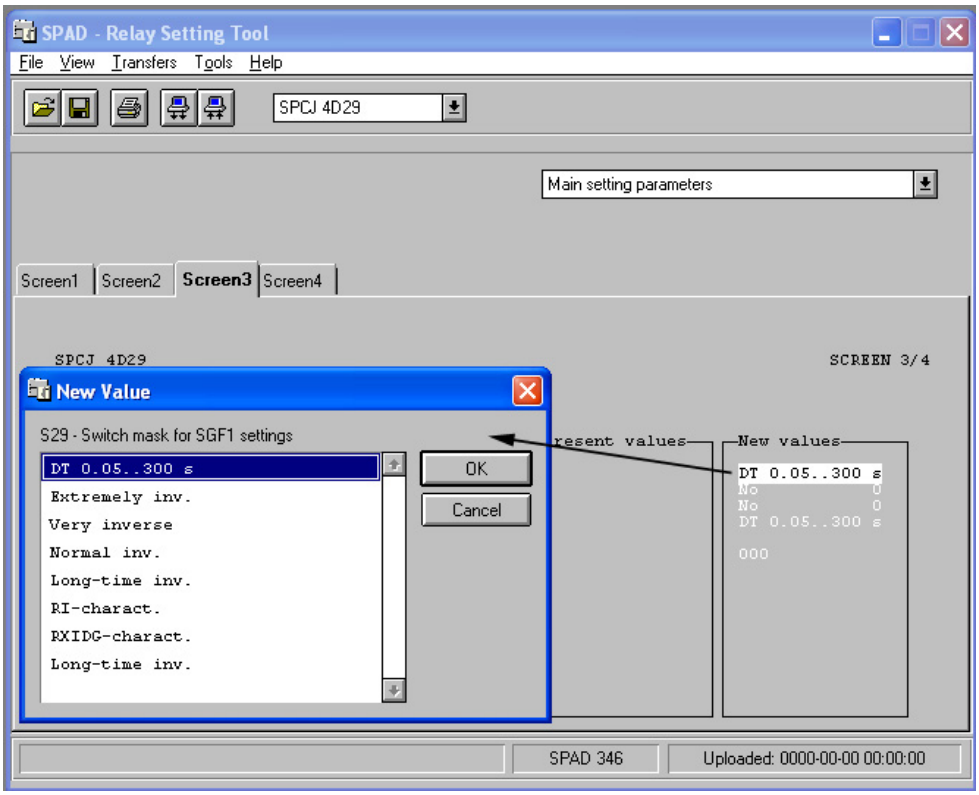


Fig. 4.4.2.3.-2 The dialog presenting possible alternatives for the new value in the Setting Tool view for main switches of the relay module SPCJ 4D29.

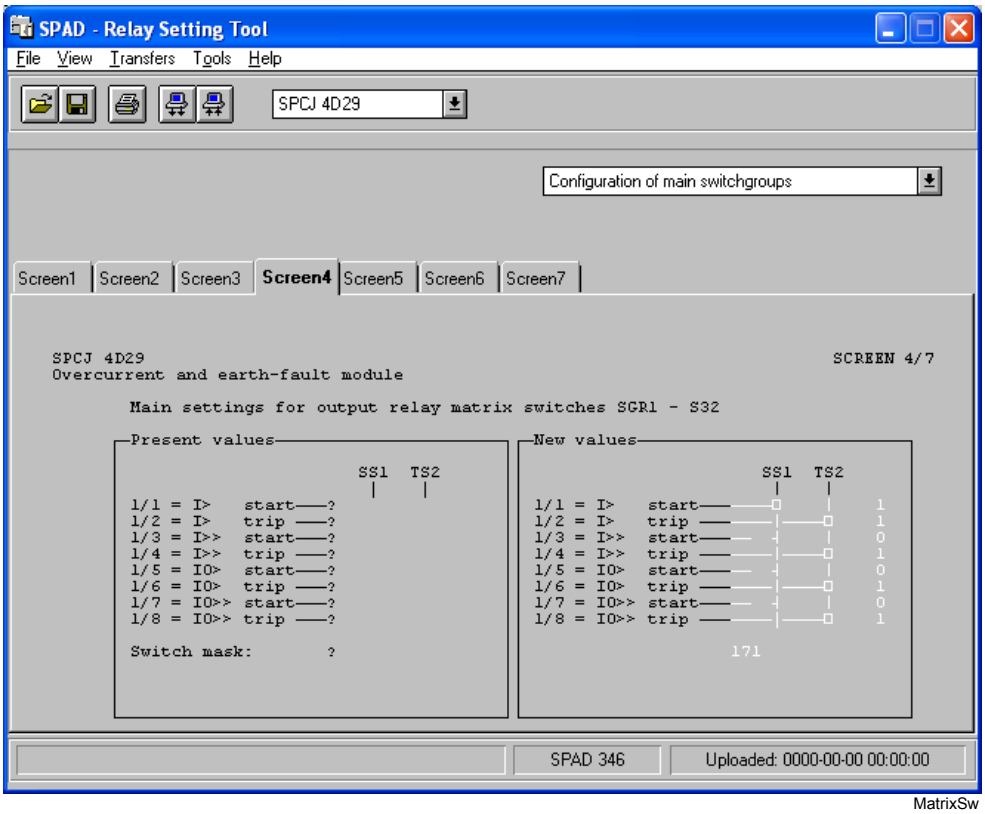


Fig. 4.4.2.3.-3 The main settings for output relay matrix switches of the module SPCJ 4D29.

4.4.3. Transfers menu

The Transfers menu contains commands used to communicate with the relay module.

Fig. 4.4.3.-1 Transfers menu

4.4.3.1. Upload parameters

Uploading is a process where the parameters are read from the relay to the relay setting tool. The function of the Upload dialog (see Fig. 4.4.3.1.-1) is to make a connection either to all modules, to the selected module, or to the selected parameter group of the selected module, and to upload parameters. To select the desired alternative, click the option button. Confirm the choice made by clicking OK and cancel by clicking Cancel.

Access: Authorization level 0.

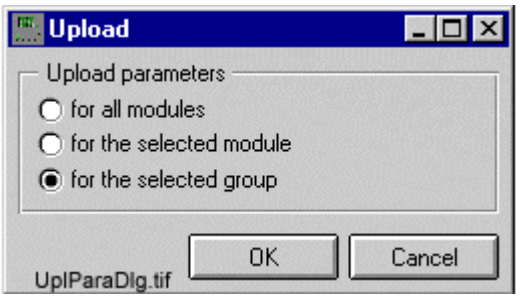


Fig. 4.4.3.1.-1 Upload Parameters dialog

4.4.3.2. Download parameters

Downloading is a process where the parameters are transferred to the relay from the relay setting tool. Parameters can be downloaded either for all modules, only for the selected module, or for the selected parameter group of the selected module in the Download dialog (see Fig. 4.4.3.2.-1). To select the desired alternative, click the relevant option button. Confirm the choice made by clicking OK and cancel by clicking Cancel.

Access: Authorization level 2.

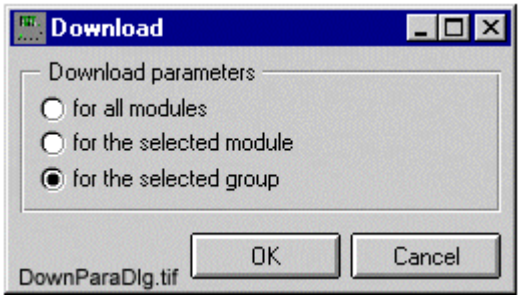


Fig. 4.4.3.2.-1 Download Parameters dialog

You can select the desired alternative from the Download dialog. It is not possible to perform downloading, when the Settings and Registers views are active.

The third download option cannot be used (see Fig. 4.4.3.2.-1), if the selected parameter group in the Setting tool view does not contain any editable parameters.The upload function is performed automatically after the downloading has been finished.

4.4.4. Tools menu

The Tools menu contains the tools Compare, Reset Registers, Change Active Setting Group, View Transducers, and View Communication Settings. Each tool can be opened by clicking the appropriate alternative in the Tools menu.

Fig. 4.4.4.-1 Tools menu

4.4.4.1. Compare

The purpose of the Compare function is to compare the values in the relay parameters with the settings. Both the present and the new values can be compared. The Compare function does not update the values in the parameter file. You can use either the values from the parameter file or you can import the values from some other file and then proceed with the Compare function.

Present values and new values can be compared. Parameters can be compared either for all modules, for the selected module or only for the selected parameter group, see Compare dialog, Fig. 4.4.4.1.-1). Click the option button of the desired alternative and confirm the selection by clicking OK. To exit the dialog without confirming the selection, click Cancel.

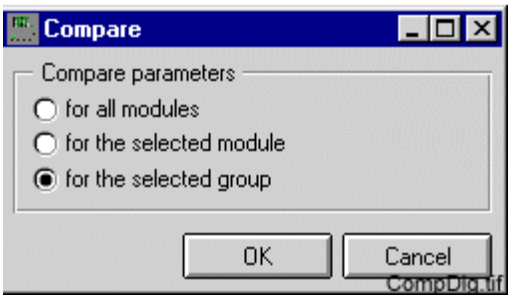


Fig. 4.4.4.1.-1 Compare dialog

After clicking OK in the Compare dialog, the dialog presented in Fig. 4.4.4.1.-3 appears on the screen. The Compare dialog contains Present Values and New Values pages.

To list the values that are different in the parameter file and in the relay, click the Compare button in the lower part of the dialog, after which the uploading dialog (see Fig. 4.4.4.1.-2) appears on the screen. If the data is the same in the file and in the relay, the report indicates that no differences have been found.

Access: No limitations.

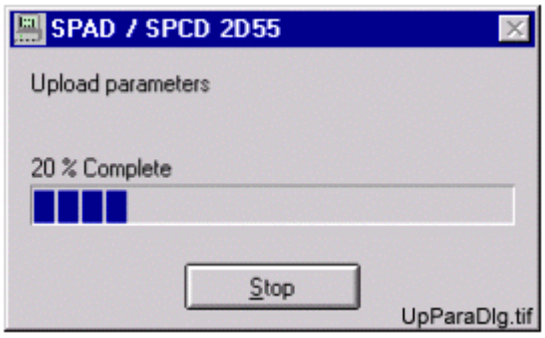


Fig. 4.4.4.1.-2 Uploading of values to be presented in the Compare dialog

There are several fields in the Present Values (see Fig. 4.4.4.1.-3) and in the New Values pages (see Fig. 4.4.4.1.-4):

- In the first field the character # stands for a consecutive number
- In the second field the name of the module is indicated
- In the third field the parameter name is presented
- In the fourth field File Value is given
- In the last field the Relay Value is given

The values will be shown only if the values in the parameter file differ from the values in the relay. In case there has been an error during the reading process, an error message will be shown in Relay Value field.

Present Values page shows the differences between the Present Values in the file and the values in the relay.

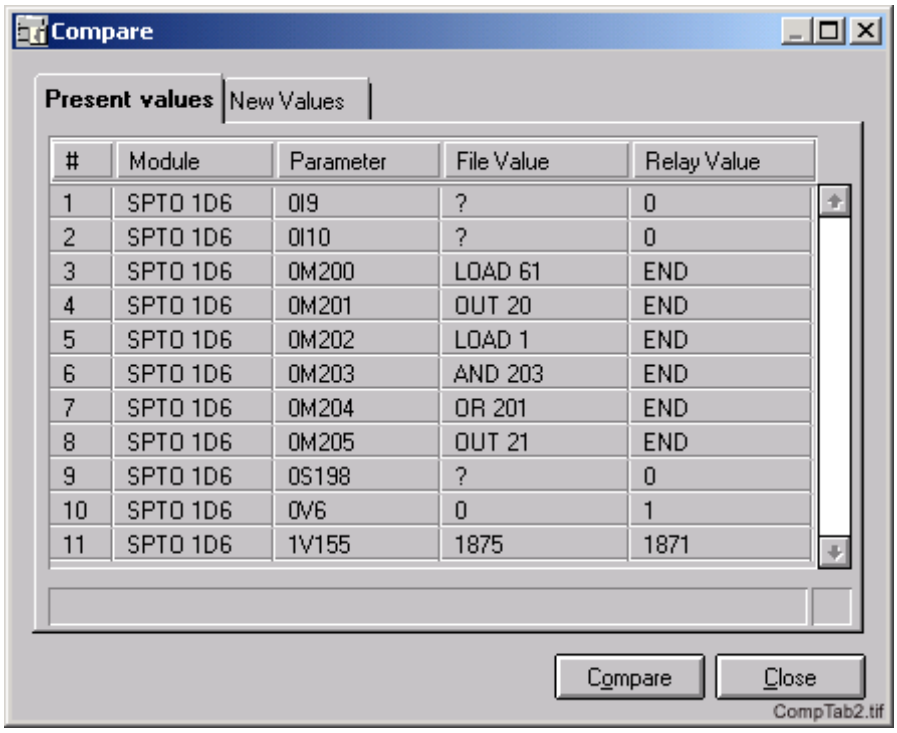


Fig. 4.4.4.1.-3 Present Values page

New Values page shows the differences between the New Values in the file and the values in the relay.

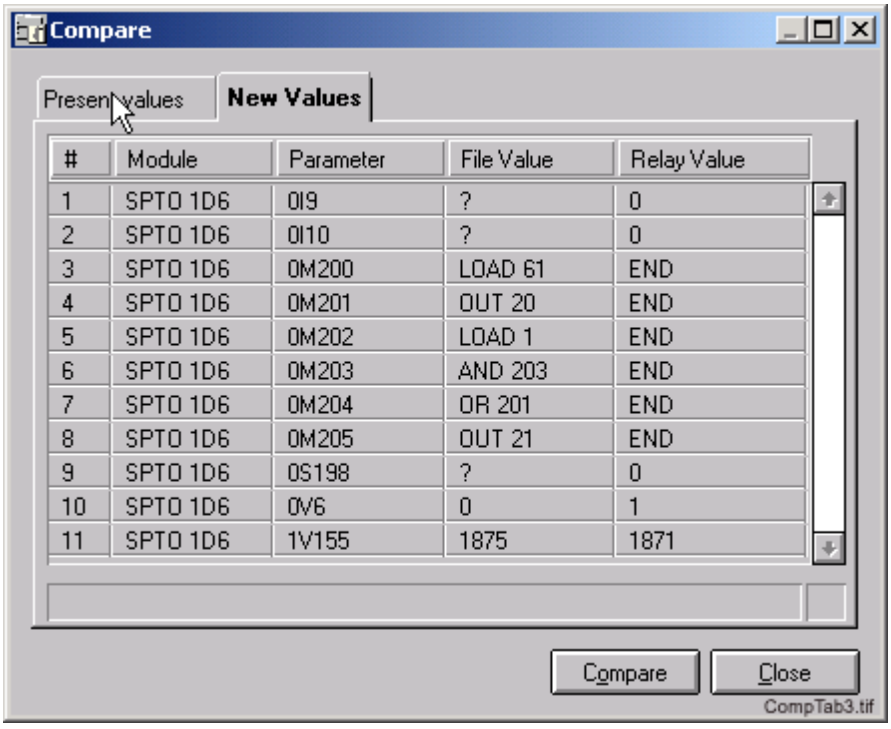


Fig. 4.4.4.1.-4 New Values page

4.4.4.2. Reset registers

Registers can be reset either for all modules or only for the selected module by clicking the relevant option button in the Reset registers dialog (see Fig. 4.4.4.2.-1). To confirm the selection, click OK. To exit the dialog without confirming the selection, click Cancel.

Access: Authorization level 1.

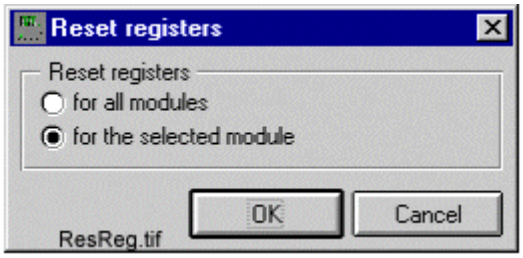


Fig. 4.4.4.2.-1 Reset registers dialog

4.4.4.3. Change Active Setting Group

The relay may contain a number of setting groups, but only one can be active at a time. You can change the active setting group for all modules or for some of the modules. When you have selected the function, the tool displays a dialog which shows the active setting groups for all modules. After that you can select another setting group and download the changes to the modules.

Access: Authorization level 1.

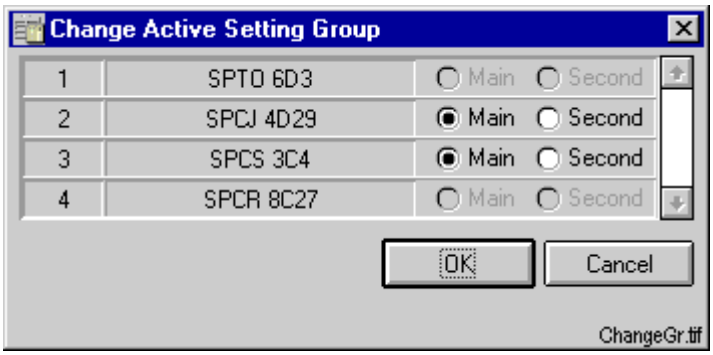


Fig. 4.4.4.3.-1 The dialog for changing active settings

4.4.4.4. View Transducers

In the View Transducers dialog (see Fig. 4.4.4.4.-1) it is possible to view nominal values. To exit the dialog, click Close.

Access: No limitations.

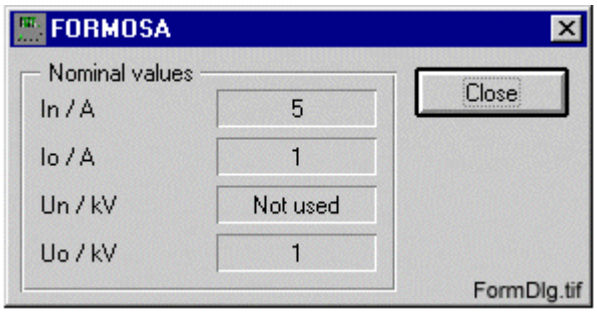


Fig. 4.4.4.4.-1 View Transducers dialog

4.4.4.5. View Communication Settings

View Communication Setting displays the communication settings for all the modules (see Fig. 4.4.4.5.-1).

Access: No limitations.

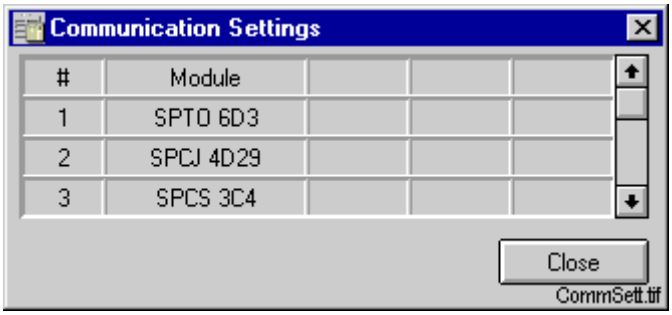


Fig. 4.4.4.5.-1 Communication Settings list

4.4.5. Help menu

The Help menu contains only the About Relay Setting Tool dialog.

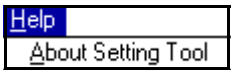


Fig. 4.4.5.-1 Help menu

4.4.5.1. About Setting Tool

The dialog About Relay Setting Tool contains information about the current version of the Relay Setting Tool.

5. RED Relay Setting Tool

5.1. Description

RED Relay Setting Tool is used for monitoring and setting parameter data of the RED relays. This tool is used for relay units regarding parametrization.

5.1.1. Features/Options

- On-line parametrization
- Off-line parametrization
- Upload/Download all parameters
- Upload/Download group of parameters
- Selection of setting group
- Reset of registers (user settable)
- Authorization support in LIB 500/510
- Comparison of relay and setting tool parameters
- Printing
- Parametrization of nominal and primary values

5.2. Tool Environments

Depending on software environment, the RED Relay Setting Tool can be started in different ways:

- In LIB 510/MicroSCADA, the Relay Setting Tool can be started from the relay symbol (push button) in the station picture (see Fig. 5.2.1.-1).
- In CAP 501/505 and SMS 510, you can use a tree navigator and select a relay. After this a list of tools is displayed and you can double-click the item Relay Setting Tool (see Fig. 5.2.2.-1).

5.2.1. Starting from LIB 510 in MicroSCADA

The relay units are displayed as push buttons in the station picture (see Fig. 5.2.1.-1).

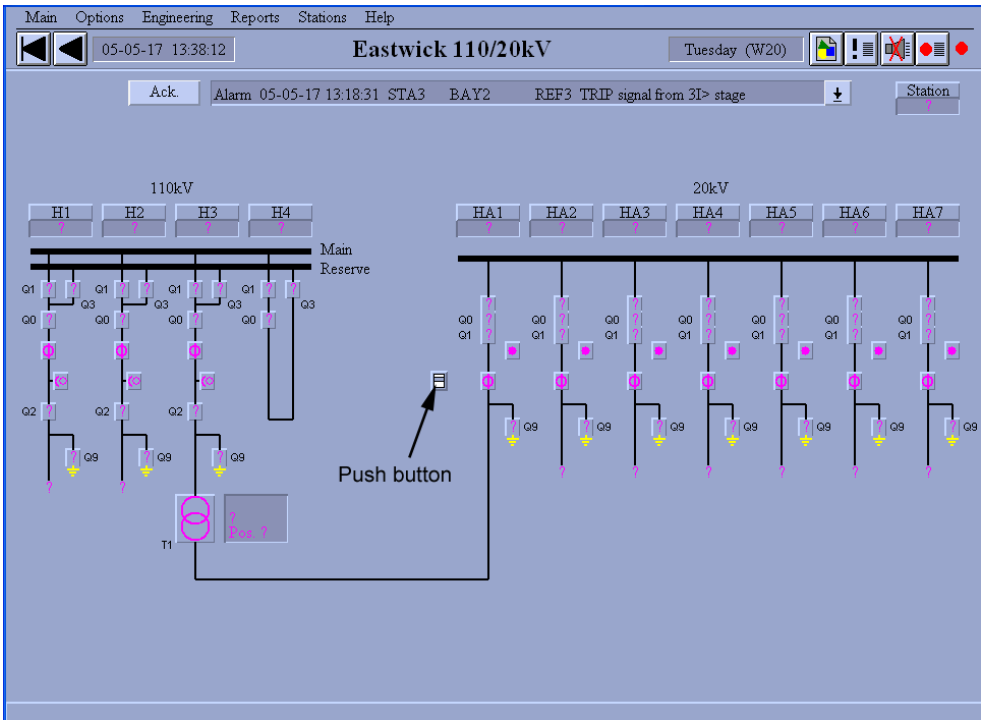


Fig. 5.2.1.-1 The station picture including a relay unit push button

In case objects need updating, a dialog appears when you press the relay unit's push button (as presented in Fig. 5.2.1.-2). You can update objects either manually in the Picture Editor or automatically by selecting Yes in the new dialog that will appear on the screen. In case you update objects manually in the Picture Editor, the whole configuration procedure has to be updated. In case you select the automatic updating, a dialog confirming that updating was successful appears on the screen (see Fig. 5.2.1.-3).

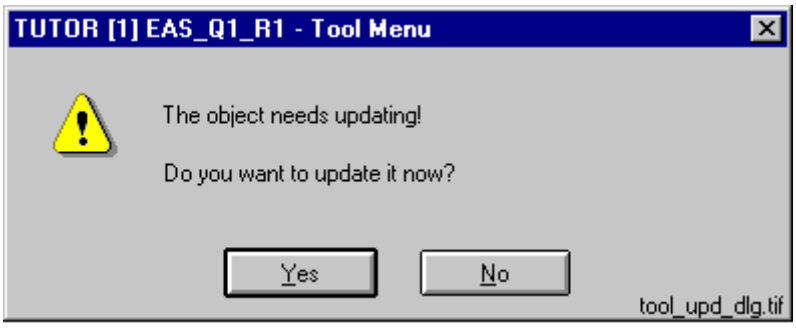


Fig. 5.2.1.-2 Dialog indicating that an object needs updating

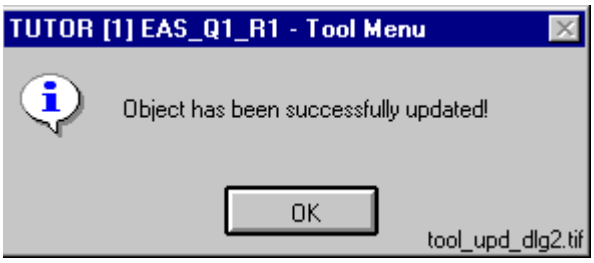


Fig. 5.2.1.-3 Dialog indicating that an object has been updated successfully

After the object has been updated successfully or a picture function has been clicked in the station picture (in case updating was not necessary), the Tool Menu dialog (see Fig. 5.2.1.-4) for the chosen object appears on the screen. This dialog contains a list of tools available for the relay unit.

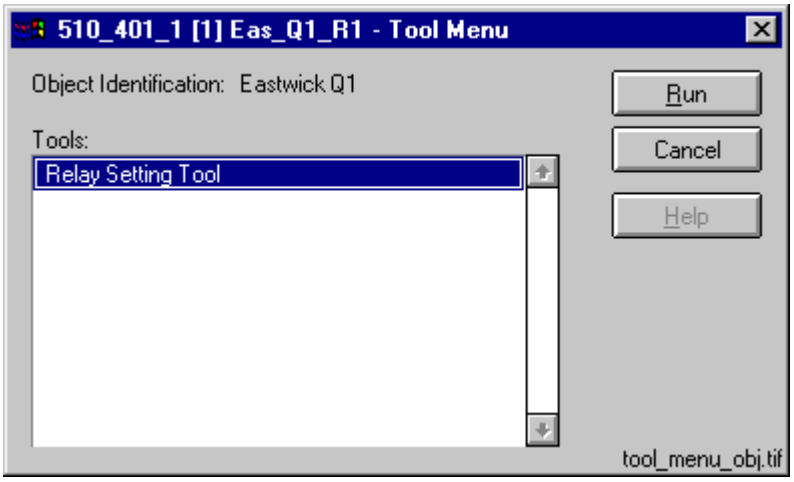


Fig. 5.2.1.-4 The Tool Menu for a relay unit object

Select the desired tool and click Run if you want to change or view the Relay unit setting parameters. The main view of the Tool is shown in Fig. 5.3.3.-1 further on in this manual.

5.2.2. Starting from CAP 501/505, SMS 510

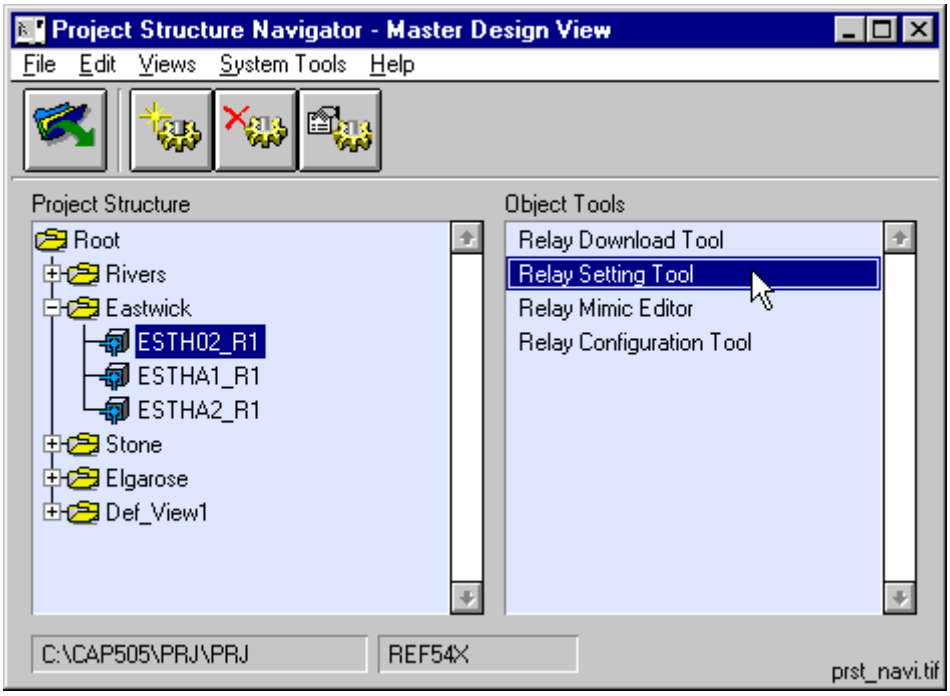


Fig. 5.2.2.-1 Starting Relay Setting Tool from the Project Structure Navigator

Navigate to the desired relay object in the Project Structure navigation tree on the left and click it. The tools that are available for the selected object appear in the Object Tools list box on the right. Open the Relay Setting Tool by double-clicking it on the list.

5.3. Relay Setting Tool

5.3.1. General

The HMI of a RED Relay unit is built up with the same menu structure as the local HMI. The available RED Relay configurations are included in the object types (e.g. REF 54x) of the SW Package SM/RED. The representation of the parameters in the Relay Setting Tool is based on MMI files (Menu, Image, Index and Help files). These files are included in the used relay configuration.

When you select a new relay unit object for the first time, or reconfigure the relay unit object, an Active Menu File is built. This is needed to present the HMI in the Relay Setting Tool. The active menu file is built by using the MMI files as input.

5.3.2. Start-up

5.3.2.1. Build Active Menu

In the normal case the non-existing Active Menu File is automatically built, when the Relay Setting Tool is started, and no manual actions described below are needed.

The message in Fig. 5.3.2.1.-1 and the Build Active Menu File dialog appear if the active menu of the used relay configuration is not found. Click Build in the Build Active Menu File dialog to build the active menu for the relay configuration. This dialog can also be opened from the Options menu.

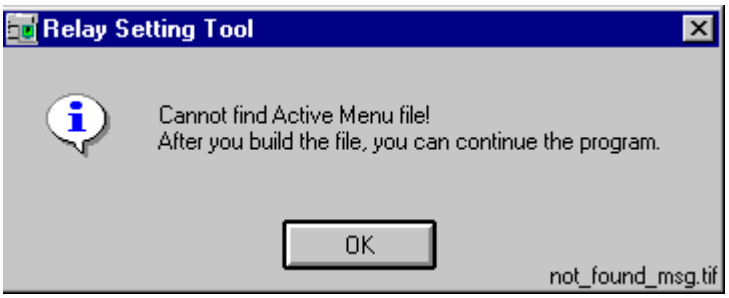


Fig. 5.3.2.1.-1 Active menu of the used relay configuration has not been found

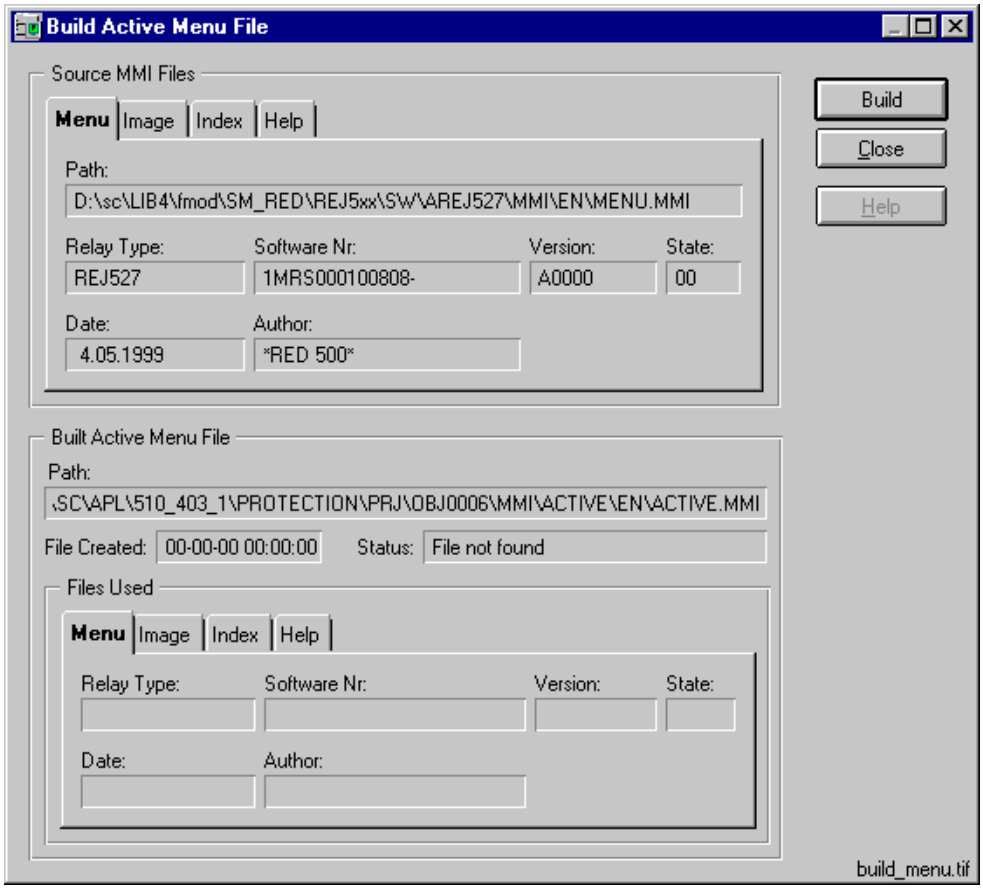


Fig. 5.3.2.1.-2 The dialog for building the Active Menu File

The Build Active Menu function does not apply to the REX 52x relays.

5.3.2.2. Import relay parameter settings from external programs

The relay parametrization that is made by another program (for example Event Editor) can be imported to the Relay Setting Tool. This import function appears automatically at start-up. Click Yes if you want to update the value in the column New Values, click No if you don't want to update the value. All the values can be imported at once by clicking Import All. Cancel the importing by clicking Cancel.

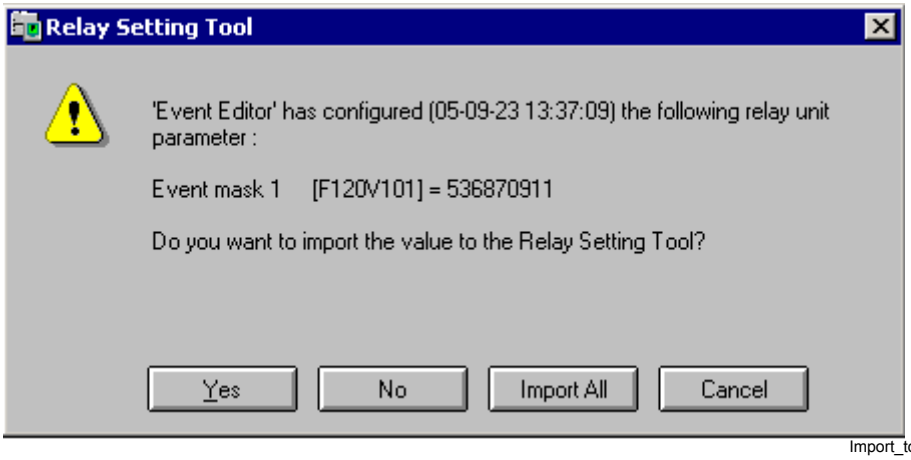
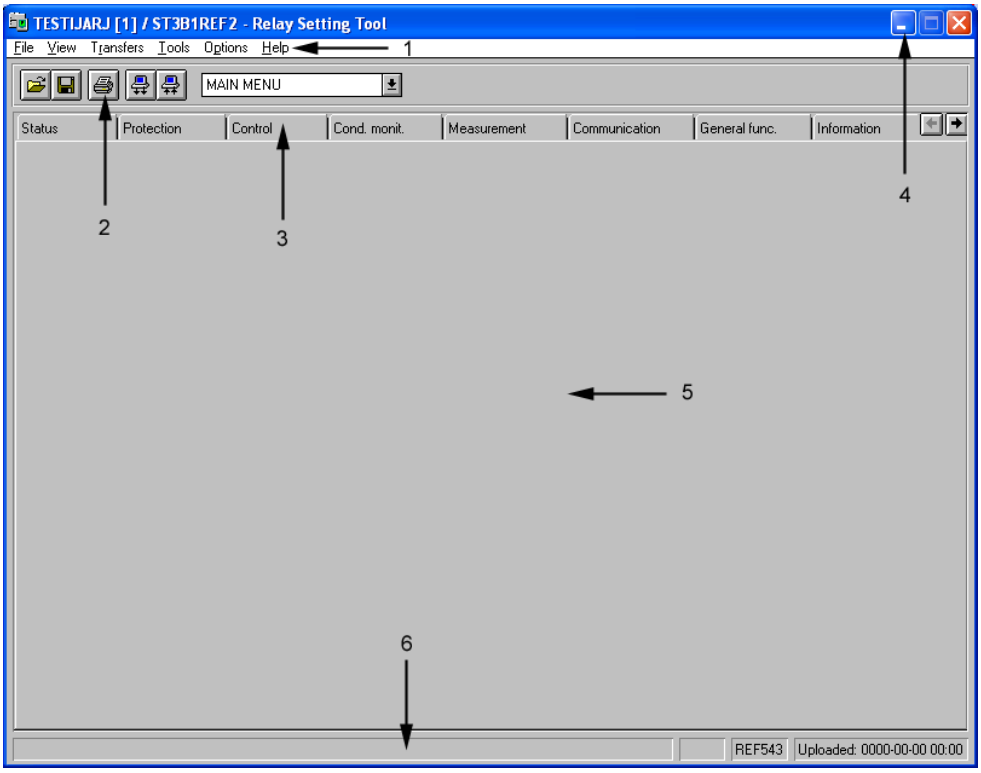


Fig. 5.3.2.2.-1 The dialog for importing relay settings

5.3.3. Main view



MainView

Fig. 5.3.3.-1 The main view for the Relay Setting Tool

The main view contains the following functions (see Fig. 5.3.3.-1):

1. **Menu bar**

The menu with commands for the Relay Setting Tool.

2. **Toolbar**

A bar with buttons that perform some of the most common tasks.

Table 5.3.3-1 The main view toolbar buttons:

Button	Functionality
	Import parameters
	Export parameters
	Printing
	Upload (receive) parameters
	Download (send) parameters

In addition, the toolbar includes the drop-down list for selecting the highest-level node from the parameter tree representation. However, currently there is only one item "MAIN MENU" available for selection,[1] i.e. there is no actual use for the drop-down list.

3. **Relay unit menu tabbed pages**

These pages represent the functions of the selected relay unit. Click the page tab to select the function that you want to operated.

4. **Minimize button**

The relay tool can be minimized to an icon in the station picture.

5. **Tool area**

The relay tool is opened into this part of the HSI. The Setting tool function offers a complete tool for monitoring and configuring the relay unit.

6. **Status bar**

The status bar shows information about the current situation in the Relay Setting Tool. The status bar has three active fields. The first field shows the name of the active view, if there is more than one selectable.The second one shows information of the relay unit type, for example REF 543. The third field shows the upload status of the parameters. The status might be:

- **Uploaded 00-00-00 00:00:00,** when the parameters of the selected page have been read from the default file.
- **Uploaded 00-00-00 00.00.00,** when the parameters of the selected page have been uploaded from the relay

status_bar

Fig. 5.3.3.-2 The status bar

5.4. Using Relay Setting Tool

5.4.1. File menu

The file menu contains the functions belonging to file handling.

Fig. 5.4.1.-1 The File menu

1. This implementation is due to the parameter format specification the tool follows.

5.4.1.1. Importing

Table 5.4.1.1-1 The Import function:

Selection	Functionality
Import	Opens a parameter database for importing parameters. The parameter file is selected on the Import dialog (see Fig. 5.4.1.1.-1).

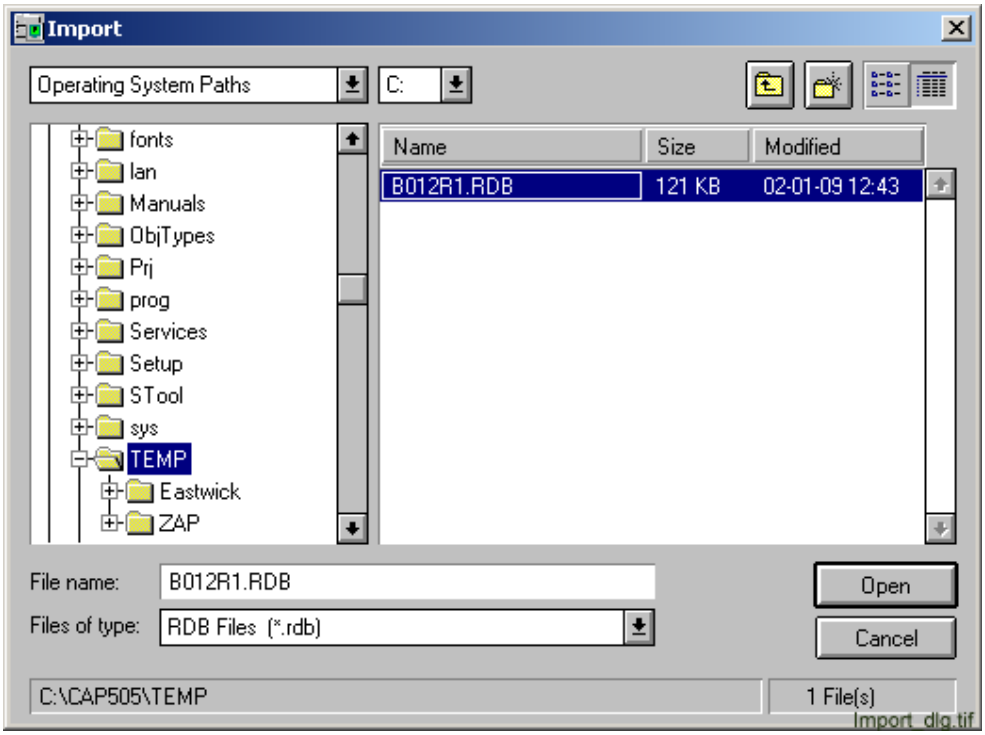


Fig. 5.4.1.1.-1 The Import dialog for the import function

Access: User level 2.

5.4.1.2. Exporting

Table 5.4.1.2-1 The Export function:

Selection	Functionality
Export	Saves all parameters for exporting into the file being currently selected. The file name can be selected from the dialog, which is opened first.

Access: User level 2

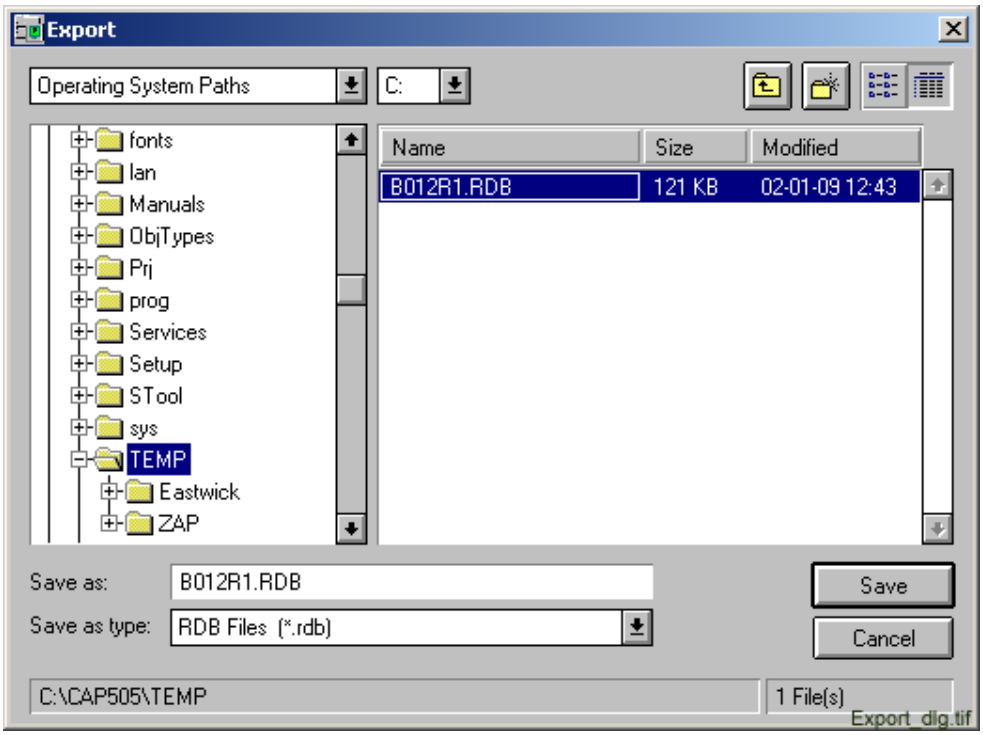


Fig. 5.4.1.2.-1 The Export dialog for the export function

Access: User level 2.

5.4.1.3. Page Setup

Table 5.4.1.3-1 The Page Setup function:

Selection	Functionality
Page Setup	Opens a dialog in which page setup/margins (Top, Left, Bottom, Right) can be defined.

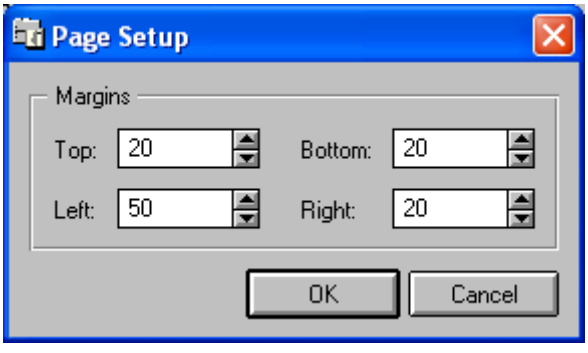


Fig. 5.4.1.3.-1 Page Setup dialog

5.4.1.4. Print Setup

Table 5.4.1.4-1 The Print Setup function:

Selection	Functionality
Print Setup	Opens a dialog in which print setup for the paper as well as for the printer can be defined, if you have selected the option VS Local in the MicroSCADA Monitor.

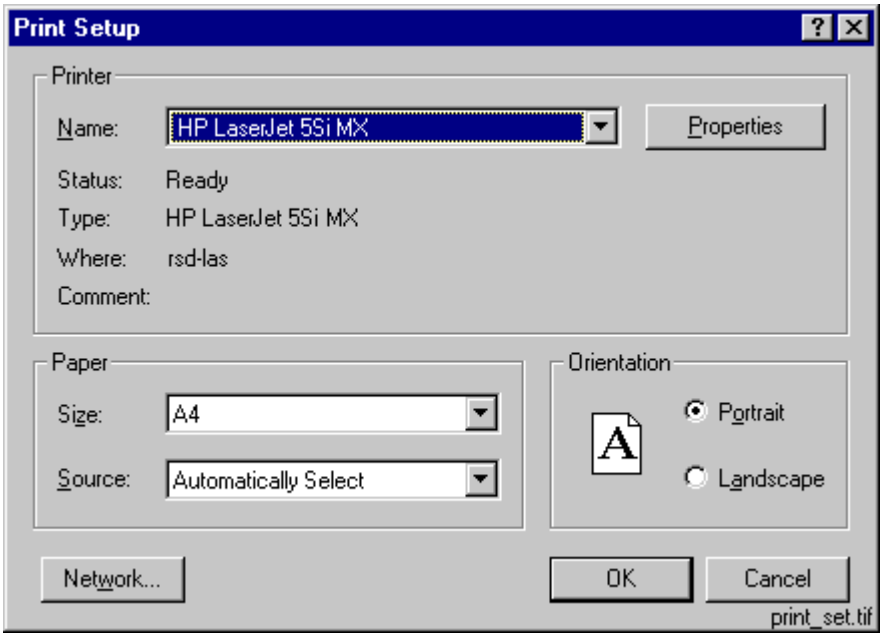


Fig. 5.4.1.4.-1 Print Setup dialog

In case the option VS Remote has been selected in the MicroSCADA Monitor dialog (see Fig. 5.4.1.4.-2), the option Print Setup in the File menu is unavailable, and the dialog presented in Fig. 5.4.1.4.-3 pops up. In this case, information about the printer is given in the MicroSCADA Monitor dialog (the last field on the left-hand side of the dialog in Fig. 5.4.1.4.-2).

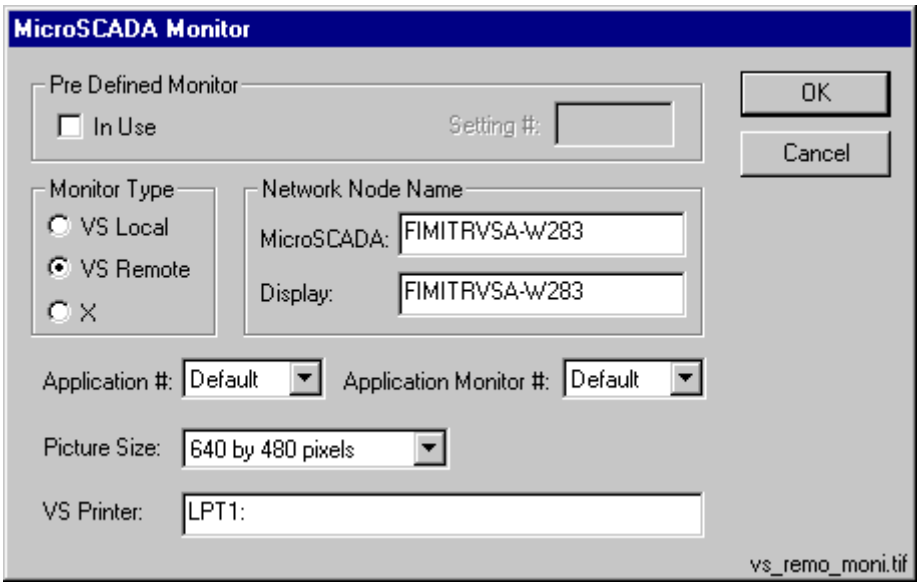


Fig. 5.4.1.4.-2 VS Remote monitor selected in the MicroSCADA Monitor dialog

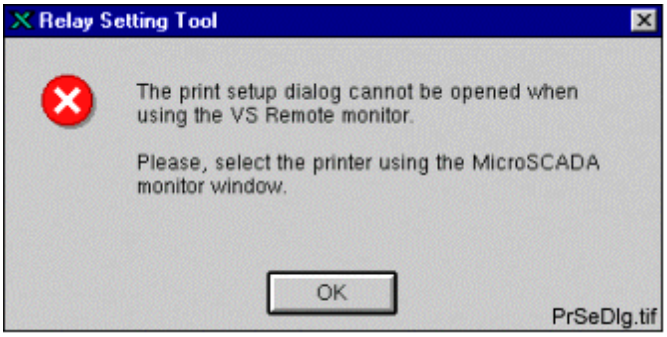
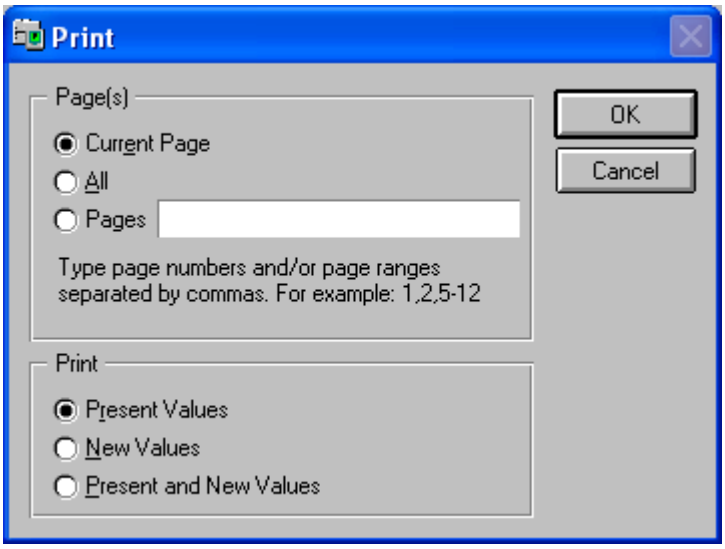


Fig. 5.4.1.4.-3 Dialog indicating that print setup cannot be opened when VS Remote Monitor has been selected

5.4.1.5. Printing

Table 5.4.1.5-1 The Print function:

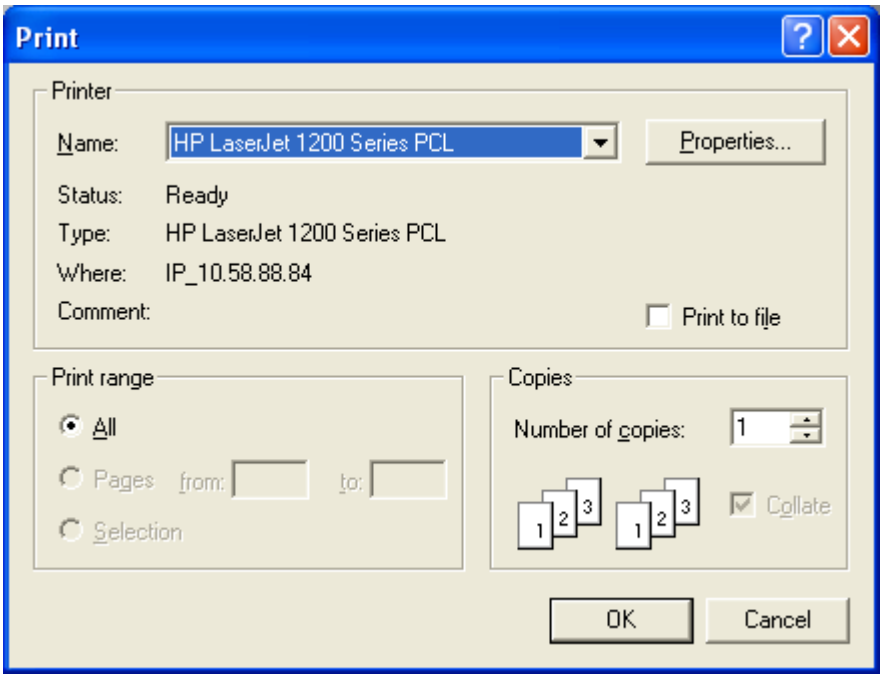
Selection	Functionality
Print	Opens a dialog in which it is possible to select printing of the current page, all pages or of certain pages (the page numbers can be entered in the field, see Fig. 5.4.1.5.-1). It is also possible to select whether present values, new values, or both present and new values are printed. When you select printing of both present and new values, printing requires more pages than when you select printing of either present values or new values.



print_curr_dig

Fig. 5.4.1.5.-1 Print dialog

After you have selected the desired printing option and clicked OK in the Print dialog (see Fig. 5.4.1.5.-1), the second Print dialog (see Fig. 5.4.1.5.-2) pops up. In this dialog you either confirm printing or cancel it.



PrintDlg

Fig. 5.4.1.5.-2 Print dialog 2

Printouts can be made from a Visual SCIL tool, such as the RED Relay Tool, to a local or network printer defined in the operating system. Depending on which context the MicroSCADA monitor is opened in, the available printers and the needed configuration work may differ. This varies in different MicroSCADA technology products, as described in the following sections.

CAP 501, CAP 505 and SMS 510

In CAP 501, CAP 505 and SMS 510 a tool is always opened in accordance with the current user that has logged into the operating system. In this case, all the printers that are provided by the operating system for the user are available also for printing from RED Relay Tools.

LIB 510/MicroSCADA

In these products a monitor is by default opened in accordance with the MicroSCADA user, i.e. the user with the user name "MicroSCADA". In this case only local printers can be used for printing from RED Relay Tool. Local printers are:

- Printers connected directly to computer's serial or parallel port
- Network printers defined as local port.

The procedure how to define a network printer as local port is described in the SYS 500 System Management User's Guide.

If a monitor is opened from command prompt or from SCIL with an operating system call, it can be opened to the context of the current operating system user. This requires that the command line option start_as_logon_user is used when opening the monitor. Further details for the opening of monitors can be found in the SYS 500 System Management User's Guide. When a monitor is opened in accordance with the current operating system user, printers can be used as in CAP 501, CAP 505 and SMS 510.

When local printers are used, the MicroSCADA user should have access to these printers.

5.4.1.6. Exit

Table 5.4.1.6-1 The Exit function:

Selection	Functionality
Exit	Exits the Relay Setting Tool and returns to the station picture from where the tool is started.

Fig. 5.4.1.6.-1 The Exit dialog

Access: No limitations

5.4.2. View menu

The View menu contains a selection of views for the currently selected relay configuration. The All view is always available and it shows all parameters of the active menu. The other possible views are subviews of the All view and they are user-specific. These additional alternatives may be added by using the Options/ Menu configuration (described in Section 5.4.5.3.).

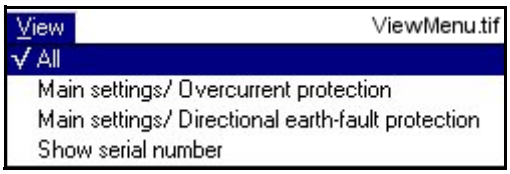


Fig. 5.4.2.-1 The View menu

5.4.3. Transfer menu

The Transfer menu contains commands used to communicate with the relay unit. The offered selections below the line in the menu are user-specific. These additional possibilities are to be added by using the Options/Menu configuration (described in Section 5.4.5.3.).

Fig. 5.4.3.-1 The Transfers menu, the Reset selection is shown as an example of an user-specific configuration

Reservation of communication

The RED Relay Setting Tool reserves communication to the selected object upon a transaction between the tool and the relay unit. Communication is reserved until either the tool is closed or fifteen (15) minutes has elapsed since the transaction ended.

Persistence of write-only parameter settings

All write-only parameters that have been changed and thereafter saved in the parameter file, remain effective until manually reset to their initial ineffective state. For example, if the value of the "Reset registers" command is set to "Reset" in the New Value field and the values are stored when exiting the tool, then the "Reset registers" command is still active the next time the tool is opened. In order to take the "Reset" command out of use, the value in the New Value field must be set to "0" (the original value) and, after that saved in the parameter file.

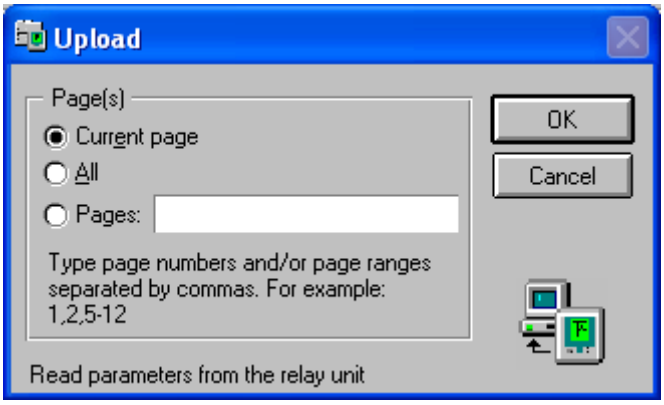
It is recommended that whenever a write-only parameter has been activated it should be immediately deactivated once used in a download. By following this practice, write-only parameters are never inadvertently used in future downloads.

Distinction between the types ("write-only" or "normal") of individual parameters should be based on the information which is available in the respective relay terminal unit manual. The values of the write-only parameters cannot be read from the relay terminal unit. The Relay Setting Tool does not provide this information.

5.4.3.1. Upload

Table 5.4.3.1-1 The Upload function:

Selection	Functionality
Upload	Connects to the selected unit and uploads (receives): 1) parameters that are defined in the current page 2) all parameters of the current view (selected in the View menu) 3) parameters on the entered pages.



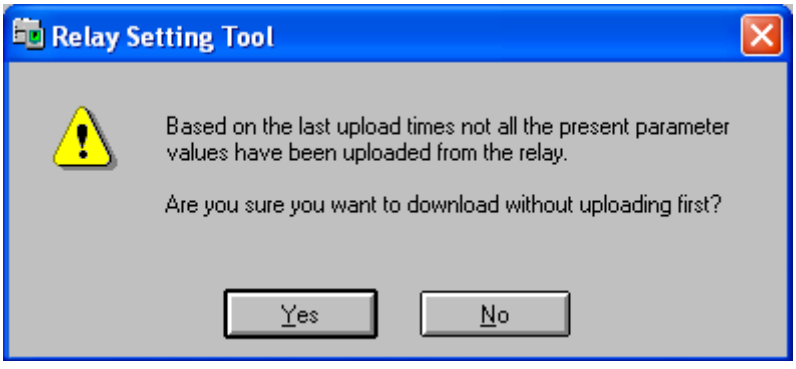
upl_curr

Fig. 5.4.3.1.-1 The dialog for selecting the uploading method

Access: User level 0.

5.4.3.2. Download

Before the actual download operation can begin, the tool checks the status of the parameter values. If, based on the registered time stamps, some parameter values have never been uploaded from the relay unit, a warning is shown before executing the requested download operation.

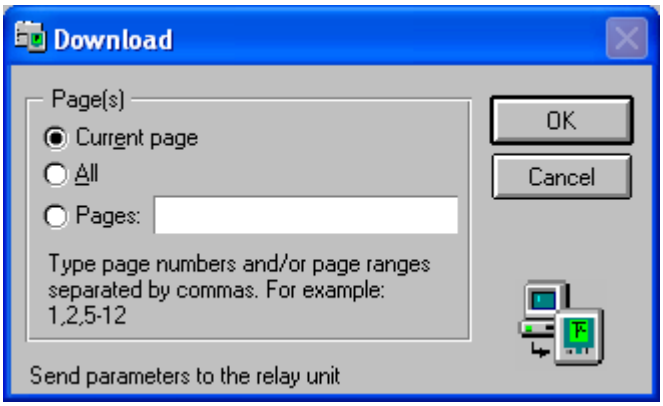


download_warning

Fig. 5.4.3.2.-1 Warning dialog for not uploaded parameters

Table 5.4.3.2-1 The Download function:

Selection	Functionality
Download	1) parameters that are defined in the current page 2) all parameters of the current view (selected in the View menu) 3) parameters on the entered pages.

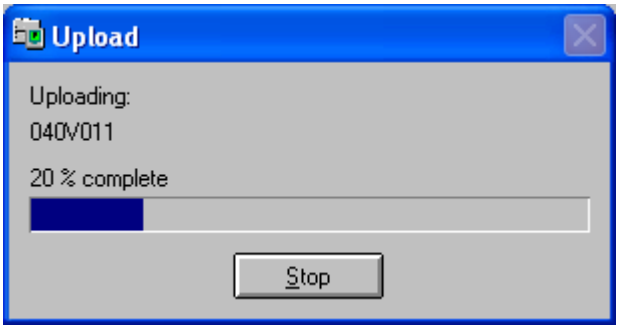


dowl_curr

Fig. 5.4.3.2.-2 The dialog for selecting the downloading method

Access: User level 2.

After uploading/downloading has been started, the dialog shown in Fig. 5.4.3.2.-3 appears on the screen. The dialog gives you information about the current operation (uploading/downloading). It also shows how downloading proceeds. The Stop button cancels the operation and removes the dialog.



uploading_dlg

Fig. 5.4.3.2.-3 The communication dialog

After the uploading/downloading process is completed, the dialog is closed and the tool area is updated.

If an error occurs during communication (the relay answers with the NAK code), the error dialog is shown with the possibility to either skip, retry or cancel the reading.

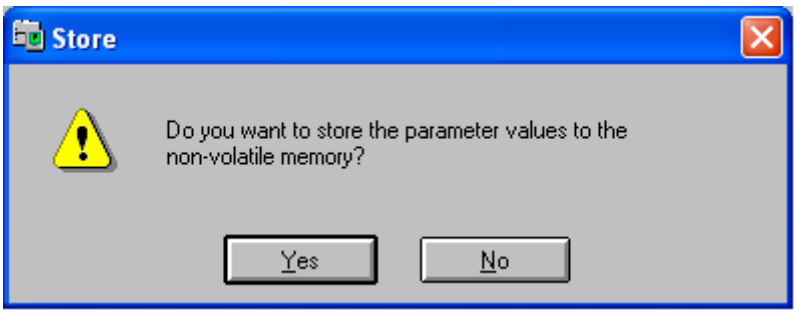
If the communication error is such that the relay unit does not answer, a dialog is opened, which prompts you to select whether to Retry or Cancel the downloading process.

5.4.3.3. Store

The Store function applies only to certain relays.

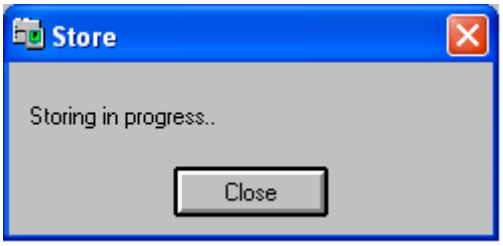
Table 5.4.3.3-1 The Store function:

Selection	Functionality
Store	Stores settings to the non-volatile memory in the relay unit. Clicking Close in the Storing dialog does not cancel storing operation in the relay unit. But then it cannot be guaranteed that storing has been completed successfully (see Fig. 5.4.3.3.-1). This function is not provided by all relays.



store_param

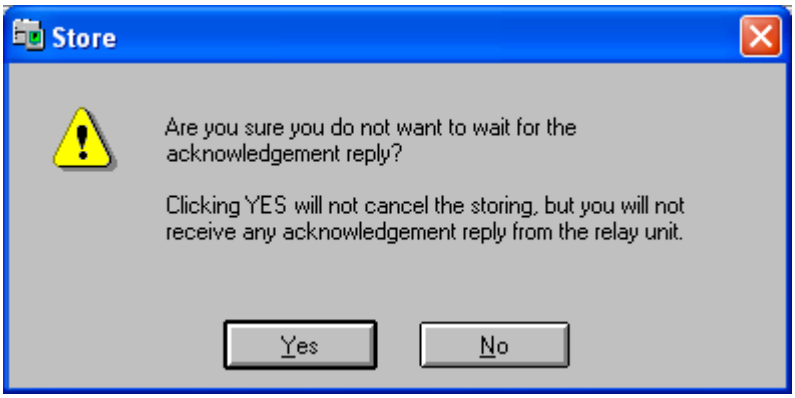
Fig. 5.4.3.3.-1 The dialog in which the storing of parameter values is confirmed



store_ack

Fig. 5.4.3.3.-2 The dialog indicating progress in the storing process

Clicking the Close button in Fig. 5.4.3.3.-2 does not interrupt the storing operation, but asks you whether you want to close the dialog or not (see Fig. 5.4.3.3.-3). Close the dialog by selecting Yes. You will, however, not receive any information whether storing was successful or not. If you select No, the program will return to the Storing dialog (see Fig. 5.4.3.3.-2).



close_store

Fig. 5.4.3.3.-3 Dialog asking whether you want to close the storing dialog

StoreSuccess

Fig. 5.4.3.3.-4 Storing completed successfully!

5.4.3.4. Reset (example)

Table 5.4.3.4-1 The Reset function:

Selection	Functionality
Reset	Opens a dialog for some general resetting operations. Select the wanted action and click Send. See the example in Fig. 5.4.3.4.-1.

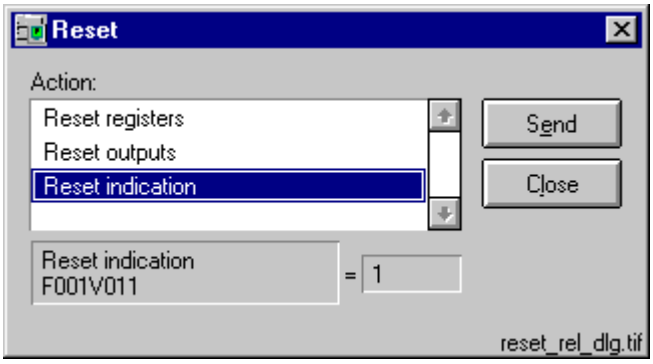


Fig. 5.4.3.4.-1 The dialog for resetting relay unit

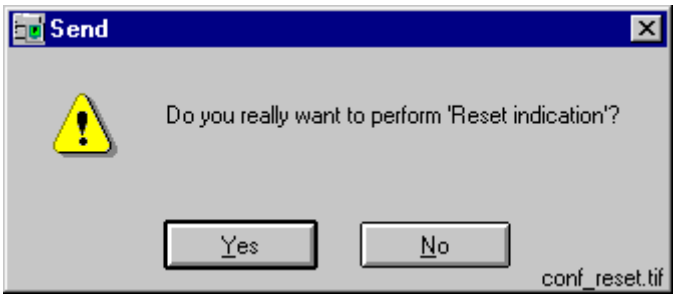


Fig. 5.4.3.4.-2 The dialog in which the selected action can be confirmed

5.4.4. Tools menu

The Tools menu contains miscellaneous tools and commands.

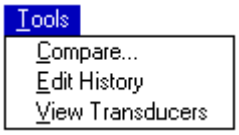


Fig. 5.4.4.-1 Tools menu

5.4.4.1. Compare

Table 5.4.4.1-1 The Compare function:

Selection	Functionality
Compare	The purpose of this function is to check that the values in the parameter file and in the relay are the same. The Compare dialog contains two pages: • Present Values page shows the differences between the Present Values in the file and the values in the relay. • New Values page shows the differences between the New Values in the file and the values in the relay.

In the Present Values and in the New Values pages (see Fig. 5.4.4.1.-1) there are several fields:

- In the first field the character # stands for a consecutive number
- the second field (called Parameter) indicates the description of the parameter
- In the third field the database name is presented
- In the fourth field the File Value is given
- In the last field the Relay Value is given

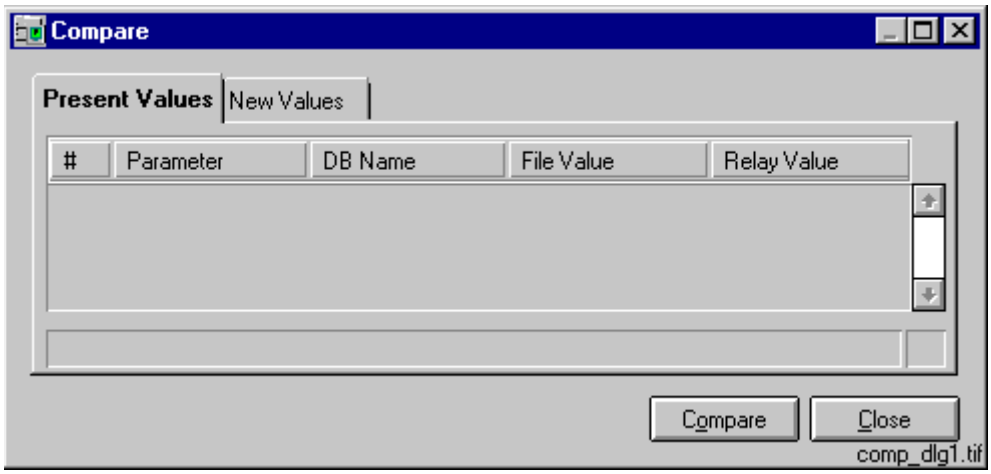


Fig. 5.4.4.1.-1 Compare dialog in which the comparing process can be started by pressing the Compare button.

The values will be shown only if the values in the parameter file differ from the values in the relay. In case there has been an error during the reading process, an error message will be shown in the Relay Value field. You can start the comparing process by pressing the Compare button in the lower part of the dialog. Click Close to exit the dialog without starting the comparing process.

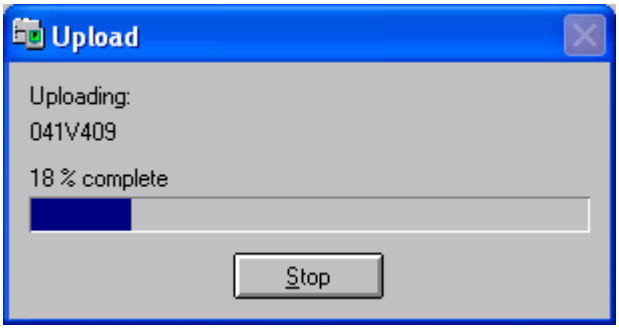


Fig. 5.4.4.1.-2 Compare Uploading dialog

When you click a field in the Present Values or New Values page, the field is activated (shown in blue as presented in Fig. 5.4.4.1.-3). A menu path is shown in the field on the left-hand side of the dialog in the status bar. The time when the File Value was updated last time is shown on the right-hand side in the status bar.

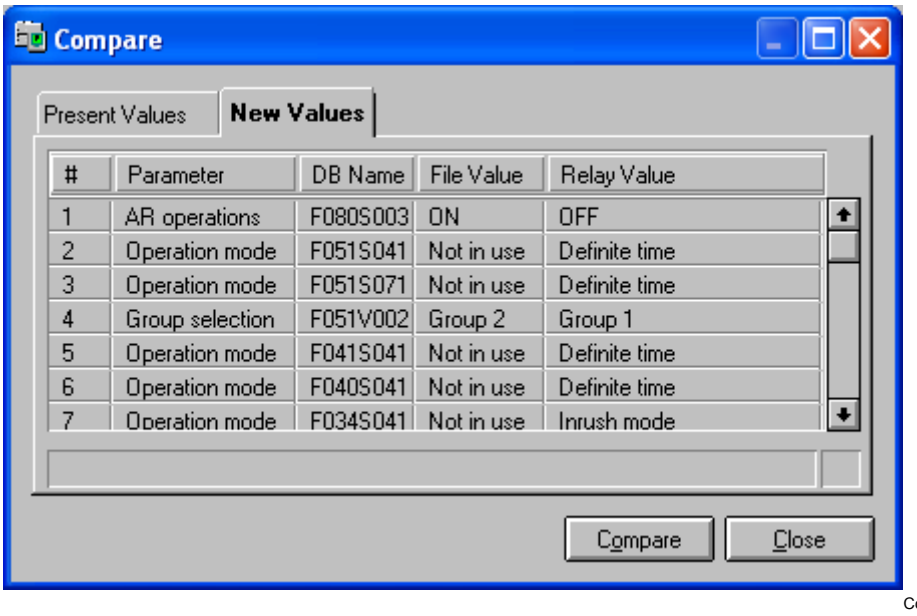


Fig. 5.4.4.1.-3 Compare New Values dialog

To exit the dialog, click Close.

5.4.4.2. Edit History

Table 5.4.4.2-1 The Edit History function:

Selection	Functionality
Edit History	Made changes are collected and presented in the Edit history dialog. These changes remain in the dialog only until the end of the session (i.e. they are not saved).

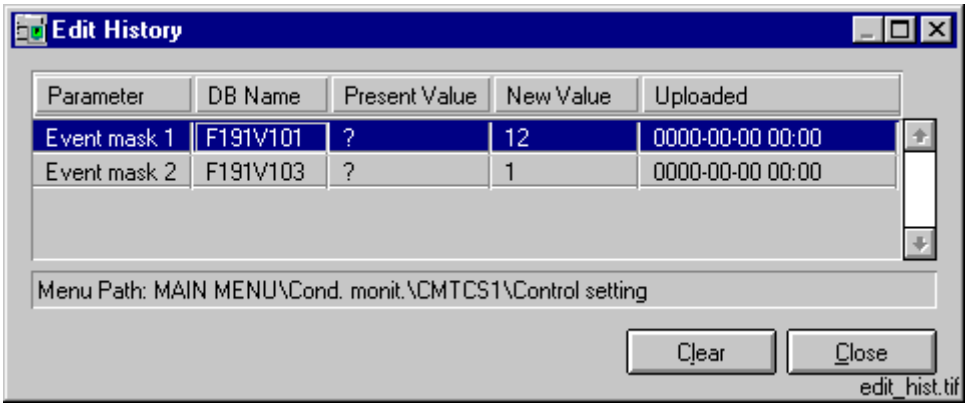


Fig. 5.4.4.2.-1 Edit History dialog

To erase all information from the dialog, click Clear. To exit the dialog, click Close.

5.4.4.3. View Transducers

Table 5.4.4.3-1 The View Transducers function:

Selection	Functionality
View Transducers	Nominal values can be viewed in the View Transducers dialog. These nominal values are used when calculating primary values for certain parameters (see Fig. 5.4.7.2.-1, note 6). Values are defined in the Object Configuration Tool, please see "RED relay object types" on page 17.

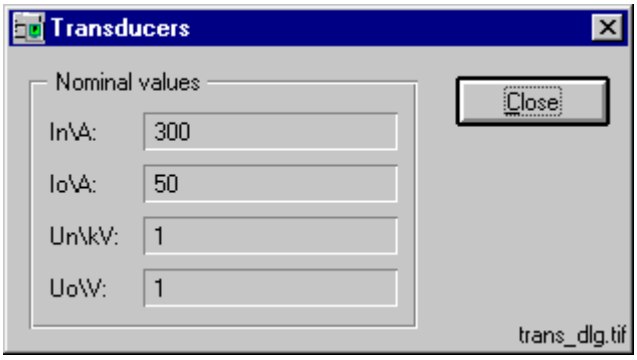


Fig. 5.4.4.3.-1 Transducers dialog

To exit the dialog, click Close.

5.4.5. Options menu

The Options menu contains miscellaneous tools and commands.

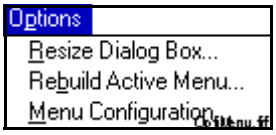


Fig. 5.4.5.-1 The Options menu

5.4.5.1. Resize Dialog

Table 5.4.5.1-1 The Resize Dialog function:

Selection	Functionality
Resize Dialog	Opens a dialog in which the size of the dialog can be changed (see Fig. 5.4.5.1.-1).

Access: User level 1.

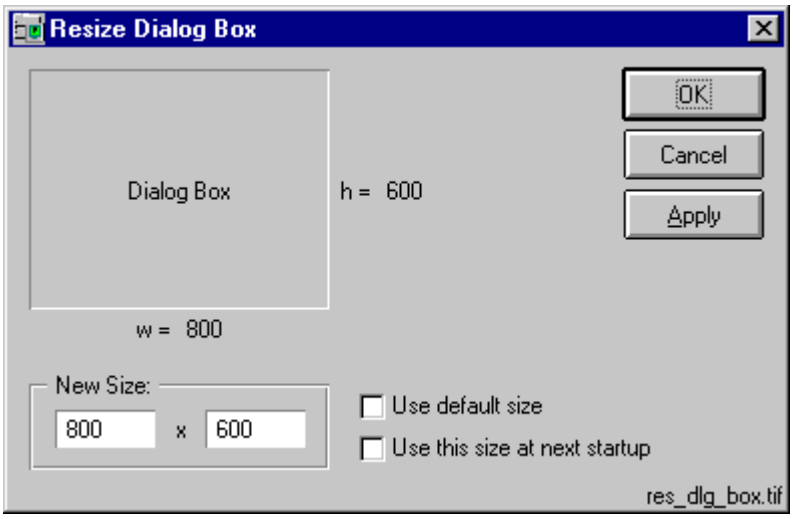


Fig. 5.4.5.1.-1 Dialog for resizing the Relay Setting Tool

5.4.5.2. Rebuild Active Menu

Table 5.4.5.2-1 The Rebuild Active Menu function:

Selection	Functionality
Rebuild Active Menu	Opens a dialog, where the building of the Active Menu File is started. You need this file to present the HMI in the Relay Setting Tool. **NOTE!** The Rebuild Active Menu function does not apply to the REX 52x relays.

Under Source MMI files there is a page for every MMI file. These pages contain information about file location, relay type, software number, version and state, date of creation and author. These files are used when building the new active menu (see Fig. 5.4.5.2.-1).

Under Build Active Menu File there is information about the current active menu file: file location path, date of creation and status. Details of used MMI files can be found under Files Used. The active menu file has been created on the basis of these used MMI files.

Access: User level 1.

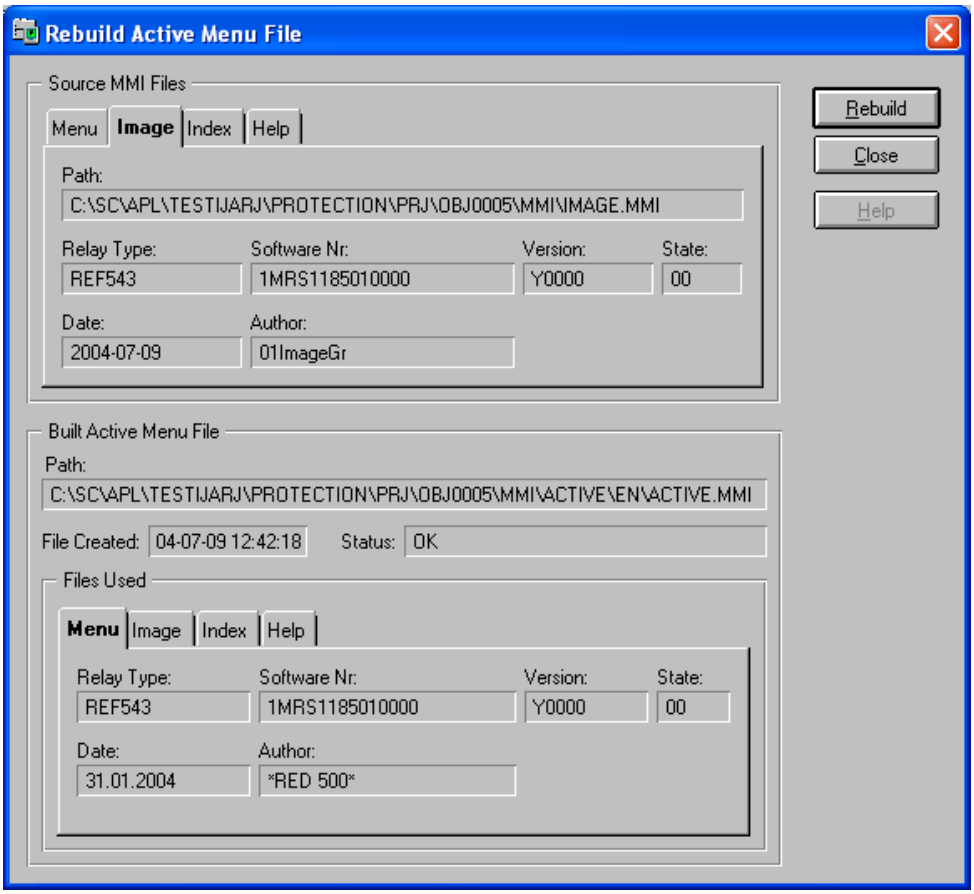


Fig. 5.4.5.2.-1 The dialog for building the Active Menu File

5.4.5.3. Menu Configuration

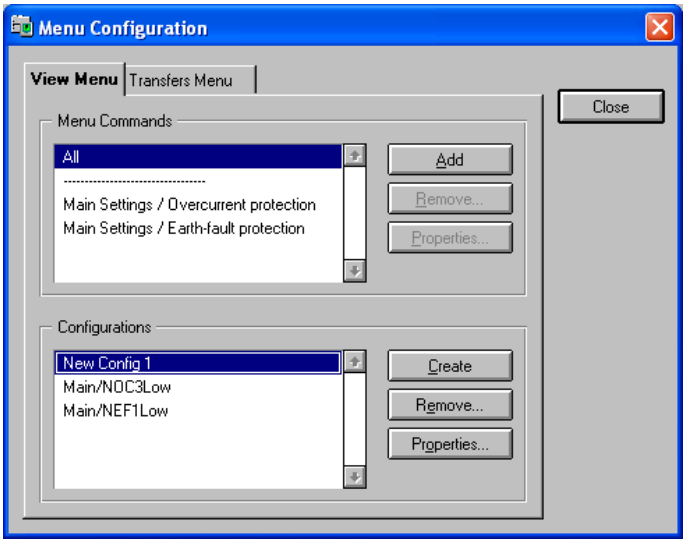
Table 5.4.5.3-1 The Menu Configuration function:

Selection	Functionality
Menu Configuration	With this function you have the possibility to customize the View and Transfers menu options. All menu configuration settings apply only to the object that has been selected in a station picture (in LIB/ MicroSCADA environment) or in the navigation tree (in CAP 501/505 environment).

Access: User level 2.

An example of how to add a function to the View menu is shown in the following section. The method is the same for both View and Transfers. You can add several new selections to the menus. It is also possible to delete inactual selections from the menus.

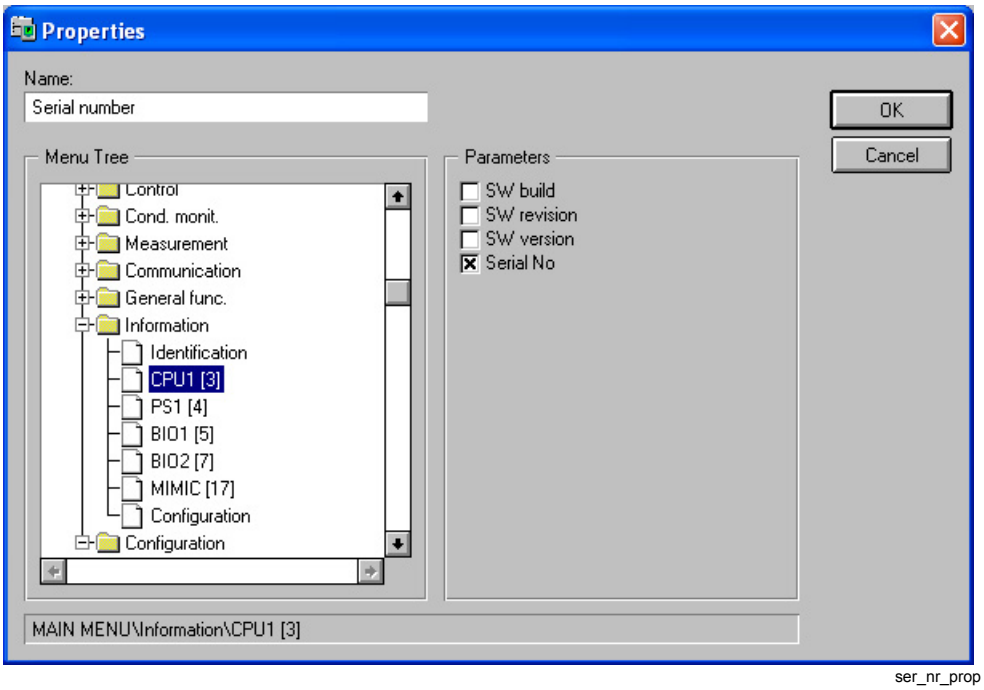
Menu Configuration/View Menu



add_menu_conf

Fig. 5.4.5.3.-1 Adding a new configuration to the list of Configurations

Start by creating a new configuration with the function Create. After you have pressed the Create button, the "raw material" New Config1 is added to the Configurations list. Select this item and click Properties.



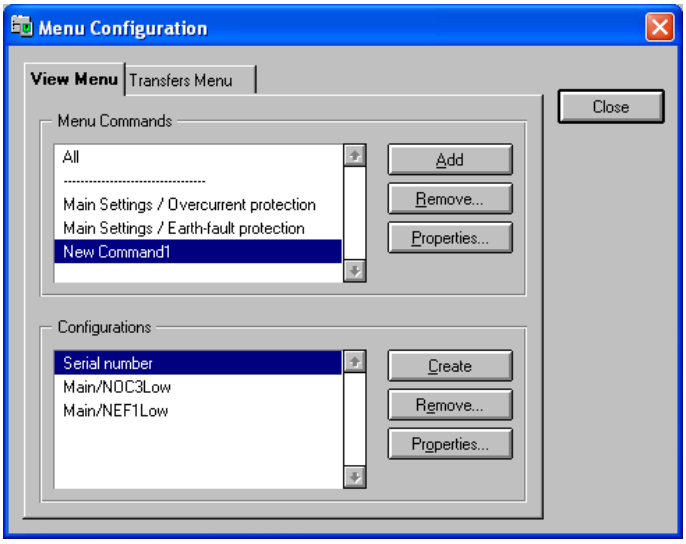
ser_nr_prop

Fig. 5.4.5.3.-2 Giving the properties for Serial number

Table 5.4.5.3-2 The function Properties has the following fields and functions:

Selection	Functionality
Name	Give a useful name for the configured function, otherwise it will remain as e.g. New Config1. In the example mentioned above, the name Serial number has been given by the user.
Menu Tree	Navigate in the menu tree and select the wanted function.
Parameters	The selectable parameters are shown in this field. Select the ones needed.
OK	Verify the choices made.
Cancel	Regret and return without changes.

After New Config1 has been configured, it will have the name Serial number. The following step is to prepare the Menu Commands. Start by pressing Add, and the New Command1 appears on the list.



new_comm_conf

Fig. 5.4.5.3.-3 A new menu item New Command 1 is added to the Menu Commands, but it still has to be prepared with the help of the Properties functions.

Select New Command1 and press Properties.

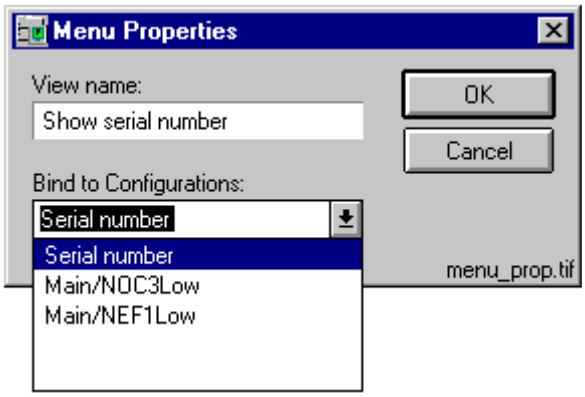


Fig. 5.4.5.3.-4 Giving the name for the menu function and binding it to the appropriate configuration.

Table 5.4.5.3-3 Menu Properties contains the following fields and functions:

Selection	Functionality
View name	Rename the New Command1 with the name you intend to present in the View menu.
Bind to Configurations	You will now have to bind a configuration with the menu selection.
OK	Verify your changes/setup
Cancel	Regret and leave without changes

The new menu selection is at your disposal after closing the Options/Menu configuration function.

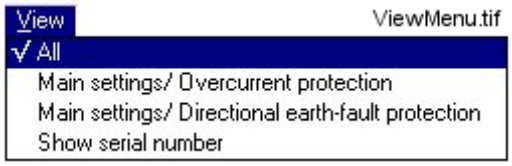
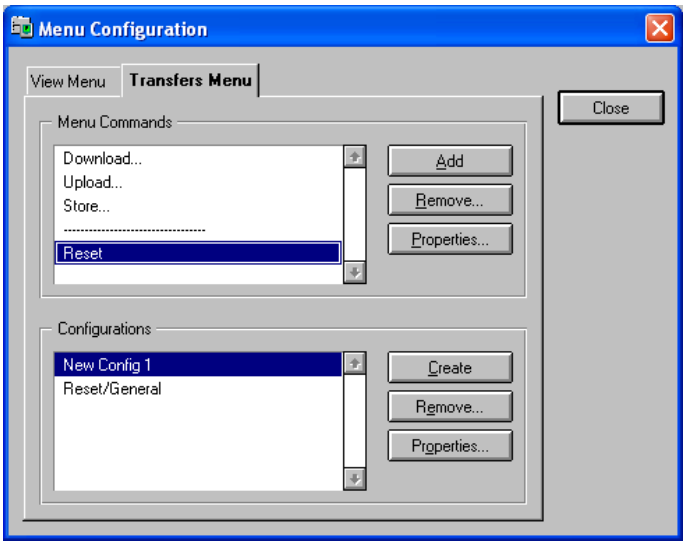


Fig. 5.4.5.3.-5 The new menu selection is at your disposal

Menu Configuration/Transfers Menu

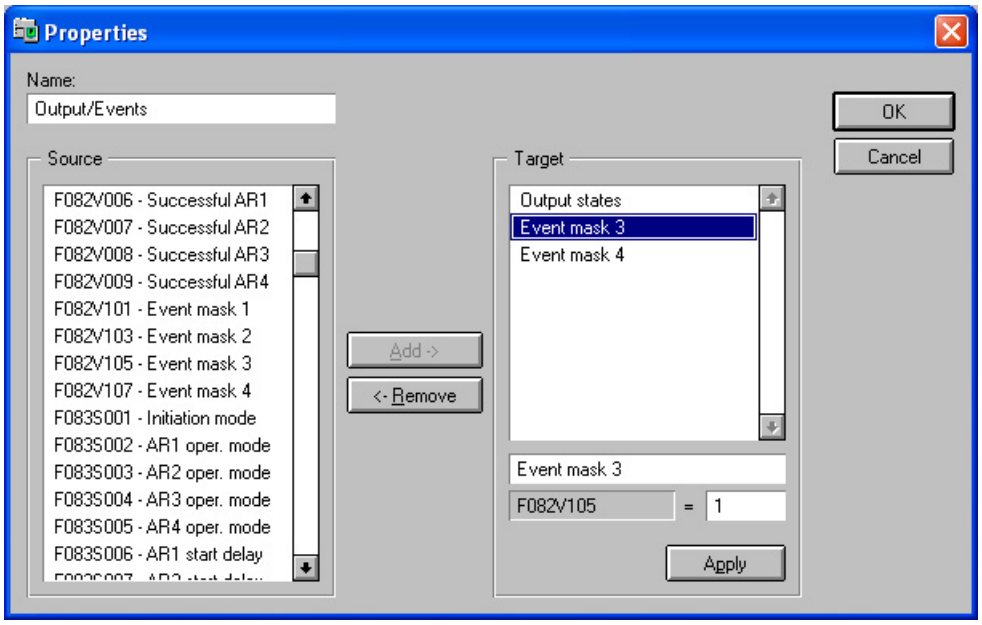
You have the possibility of preparing your own Transfers menu. The method is exactly the same as described in the previous section regarding the View menu, see Section 5.4.5.3.



trans_menu_conf

Fig. 5.4.5.3.-6 The Transfers menu is customized in the same way as the View menu. In this connection the option Properties has slightly different functions as in the View menu, see Fig. 5.4.5.3.-3.

Select Properties for the created New Config 1, see Fig. 5.4.5.3.-7:



new_conf_prop

Fig. 5.4.5.3.-7 Giving the properties for the new configuration

Table 5.4.5.3-4 Properties dialog contains the following fields and functions:

Selection	Functionality
Name	Give a useful name for your configured function, otherwise it will remain as e.g. New Config 1. In the example above the name Outputs/ Events is given by the user.
Source	Select the wanted parameters or items to be added to the Target and click the Add button
Target	The Target list contains a list of all added items from the Source list. By selecting the items one by one, the text can be edited. The field for the parameter code, e.g. F127V107 cannot be edited, but the value in the field to the right can be changed. Click Apply to verify each change of an item on the Target list.
Add	Adds the selected item from the Source list to the Target list
Remove	Removes the selected item from the Target list
OK	Verify your selections and modifications made
Cancel	Regret and return without changes, also those confirmed with the Apply button

Remarks regarding Fig. 5.4.5.3.-7:

As it can be seen in the Source list in Fig. 5.4.5.3.-7, a huge amount of parameters/ items can be selected and added to the Target list. Normally, the idea is not to make parametrization of the relay parameters via the Transfers menu even if it is possible, but to enable e.g. resetting of registers, indications etc. in the relay. Relay parametrization and monitoring is described further on in Section 5.4.7.

Furthermore, the user should check that the value of each parameter/item in the Target list has the right value (in the field on the right side of the parameter code). In other words, you should ensure that the parameter/item has the value you want to send to the relay. The default value is not always the wanted one. The values can, of course, be changed afterwards, whenever necessary. It is also recommended to take into consideration that giving "wrong" value may result in that the expected result remains unfulfilled when executing the menu selection in the Transfers menu.

5.4.6. Help

The Help menu contains an on-line help for the tool functions.

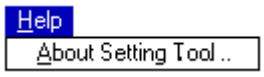


Fig. 5.4.6.-1 The Help menu

5.4.6.1. About Relay Setting Tool

Table 5.4.6.1-1 About Setting Tool:

Selection	Functionality
About Setting Tool	Gives information regarding the setting tool.

Access: No limitations.

5.4.7. Monitoring and changing parameters

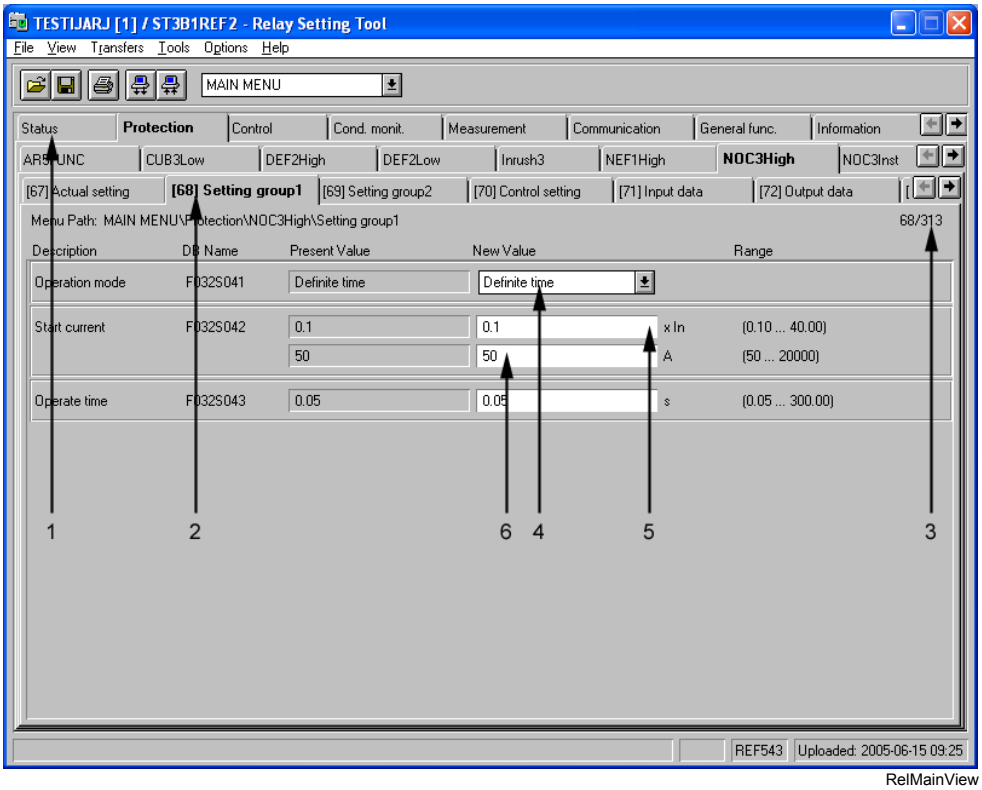
The RED Relay Setting Tool gives you a powerful tool for monitoring and configuring the relay units.

5.4.7.1. RED menus

When a menu from the Relay Setting Tool is selected, a menu hierarchy of the functions (see Fig. 5.4.7.2.-1, item 1) available for the relay unit is displayed in the tool area. Each function holds several tabbed pages of configurable parameters.

5.4.7.2. Tabbed pages

The Relay Setting Tool's Main View contains tabbed pages. The hierarchy and the number of these tabbed pages depends on the selected relay. A tabbed page can be selected by clicking the wanted page with the mouse, e.g. page 68 (see item 2 in Fig. 5.4.7.2.-1). Item 3 in Fig. 5.4.7.2.-1 indicates the last page (313).



RelMainView

Fig. 5.4.7.2.-1 Relay Setting Tool's Main View

5.4.7.3. Parametrization

The Setting Tool pictures hold a field indicating the Present Value and a field indicating the New Value. After you have changed the new values, the changes have to be downloaded to the relay unit. To download parameters, select Transfers menu and click Download parameters. The Present Value field is updated when you have downloaded the new values.

If there are multiple choices, the suitable alternative can be selected from the drop-down combo box (see item 4 in Fig. 5.4.7.2.-1). If the relay unit is protected by a password, the password is prompted before you can download the changes. To enter a new value, press the mouse button or any key in the New Value field (item 5 in Fig. 5.4.7.2.-1). A dialog opens in which you can enter the new value (see Fig. 5.4.7.3.-1). Item 6 is also an input field for the new value. Whether this is in use or not, is defined in the Object Configuration Tool.

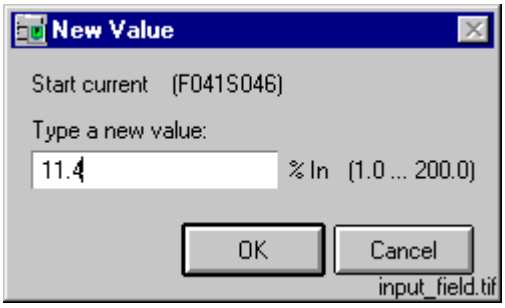


Fig. 5.4.7.3.-1 The input field of the Setting Tool

6. Graphical I/O Setting Tool

6.1. General

Graphical I/O Setting Tool is a setting tool for REX 521 relays used for the following tasks:

- Setting of I/O related parameters with graphical matrices
- On-line parametrization
- Off-line parametrization
- Upload or download a group of parameters
- Authorization support

The Graphical I/O Setting Tool is used in CAP 501, CAP 505 and in SMS 510 environments.

The Graphical I/O Setting Tool is complementary to the Relay Setting Tool, and it is used to set digital inputs, digital outputs and alarm LED signals of REX 521 relays in an easy way. The routing of signals is presented with a graphical connection matrix where it is possible to connect a signal to a function block, or vice versa.

The tool has one graphical matrix page for digital inputs, one for digital outputs and one for alarm LEDs. The Alarm LED Matrix page can be used with REX 521 relays from revision C onwards. Only parameters related to digital inputs, digital outputs or alarm LED signals are possible to set with the Graphical I/O Setting Tool. A change of parameter setting in the Graphical I/O Setting Tool will be visible in the Relay Setting Tool, and vice versa.

6.2. Start-up

6.2.1. Starting from CAP 501/505 or SMS 510

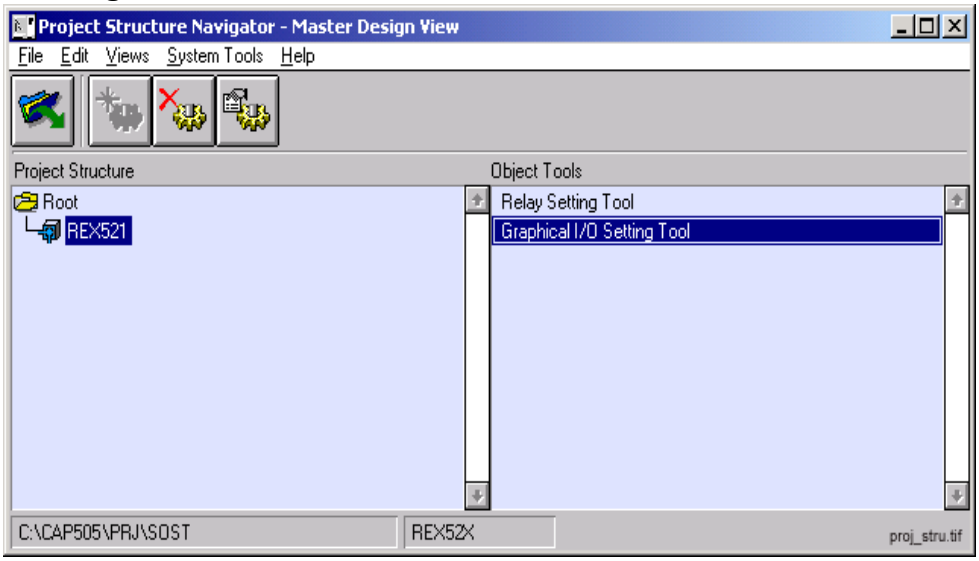


Fig. 6.2.1.-1 Starting Graphical I/O Setting Tool from the Project Structure Navigator.

Navigate to the desired relay object in the Project Structure navigation tree on the left and select it. The tools that are available for the selected object appear on the Object Tools list on the right. Open the Graphical I/O Setting Tool by double-clicking it on the list.

6.3. Main view

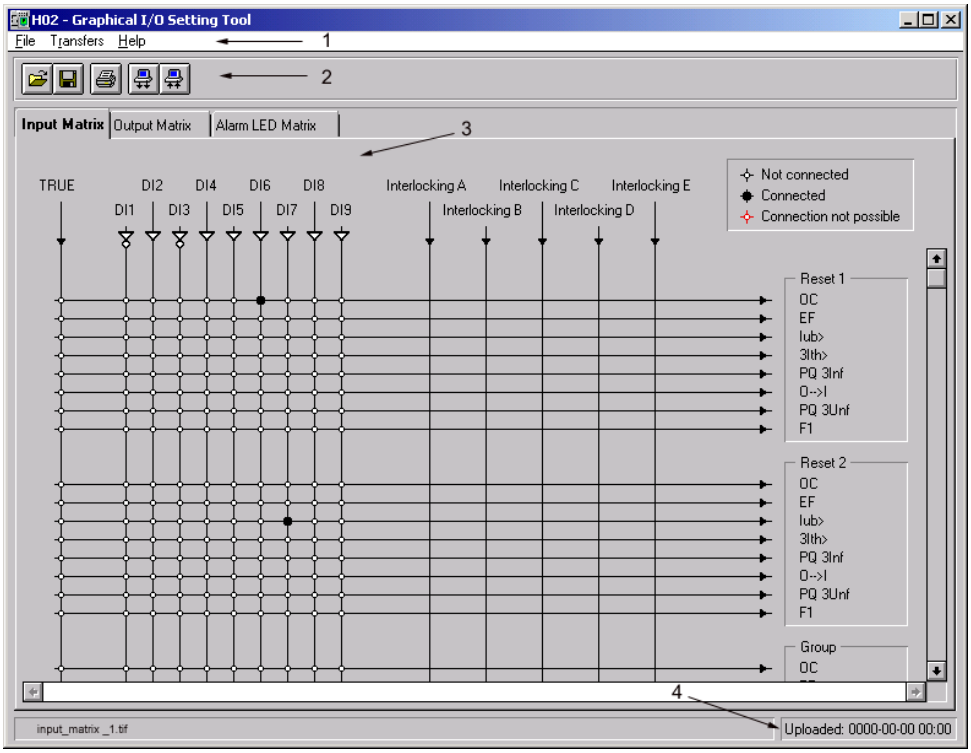


Fig. 6.3.-1 The main view

The main view includes the following functions:

1. Menu bar

The menu with commands for the Graphical I/O Setting Tool.

2. Toolbar

The toolbar contains buttons that perform the most common tasks.

Table 6.3.-1 Main view toolbar buttons:

Button	Functionality
	Import parameters
	Export parameters

Button	Functionality
	Printing
	Upload (receive) parameters
	Download (send) parameters

3. The graphical I/O matrices

These pages show the different matrix pages where digital input, digital output and alarm LED signals may be routed.

4. Status field

The status field shows the upload status of the parameters. The status might be:

- **Uploaded 0000-00-00 00:00**, when the parameters of the selected page have been read from the default file.
- **Uploaded 0000-00-00 00:00 (red colored text)**, when the parameters of the matrix page have been uploaded at different times. This situation may occur when the parameter settings of a relay have also been uploaded or downloaded by the Relay Setting Tool. It is recommended to upload the parameter settings for the matrix page from the relay to prevent inconsistency between parameter settings that have been uploaded at different times.

6.4. Using Graphical I/O Setting Tool

6.4.1. Matrix pages

A graphical matrix is generated when you select a page for the first time by clicking on the page tab. The dialog in Fig. 6.4.1.-1 is shown during the generation of the matrix.

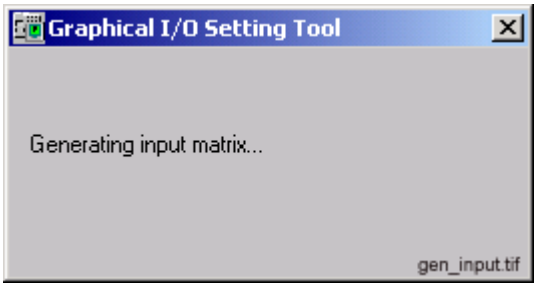


Fig. 6.4.1.-1 Matrix generation is proceeding

The tool allows routing of digital input, digital output and alarm LED signals to function blocks by clicking on the connection point of the signals in a matrix view. Each matrix contains an info box of the possible connection symbols used in the matrix. See Fig. 6.4.1.-2.

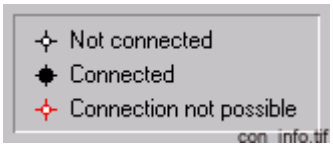


Fig. 6.4.1.-2 Possible connection symbols for the Input Matrix

The connection symbol "Connection not possible" is shown for a half second when you try to make a connection that is not possible.

This situation occurs when some other signals already are connected to each other and the selected signal cannot be connected due to the parameter types and the settings of the parameters.

Fig. 6.4.1.-3 shows an example where it is not possible to connect the digital input signal DI9 to the Blocking 1 switchgroup, because the digital input DI1 is already connected to the Blocking 1 switchgroup.

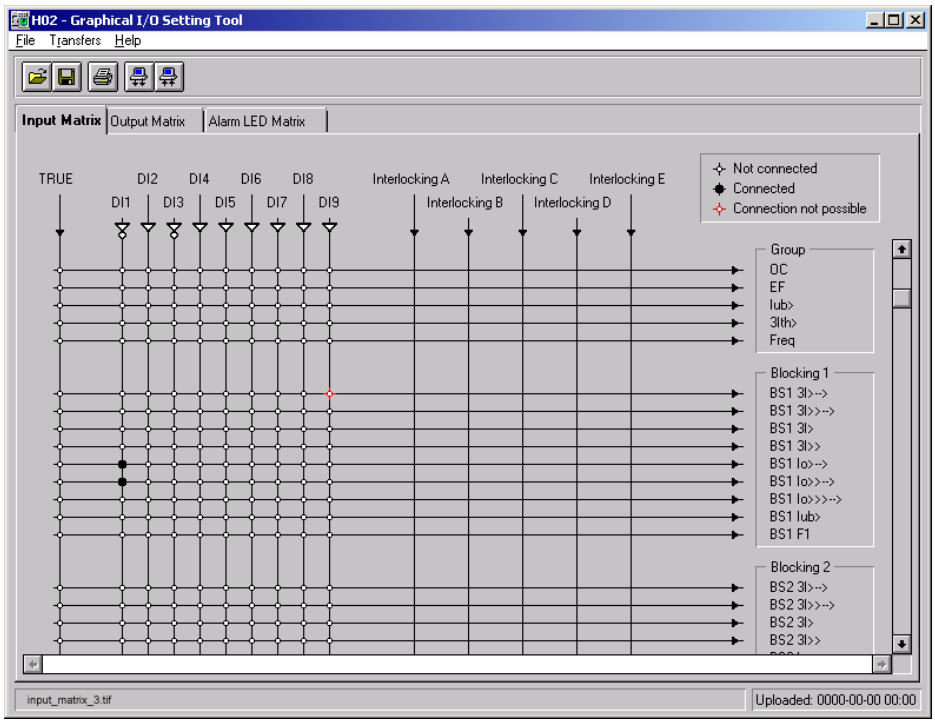


Fig. 6.4.1.-3 An Input Matrix in which a connection of DI9 input to Blocking 1 switchgroup is impossible.

The connections between the digital input DI1 and the Blocking 1 switchgroup (see Fig. 6.4.1.-3) must first be disconnected by clicking on the connected connections. After this, it is possible to connect the selected digital input DI9 to the Blocking 1 signal.

Signals can basically be routed in the same way in the three matrices, but there are some differences because of the standard configuration and parameter types used in the relay. The routing of signals is described in detail in Sections 6.4.1.1- 6.4.1.3.

6.4.1.1. Input Matrix

The Input Matrix has two possible connections:

- Not connected
- Connected

The symbol indicates if a digital input signal is routed to a function block or not. By clicking on the connection symbol you can toggle the connection type between "Not connected" and "Connected".

The inversion settings for a digital input can be changed in the matrix and the symbols for the inversion of digital inputs are the following:

- Input inverted
- Input not inverted

By clicking on the digital input inversion symbol you can change the value for the signal. In Fig. 6.4.1.1.-1, the digital inputs DI1 and DI3 are inverted and the rest are not.

Routing of signals that are connected via a switchgroup from a protection function block to another protection function block in the relay is also possible in the Input Matrix. These signals are gathered beneath the Input Matrix (see Fig. 6.4.1.1.-1). A selected check box of a signal indicates that the signal is connected.

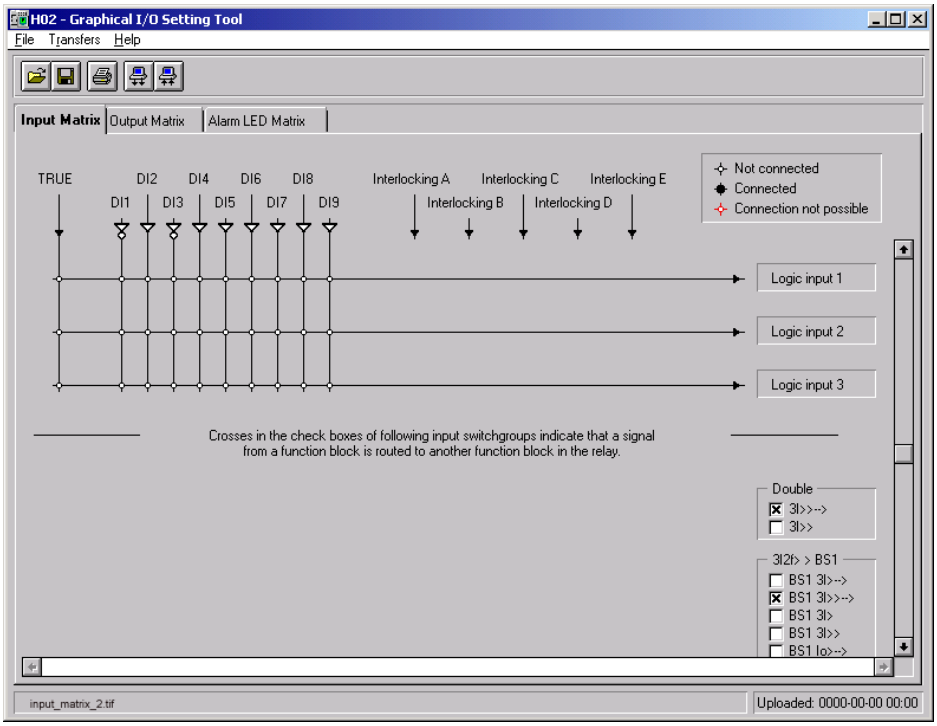


Fig. 6.4.1.1.-1 An Input Matrix with the window scrolled down

6.4.1.2. Output Matrix

The Output Matrix has three possible connections:

- Not connected
- Connected and non-latched
- Connected and latched

The symbols indicate the way a signal is connected from a function block to a digital output relay. Note that the "Connected and latched" connection is only possible for the trip signals (Trip 1, Trip 2 and Trip 3). The value of the connection changes in the following order when it is selected: "Not connected", "Connected and non-latched", "Connected and latched", "Not connected", and so on.

Fig. 6.4.1.2.-1 shows an example of the Output Matrix.

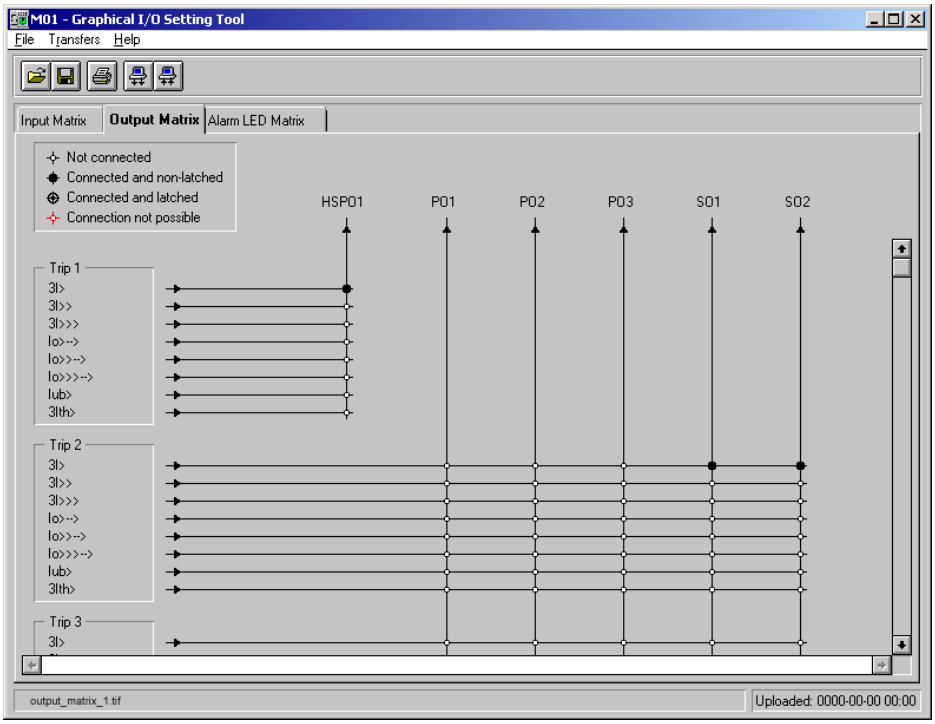


Fig. 6.4.1.2.-1 An Output Matrix

The routing of one signal or the change of a connection value in the Output Matrix may affect other connections at the same time. Following examples describe a situation where this may occur:

Example 1

If you want to change the connection type between Trip 1, 3I> and HSPO1 to "Connected and latched" by clicking on the connection (see Fig. 6.4.1.2.-1), other connections might be affected. In this case, the connections between Trip 2, 3I> and SO1, SO2 will also become "Connected and latched" as shown in the next picture (see Fig. 6.4.1.2.-2). This behaviour originates from the standard configuration, in which the 3I> (Trip 1, Trip 2 and Trip 3) signals are connected to the same protection

function block output. Changing the value of a trip signal parameter, which sets the non-latching or latching state of the trip signal for the protection function block, will affect all connected trip signals.

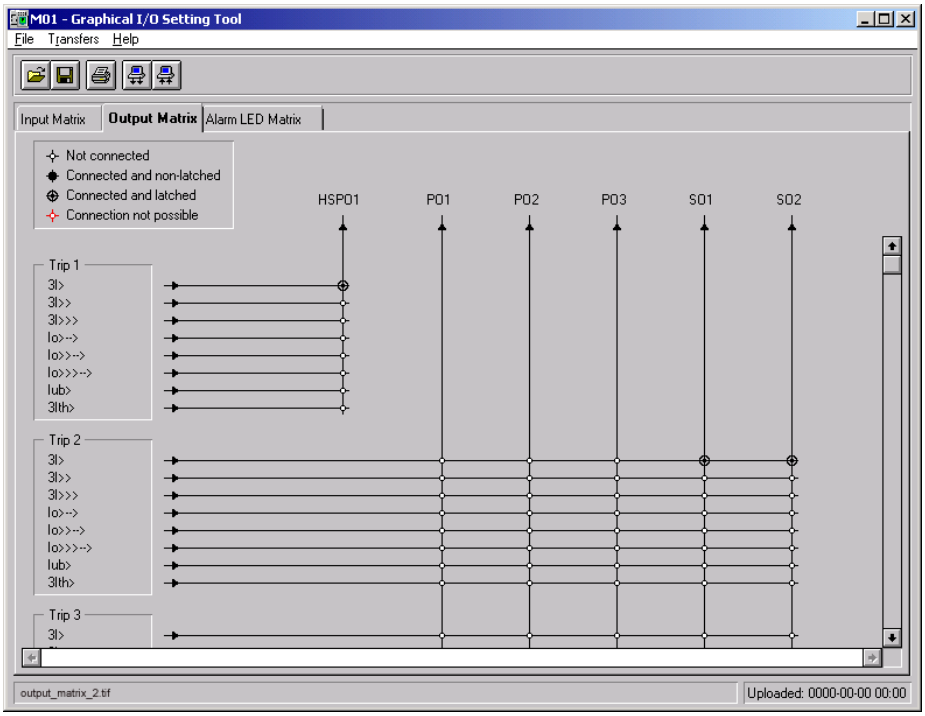


Fig. 6.4.1.2.-2 An Output Matrix showing "Connected and latched" connections

Example 2

If we want to route the Trip 2, 3I>> signal to PO1 by clicking on the connection (see Fig. 6.4.1.2.-2), other related connections could be affected. In this case the connections between Trip2, 3I>> and SO1, SO2 will become "Connected and non-latched" and the connection between Trip 2, 3I> and PO1 will become "Connected and latched" (see Fig. 6.4.1.2.-3). This behaviour originates from the output switchgroups and output selectors used in the standard configuration for routing of output signals.

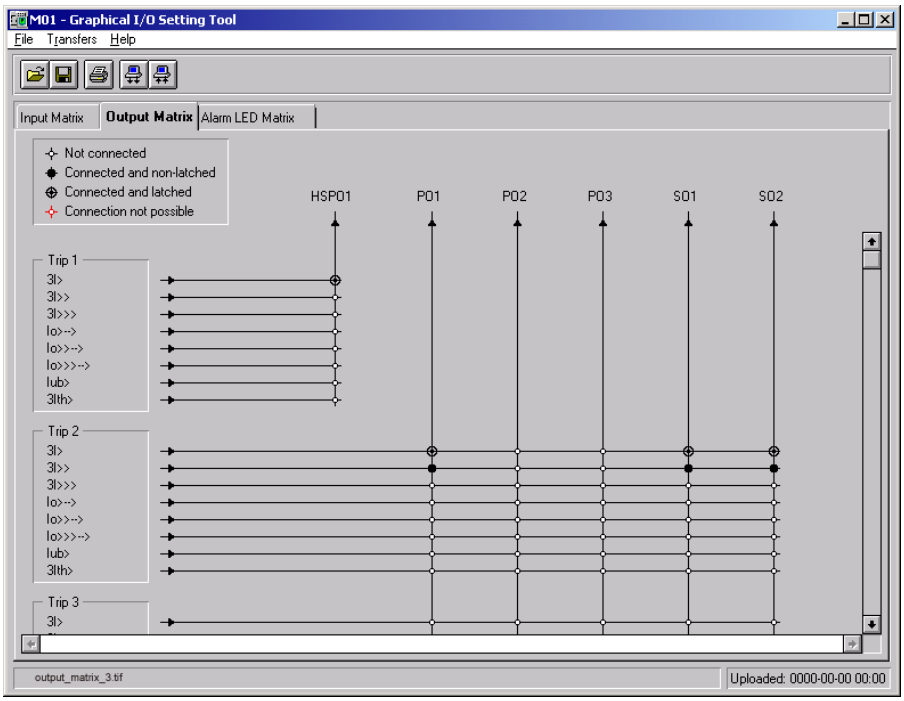


Fig. 6.4.1.2.-3 An Output Matrix showing "Connected and non-latched" and "Connected and latched" connections.

6.4.1.3. Alarm LED Matrix

The Alarm LED Matrix has four connection symbols:

- Not connected
- Non-latched alarm
- Latched alarm steady LED
- Latched alarm flashing LED

The symbol indicates if a signal is connected to an alarm LED, and in what way the LED indicates an alarm (see Fig. 6.4.1.3.-1). The value of the connection changes in the following order when it is selected; "Not connected", "Non-latched alarm", "Latched alarm steady LED", "Latched alarm flashing LED", "Not connected", and so on.

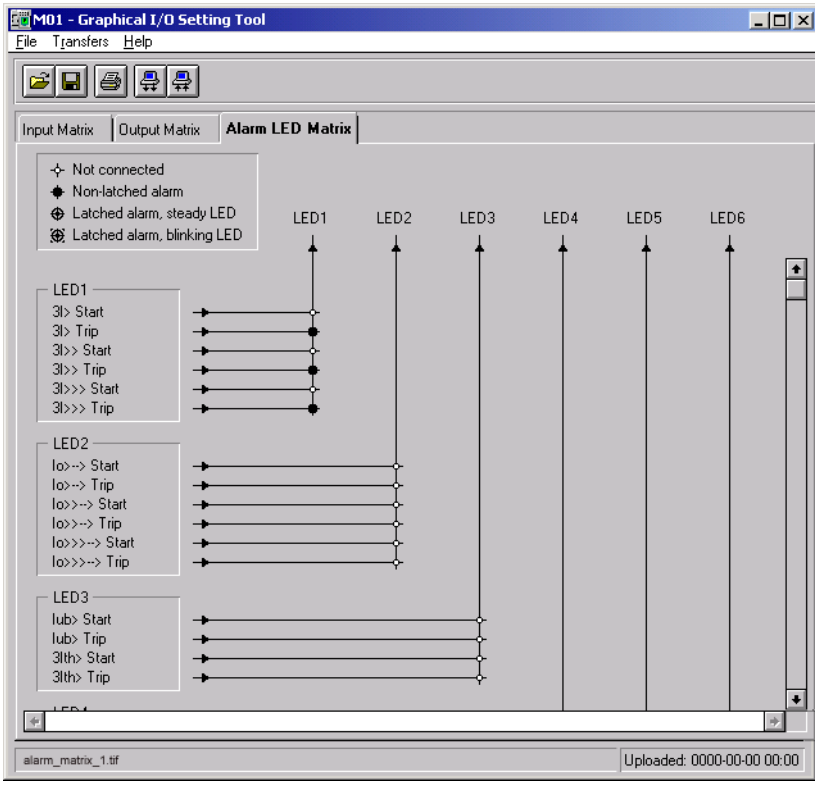


Fig. 6.4.1.3.-1 Alarm LED Matrix

All connected signals for an alarm LED switchgroup have the same connection value. For example, when the connection between 3I> Trip (LED1) and LED1 is selected (see Fig. 6.4.1.3.-1) all the connections symbols for the alarm LED switchgroup LED1 are updated to "Latched alarm steady LED" (see Fig. 6.4.1.3.-2).

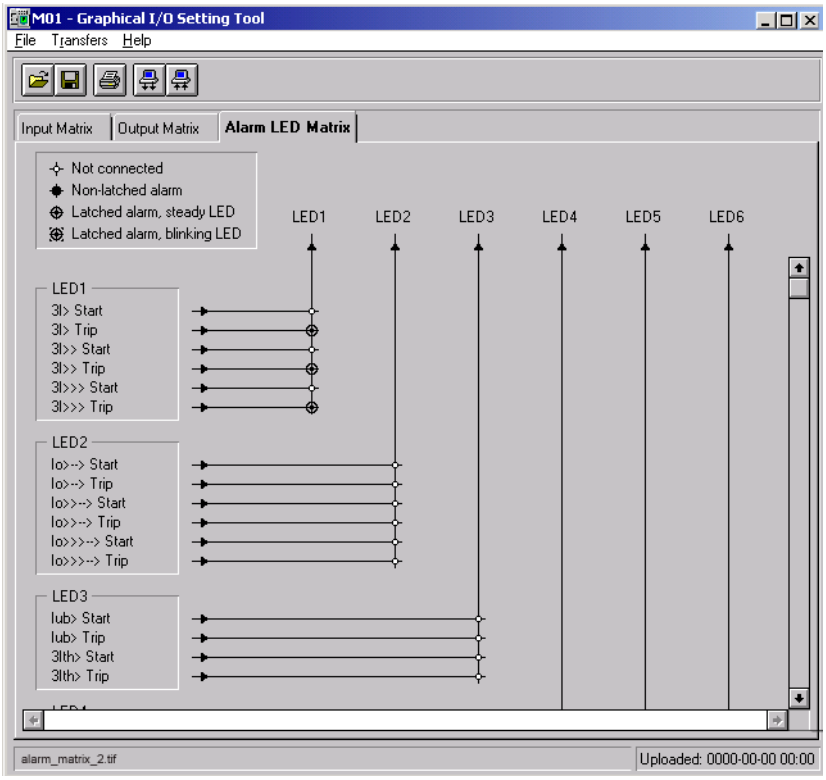


Fig. 6.4.1.3.-2 An Alarm LED Matrix showing "Latched alarm steady LED" in switchgroup LED1.

6.4.2. File menu

The file menu contains the functions belonging to file handling. The functions of the file menu are the same as in the RED Relay Setting Tool. Therefore, for details about Import, Export, Page Setup, Print Setup and Exit functions, refer to Section 5.4 in Chapter 5 "RED Relay Setting Tool". For details about the printing function, see Section 6.4.2.1.

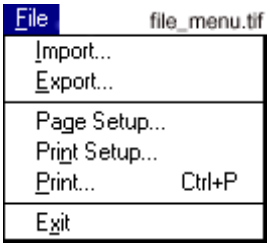


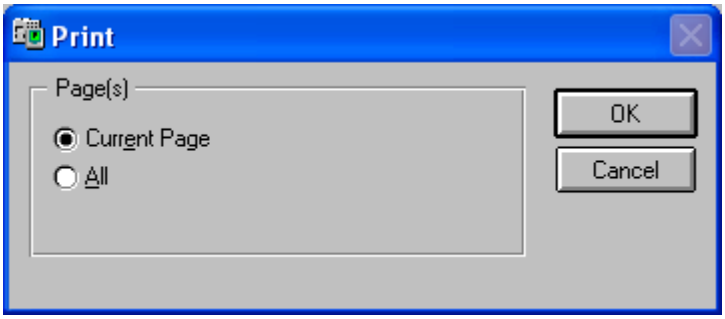
Fig. 6.4.2.-1 File menu

6.4.2.1. Printing

Table 6.4.2.1-1 The Printing function:

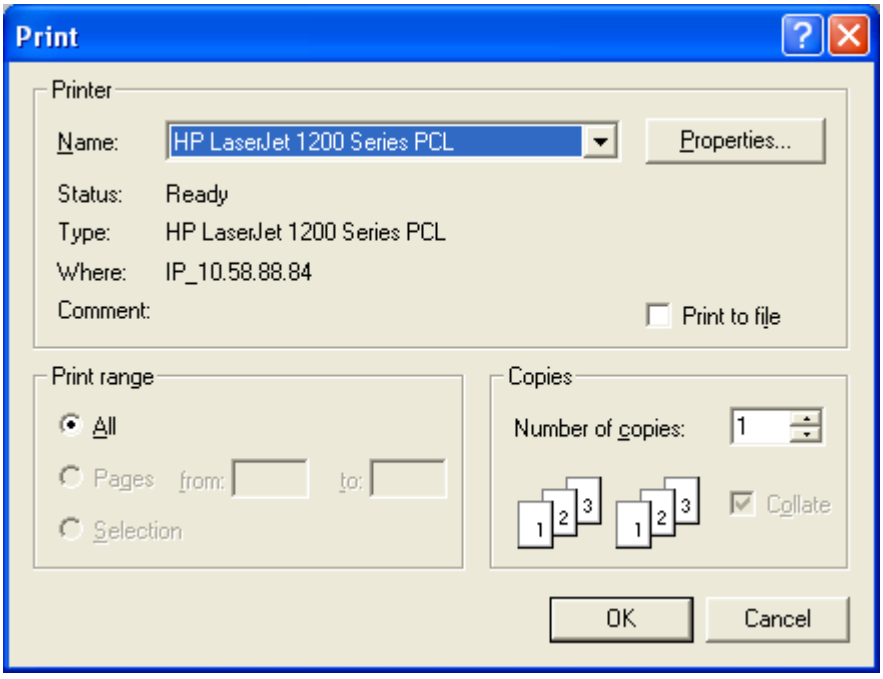
Selection	Functionality
Print	Opens a dialog in which it is possible to select printing of the current matrix page or all matrix pages. Printed output of the matrix pages is similar to what is displayed on the screen.

After you have selected the printable matrix pages for printing, click OK (see Fig. 6.4.2.1.-1). The second print dialog will be opened (see Fig. 6.4.2.1.-2) in which you can either confirm printing or cancel it.



print_1

Fig. 6.4.2.1.-1 Print dialog



print_2

Fig. 6.4.2.1.-2 Confirm or cancel printing

Printouts can be made to a local or network printer defined in the operating system. Depending on which context the MicroSCADA monitor is opened in, the available printers and the needed configuration work may differ. This varies in different MicroSCADA technology products.

When using CAP 501, CAP 505, and SMS 510, refer to Section 5.4.1.5 in RED Relay Setting Tool.

When local printers are used, the MicroSCADA user should have access to these printers.

6.4.3. Transfers Menu

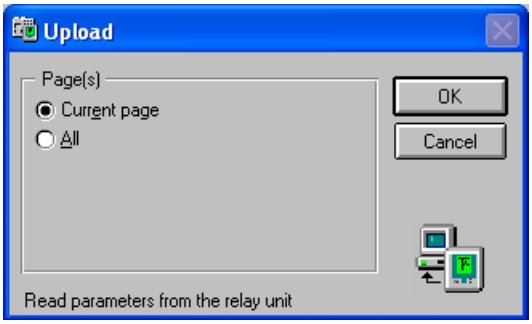
The Transfers menu contains commands used for communication with the relay unit.

Fig. 6.4.3.-1 Transfers menu

6.4.3.1. Upload

Table 6.4.3.1-1 The Upload function:

Selection	Functionality
Upload	Connects to the selected unit and uploads (receives): 1) parameters used in the current matrix page 2) all parameters used in the matrix pages



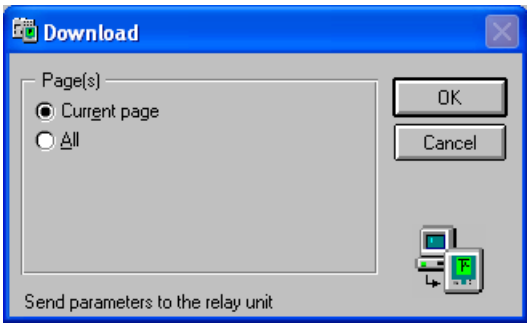
upload

Fig. 6.4.3.1.-1 Confirm or cancel upload dialog

6.4.3.2. Download

Table 6.4.3.2-1 The Download function:

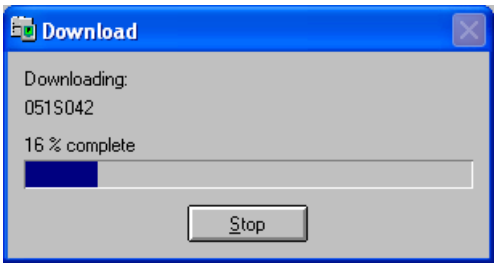
Selection	Functionality
Download	Connects to the selected unit and downloads (sends): 1) parameters used in the current matrix page 2) all parameters used in the matrix pages



download

Fig. 6.4.3.2.-1 Confirm or cancel download dialog

After you have started uploading/downloading, the dialog shown in Fig. 6.4.3.2.-2 pops up. The dialog gives the user information of the current operation (uploading/downloading). It also shows how the downloading proceeds. The Stop button cancels the operation and closes the dialog.



down_progr

Fig. 6.4.3.2.-2 Communication dialog

If a problem occurs during the communication, a dialog opens and you can either skip, retry or cancel the reading (see Fig. 6.4.3.2.-3). If the relay unit does not answer at all, you can select whether to retry or cancel the downloading system process.

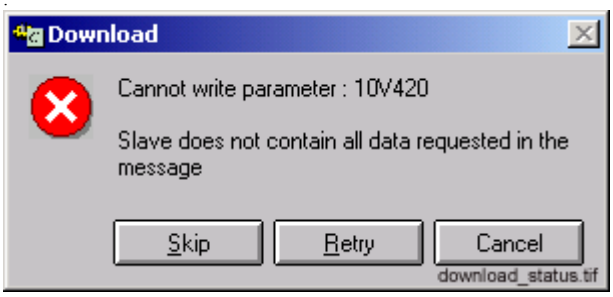


Fig. 6.4.3.2.-3 A communication problem has occurred

After the uploading/downloading process is completed, the dialog is closed and the matrices that have been selected at least once are updated.

6.4.4. Help menu

The Help menu contains a general on-line help for the tool functions, information about the related parameters and an About dialog.

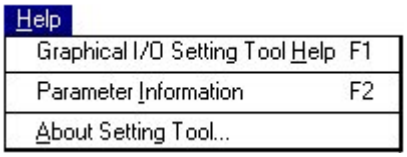


Fig. 6.4.4.-1 Help menu

6.4.4.1. Graphical I/O Setting Tool Help

Table 6.4.4.1-1 The Help function:

Selection	Functionality
Graphical I/O Setting Tool Help	Opens a help dialog where the functionality of the tool is generally described.

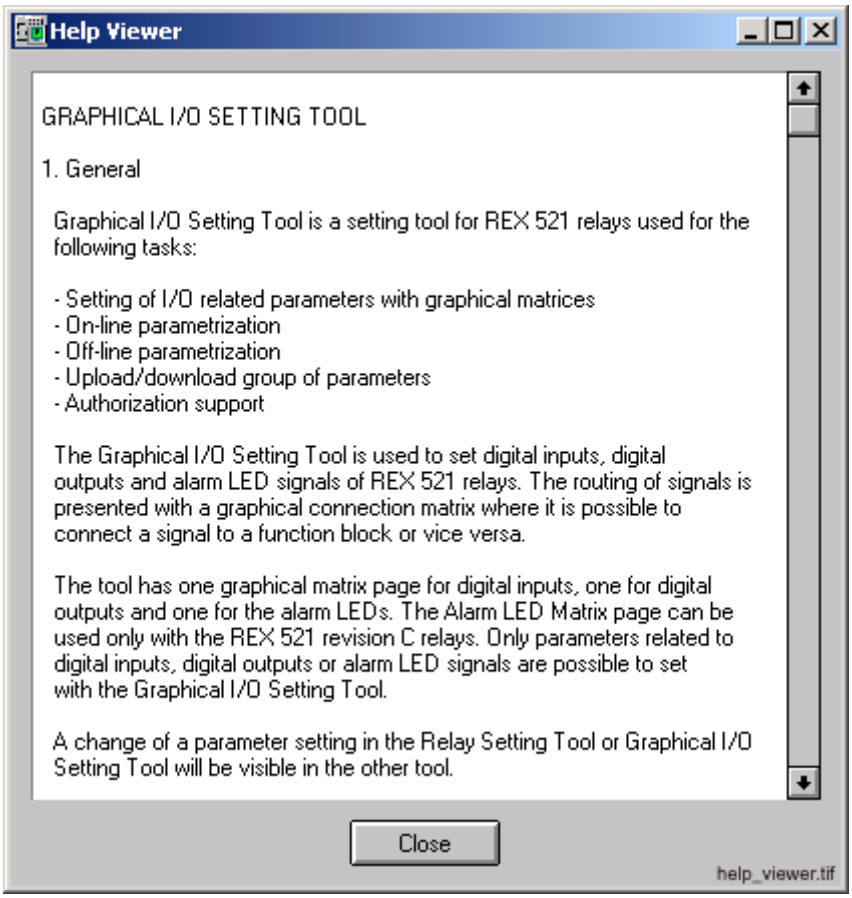


Fig. 6.4.4.1.-1 Graphical I/O Setting Tool Help Viewer dialog

6.4.4.2. Parameter Information

Table 6.4.4.2-1 The Parameter Information function:

Selection	Functionality
Parameter Information	Opens a dialog which describes all the parameters of the relay that can be set with the Graphical I/O Setting Tool.

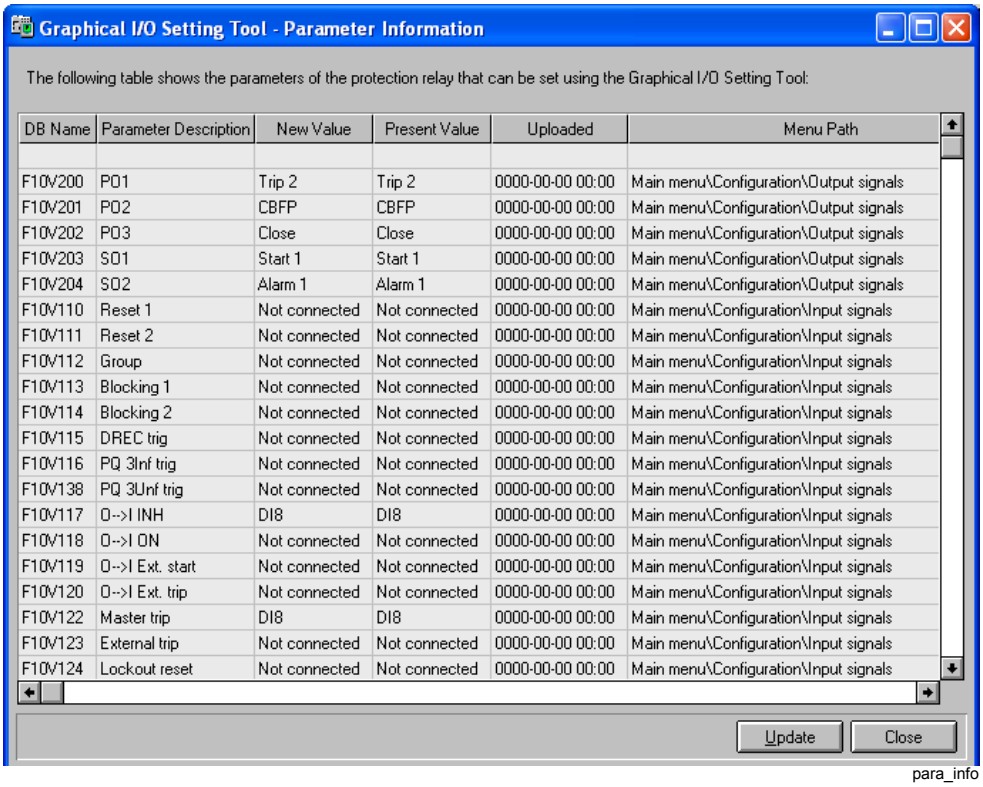


Fig. 6.4.4.2.-1 Parameter Information dialog

6.4.4.3. About Setting Tool…

Table 6.4.4.3-1 The Setting Tool function:

Selection	Functionality
About Setting Tool	Gives information about the Graphical I/O Setting Tool.

7. DR-Collector Tool

7.1. General

DR-Collector Tool is a disturbance recorder tool used for:

- Uploading recordings from the disturbance recorder, also automated uploading in LIB 510/MicroSCADA
- Monitoring
- Deleting recordings
- Remote triggering
- Copying, deleting, moving

Recorder files are created in COMTRADE format.

DR-Collector Tool is used in LIB 510 in MicroSCADA, CAP 501, CAP 505 and in SMS 510 environments.

The DR-Collector Tool that has been integrated into SPA Relay Setting Tool in LIB 510 Version 4.0.2 or older, cannot be used at the same time as the new version of DR-Collector Tool.

7.1.1. Communication support

Table 7.1.1-1 Supported communication protocols:

CAP 501	SPA, SPA TCP/IP
CAP 505	LON, SPA, SPA TCP/IP
SMS 510	LON, SPA
LIB 500/510	LON, SPA

In addition to the protocols above, in LIB 500/510 the following protocols are partly supported for certain relay types with certain restrictions. When using the protocols below, only manual disturbance recording uploading with the DR-Collector Tool is supported, not automated upload.

Table 7.1.1-2 Partly supported communication protocols in LIB 500/510:

Protocol	Relay types	Condition	Remarks
IEC 60870-5-101	REF 54x, REM 54x, REC 52x, RET 54x, REX 52x		All but REC 52x require either a COM 6xx or a KU-2000 gateway
IEC 61850-8	All other RED object types but REC 52x	Only with SYS 600	Requires a SPA-ZC 40x communication gateway

7.1.2. Supported disturbance recorders

- MEDREC16 Function Block used in REF 54x, REC 52x, REM 54x, RET 54x and REX 52x relays
- SPCR 8C27 (see Section 7.3.8.3 Transfers menu)
- Internal recorders in SPCD 2D55 and SPCD 3D53
- Internal recorders in REJ 5xx and REU 5xx relays
- Internal recorders in REx 61x relays

7.2. Using DR-Collector Tool

7.2.1. General

If an object is configured in the way that it contains a Disturbance Recorder module/ function block, the object in question can be seen in the navigation tree of the Recorder Tool in the DR-Collector Tool. For instance, REF 54x has to be configured to contain MEDREC 16 function block. After that the REF 54x object can be seen in the navigation tree. If you want the SPACOM object to be visible in the navigation tree, SPCR 8C27 has to be visible on the Rack Configuration page in the SPACOM configuration.

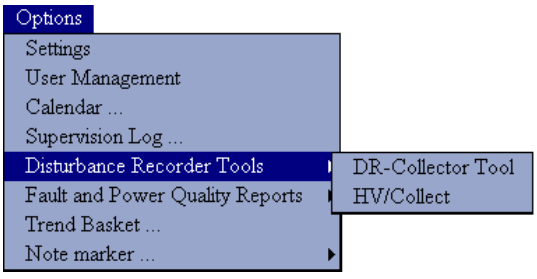
For more information on Recorder Tool, see Section 7.3.

7.2.2. Starting DR-Collector Tool

The DR-Collector Tool can be started in different ways, depending on the software environment. In LIB 510 in MicroSCADA, DR-Collector Tool is started as described in Section 7.2.2.1.The procedure how to start DR-Collector Tool in CAP 501/505 and in SMS 510 environments is described in Section 7.2.2.2.

7.2.2.1. Starting from LIB 510 in MicroSCADA

In LIB 510, you can start the DR-Collector Tool from the Options Menu in MicroSCADA main view, see the following figure.



OptiMenu

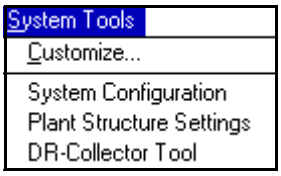
Fig. 7.2.2.1.-1 DR-Collector Tool started from the Options menu

HV/Collect is used for disturbance uploading for high-voltage relays (LIB 520).

If an error message appears on the screen after selecting the DR-Collector Tool in the Options menu, one possible reason is that the DR-Collector Tool has not been installed at all.

7.2.2.2. Starting from CAP 501/505 and SMS 510

In CAP 501/505 and in SMS 510 environments, start the DR-Collector Tool by selecting it from the System Tools menu (see Fig. 7.2.2.2.-1) or by clicking the respective toolbar button on the Project Structure Navigator dialog (see Fig. 7.2.2.2.-2).



SystMenu

Fig. 7.2.2.2.-1 Starting DR-Collector Tool from the System Tools menu

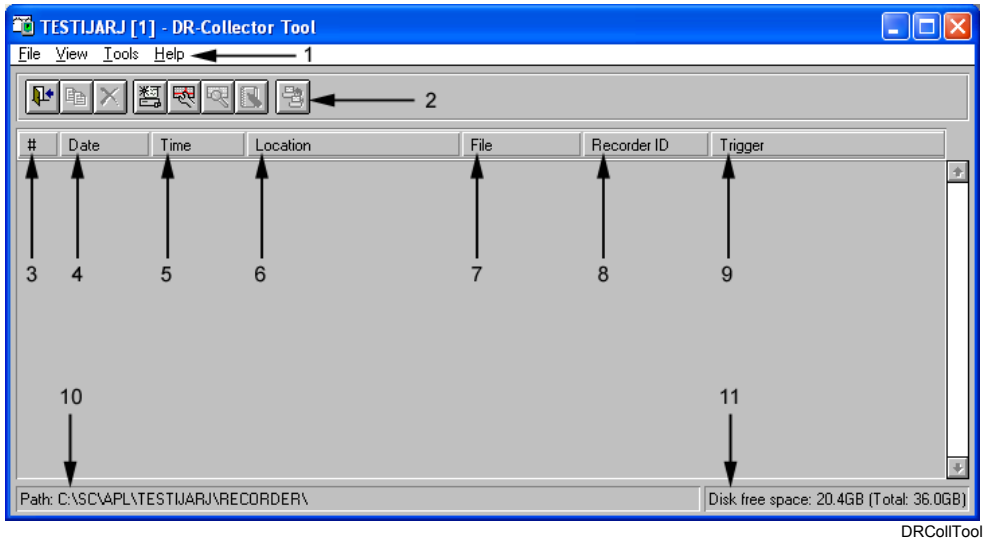
DRCT_button

Fig. 7.2.2.2.-2 Starting the DR-Collector Tool by clicking the toolbar button

After this the DR-Collector view appears on the screen (see Fig. 7.2.3.-1). DR-Collector Tool is started directly, i.e. no object selection is required.

7.2.3. DR-Collector Tool overview

The view appearing after the DR-Collector Tool has been started, consists of the following parts:



DRCollTool

Fig. 7.2.3.-1 DR-Collector Tool view

1. Menus
2. Toolbar buttons
3. Line number
4. Date of recording

5. Time of recording
6. Location indicating the relay/recorder that originates the recording
7. The name of the File that originates the recording
8. Identification of the disturbance recorder originating the recording
9. Trigger (i.e. the type of signal generating triggering)
10. Path indicating the location of recording files (the Path and Location together specify the directory where the recording file resides)

This applies to LIB 510/MicroSCADA only: the name given in square brackets (e.g. [FIMIT-RVS-S11]) indicates the name of the MicroSCADA Base System computer when Remote Monitor is selected. The letter in the beginning of the path (e.g. C, E, H) refers to the drive name of the MicroSCADA Base System computer, not to the drive name of the computer of the Remote Monitor.

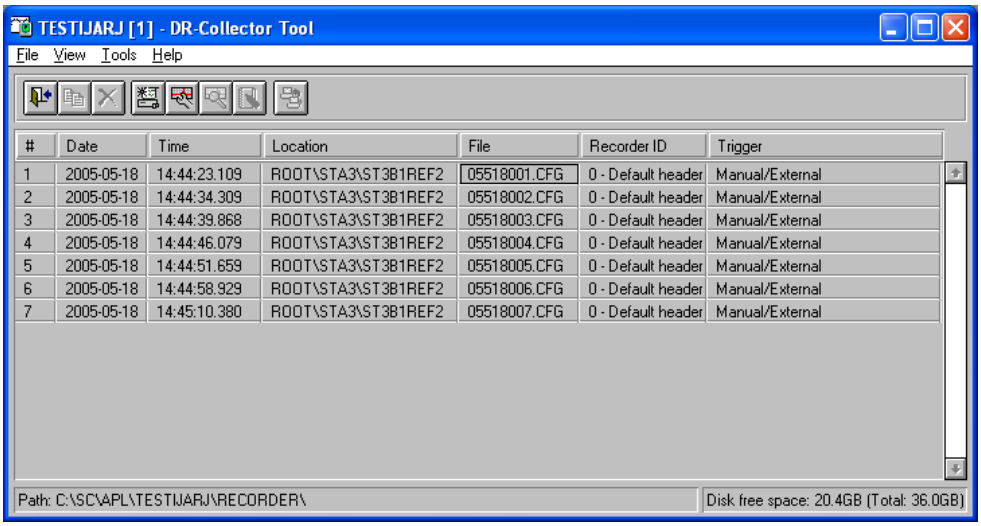
11. The amount of free space left in drive C. In case there is less than 100 kb free space left in drive C, the commands Refresh, Recorder Tool, Evaluation program and Comment cannot be carried out.

The Options dialog (see Fig. 7.2.4.2.-2) you can open by clicking Options in the View menu. Here you can choose which columns (see Fig. 7.2.3.-1, items 4-9) are to be shown in the DR-Collector Tool main view.

Recording files are named in the following way: YYMDDNNN.EEE. Below you can find the meanings:

YY	the year of the time tag in the trigger information (0.99)
M	the number of the month in the trigger information in the hexadecimal format (1.C)
DD	the number of the day in the trigger information
NNN	the disturbance number, stored in a decimal format
EXT	the extension identifying the format, e.g. 95802001.CFG 95802001.DAT
.CFG	the extension for COMTRADE header files
.DAT	the extension for COMTRADE data files
.INF	the extension for COMTRADE information files
.HDR	the extension for Comment files

To view the uploaded recordings (that are located in the subdirectory under the Path), click Refresh in the View menu. For more information on this command, please refer to Section 7.2.4.2.



DR-CollT

Fig. 7.2.3.-2 DR-Collector Tool presented with a list of recordings

7.2.4. Menus

There are four menus in the DR-Collector Tool main view. The commands provided in the menus are described in the following.

7.2.4.1. File menu

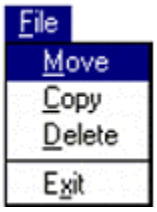


Fig. 7.2.4.1.-1 File menu

The File menu provides access to the commands Move, Copy, and Delete. These commands are available only when there are recordings in the DR-Collector Tool main view and at least one recording has been activated (see Fig. 7.2.4.1.-1). One recording may consist of several files (e.g. .DAT, .CFG and HDR files). Due to this, when you select any of the commands Move, Copy and Delete it concerns all files connected to a certain recording.

When using a Remote Monitor, give the same drive name as defined in the MicroSCADA Base System computer into the To-field of the Move/Copy dialogs (see Fig. 7.2.4.1.-2) and (see Fig. 7.2.4.1.-4). Or, you can give the path in the form: \\name of the personal workstation\shared directory. For example, in order to copy a recording from the MicroSCADA Base System computer to your personal workstation:

1. Share the desired directory in your personal workstation.
2. Give the path in the form \\name of the personal workstation\shared directory.

Move

Fig. 7.2.4.1.-2 Move dialog

The Move command is used for moving a (selected) recording to the desired destination. You can indicate the desired destination in two ways:

- Type the path leading to the directory in the To: field.
- Click the Browse button and select the desired directory in the Select A Directory (see Fig. 7.2.4.1.-3).

If the check box 'with Location' is selected, a directory structure as defined by Location is created when you move the recording to the desired directory. If the check box 'with Location' is not selected, the recording is moved directly to the directory you have specified in the To: field.

Click OK to approve moving. To exit the dialog without moving any recordings, click Cancel.

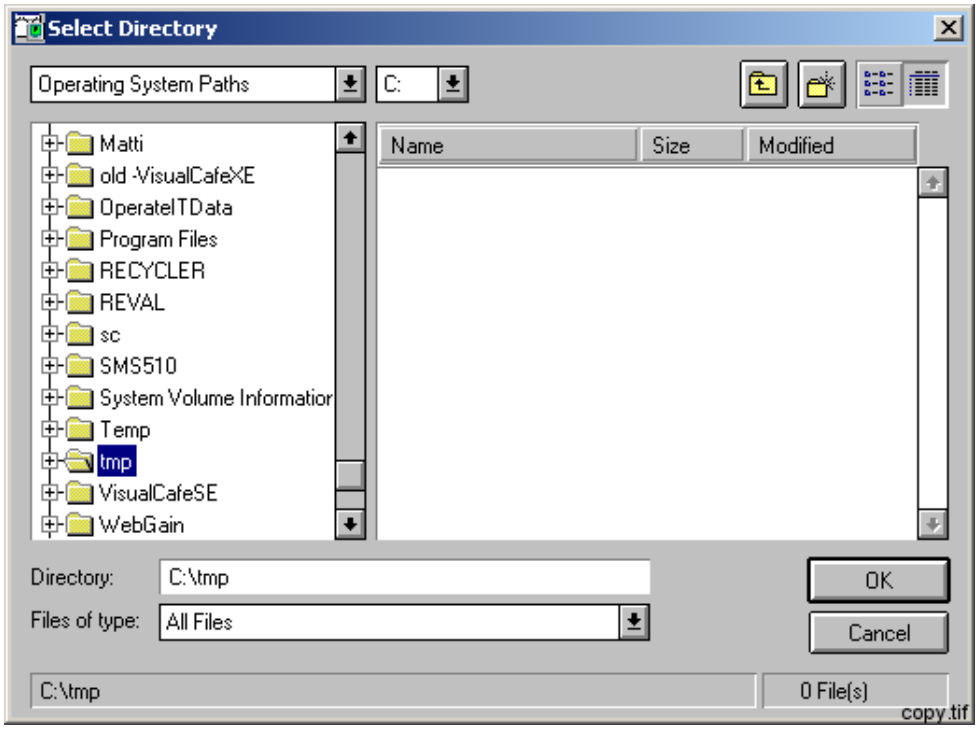


Fig. 7.2.4.1.-3 Select Directory dialog

Copy

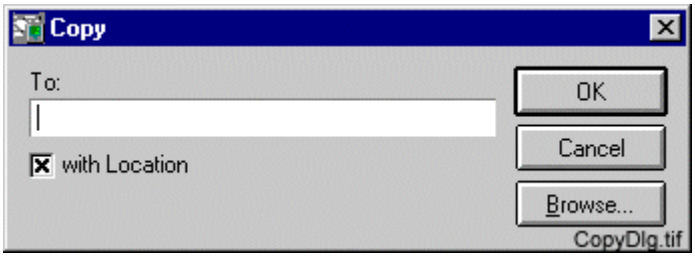


Fig. 7.2.4.1.-4 Copy dialog

The Copy command is used for copying a (selected) recording to the desired destination. You can indicate the desired destination in two ways:

- Type the path leading to the directory in the To: field.
- Click the Browse button and select the desired directory in the Select A Directory (see Fig. 7.2.4.1.-3).

If the check box 'with Location' is selected, a directory structure as defined by Location is created when you copy the recording to the desired directory. If the check box 'with Location' is not selected, the recording is copied directly under the directory you have specified in the To: field.

Click OK, to approve copying. To exit the dialog without approving copying, click Cancel.

Delete

The Delete command deletes the selected file(s) in the directory. Click Yes to delete the selected file/s. Click No to exit the dialog without deleting any file(s).

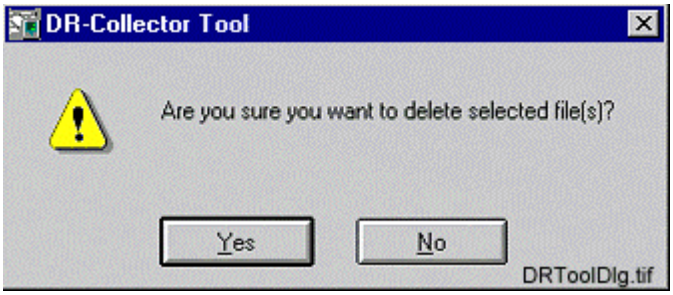


Fig. 7.2.4.1.-5 DR-Collector Tool dialog

Exit

To close the DR-Collector Tool, select the Exit command in the File menu.

7.2.4.2. View menu

The View menu contains the commands Refresh and Options.

Fig. 7.2.4.2.-1 View menu

Refresh

The Refresh command in the View Menu can be used for searching the files defined in the Path in the lower part of the dialog (see Fig. 7.2.3.-1 and 7.2.3.-2). The command shows them on the screen if the files are recording files. This is **not**, however, an automatic operation when starting the program. Therefore, it is suggested to use the Refresh command.

Options

Click the View menu and select Options.

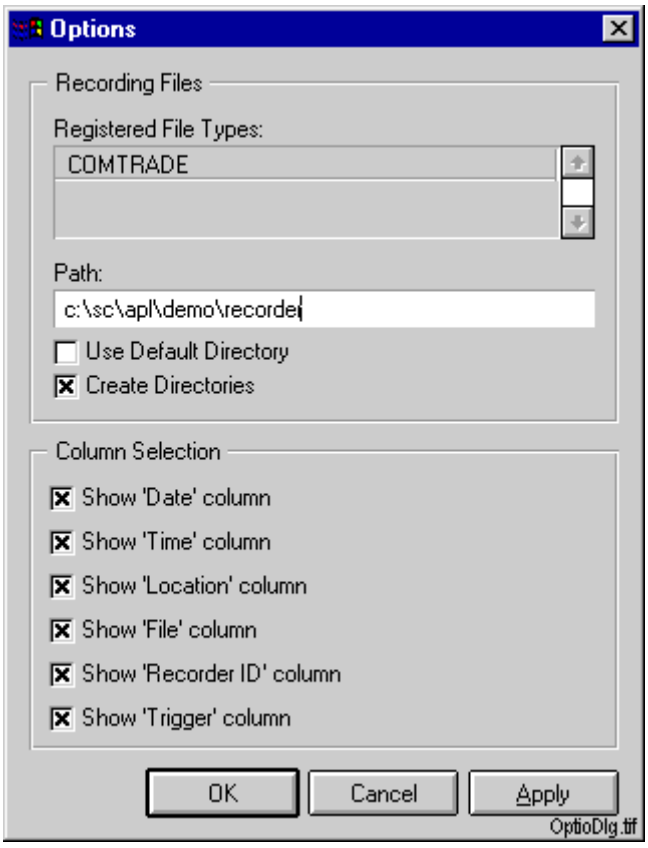


Fig. 7.2.4.2.-2 Options dialog

The first field in the upper part of the dialog shows which disturbance recording format(s) is (are) supported. In this example, only the COMTRADE format is supported.

In order to search recording files that are shown in the DR-Collector main view and in the Recorder Tool, you have to give a path to the files in the field. The path also defines where the recordings that will be uploaded are going to be saved. By default, the field contains a logical path "RECORDER" (which by default points to a "Recorder" folder under the application folder) and its real (absolute) path is shown in the lower part of the main view (see Fig. 7.2.3.-1, item 10). Click OK or Apply to start the search.

Applies only to LIB 510/MicroSCADA! If Remote Monitor has been opened from another computer, you must indicate a drive that has been defined in the MicroSCADA Base System computer.

If you want to change the default path, clear the check box Use Default Directory. After this the Path field is activated and you may change the path. In this case, select the check box Create Directories for the program to create the necessary directories, and click OK or Apply.

Furthermore, in the lower part of the dialog the user has to select which columns are to be shown in the DR-Collector Tool main view. To close the Options dialog without making any changes, click Cancel.

7.2.4.3. Tools Menu

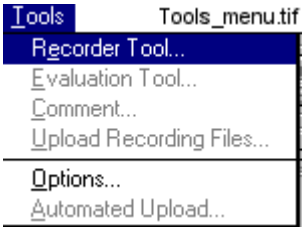


Fig. 7.2.4.3.-1 Tools menu

Recorder Tool

Recorder Tool is described in detail in Section 7.3.

Evaluation Tool

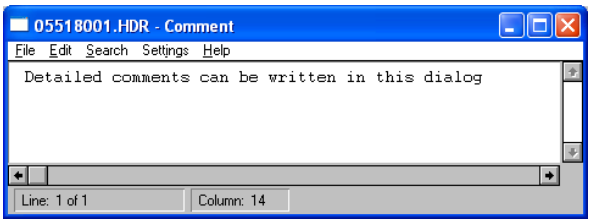
An evaluation tool is needed for analyzing the uploaded recording. When you choose an evaluation tool, you have to take into consideration that the evaluation program should support the format of this program (DR-Collector Tool), e.g. COMTRADE. The Disturbance Draw evaluation tool is included by default.

The options Evaluation Tool and Comment are unavailable until you have selected one of the recordings in the DR-Collector Tool dialog.

Start the evaluation tool by selecting Evaluation Tool in the Tools menu. Define the program in the Options dialog which is found in the Tools menu. You can also start the Evaluation Tool by double-clicking any recording on the list of recordings.

Comment

The option Comment opens a dialog in which you can type a more detailed analysis of a recording etc. The name of the file is otherwise the same as the name of the recording, except that it is provided with the extension HDR.



CommentDig

Fig. 7.2.4.3.-2 Comment dialog

Upload Recording Files

This function can mainly be used when two SMS 510 systems are connected via either a LAN or a remote/RAS connection. If the local project is selected in the Project Structure Navigator, the DR-Collector Tool works as described in Section later on in this document

Options

The Evaluation Tool for evaluating and drawing of disturbance recordings can be defined from the Options dialog. You can also define the recording path for remote connections. If the default option DistDraw32.exe is ok, just confirm it by pressing OK.

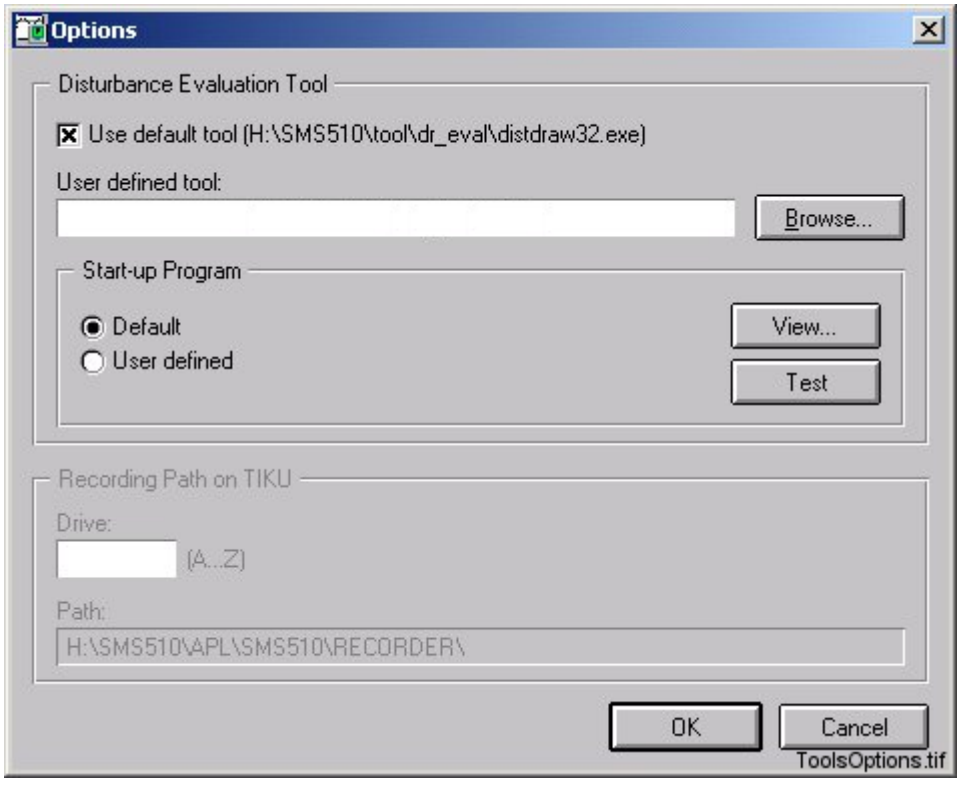


Fig. 7.2.4.3.-3 Options dialog

The Recording Path settings apply only to LIB 510/MicroSCADA (see Fig. 7.2.4.3.-3).

The settings for a 'User defined tool' are unique for each Remote Monitor in LIB 510/MicroSCADA (see Fig. 7.2.4.3.-4).

You may type the path directly into the field. You can also define the path by clicking the Browse button and by making desired selections in the Open dialog. The Browse button is, however, disabled when Remote Monitor is opened from another computer.

Fig. 7.2.4.3.-4 Disturbance Evaluation Tool

Selecting another Evaluation Tool

Use the Browse function to define another option than the default. To enable the Browse function, you need to uncheck the 'Use default tool' check box.

When you select evaluation program tools like Disturbance Draw, Reval or Wineve (the required start-up arguments are known by the DR-Collector Tool), it is possible just to select a recording on the DR-Collector Tool recording list. Then, by double-clicking the recording, you can launch the Evaluation Tool. The recording you selected will also be drawn by the Evaluation Tool.

Viewing predefined Start-Up Program

When the Default option is selected in the Start-Up Program, you can view the predefined start-up program for the Disturbance Evaluation Tool by clicking the View button (see Fig. 7.2.4.3.-5).

Fig. 7.2.4.3.-5 The Default option of Start-Up Program

With other evaluation tools, you need to define the start-up arguments by using the User defined option in the Start-Up Program (see Fig. 7.2.4.3.-6).

When selecting the User defined option, you can make your own start-up definition for the tool you have defined by clicking the Edit button. Then you may edit the SCIL program code to enable your set-up. Click the Test button to test whether the program runs properly by using the code which you have selected in the check box.

Fig. 7.2.4.3.-6 The User defined option of Start-Up Program

If problems arise when using the Reval Evaluator Program, one possible reason may be that the Reval Evaluator Program cannot read paths given in the form \\… .

If the Reval Evaluator Program fails to open the disturbance recording file at start-up, a possible reason is that the path name of the disturbance recording file contains space characters or that this program is run from a network drive. This can be circumvented by defining the correct path in the REVAL.INI file, using the "TMPL_DIR" attribute as shown in the example below:

TMPL_DIR=L:\REVAL\TMPL

RECOM_FILE=RCM-SEL.DAT

HELP_DIR=C:\DR-Analys\REVAL\HELP

RECOM_DIR=C:\DR-Analys\REVAL\RECOM

DEF_DIR=C:\SC\APL\510_401_1\RECORDER\402_TEST1

The **Recording Path on** group box (see Fig. 7.2.4.3.-7) is activated when the Remote Monitor has been opened from another computer as MicroSCADA, and when Recording path contains a drive name, e.g. C:\reval\reval_nt.exe (i.e. the Recording path is not given in the form \\…., e.g. \\RVS_W0314\sc\apl\demo\recorder.

Fig. 7.2.4.3.-7 The Recording Path

MicroSCADA W-server has to be activated before the Recording Path on group box is available.

Enter the drive name of the mapped directory into the Drive field. The path appears in the Path field. The path is used when you start the Disturbance Evaluation Tool. The selected disturbance recording is opened in the Disturbance Evaluation Tool from the computer defined in the upper part of the group box (e.g.TIKU).

If the recording path to the directory is not found under the given drive, check that the given drive has been mapped, and that one of the directories of the path is defined to have shared writing rights.

The shared directory has to be mapped into the computer from where a Remote Monitor is opened.

To accept changes, click OK. To exit the dialog without accepting the made changes, click Cancel.

Automated upload

This function is only available in LIB 510 in the MicroSCADA environment.

The automated upload is monitored and configured by the Automated Upload dialog. The status of the automated upload can be:

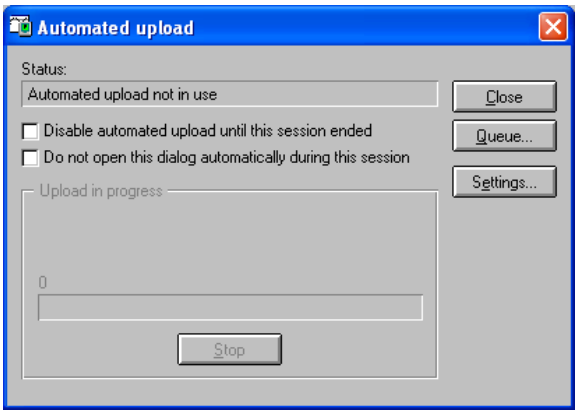
- Automated upload not in use
- Automated upload temporarily not in use
- Automated upload in standby
- Automated upload in progress

The other fields can be available or unavailable depending on status.

Changing the settings requires authorization level 1.

Automated upload not in use

If the Automated Upload is configured in a way that it does not start uploading automatically, the status 'Automated upload not in use' is shown in the Status field (see Fig. 7.2.4.3.-8). You can configure the automated upload in a dialog that opens when you click the Settings button.

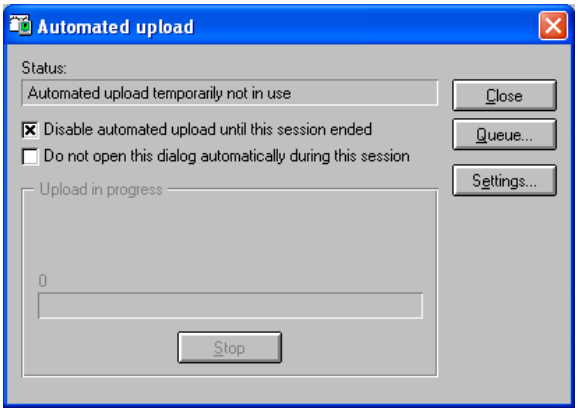


AULniu

Fig. 7.2.4.3.-8 Automated upload not in use

Automated upload temporarily not in use

The status 'Automated upload temporarily not in use' is shown if you select the option 'Disable automated upload until this session ended'(see Fig. 7.2.4.3.-9). The automated upload is in that case disabled during the current session, not during the next session. This selection is cleared by default. Please note that this selection applies to all monitors in LIB 510/MicroSCADA. This means that when this selection is made in one monitor, the function becomes activated also in other monitors containing the DR-Collector Tool.

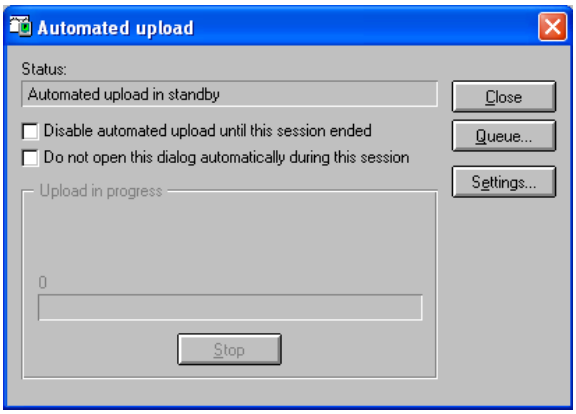


AutoUpl

Fig. 7.2.4.3.-9 Automated upload temporarily disabled

Automated upload in stand-by

The status 'Automated upload in stand-by' (see Fig. 7.2.4.3.-10) indicates that the automated uploading is in use and waits a start event and/or next periodical inquiring.



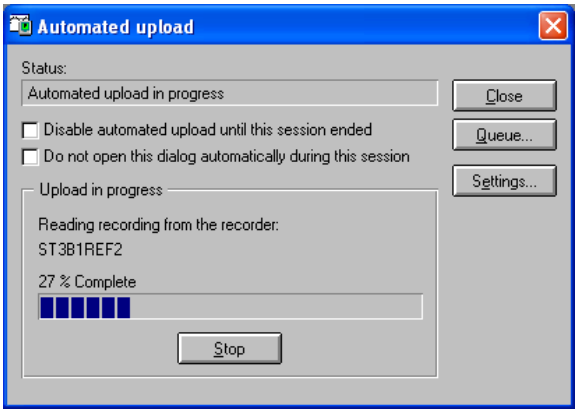
AULStaBy

Fig. 7.2.4.3.-10 Automated upload in standby

Automated upload in progress

Progress of uploading is monitored in the 'Upload in progress' group box (see Fig. 7.2.4.3.-11). This group contains exactly the same fields as the progress indicator of the visible DR-Collector Tool. You can interrupt the current uploading by clicking Stop.

This dialog is opened automatically by default whenever you start the automated upload. However, automatic opening can be disabled when you select the option 'Do not open this dialog automatically during this session'.



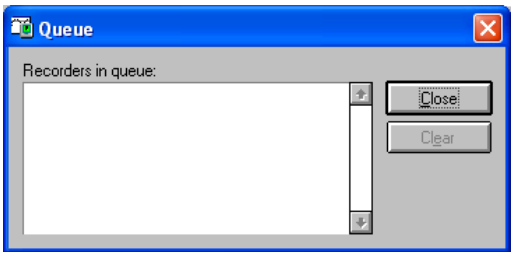
AutoUL2

Fig. 7.2.4.3.-11 Automated upload in progress dialog

The DR-Collector Tool uploads only from one Disturbance Recorder at a time.

Queue

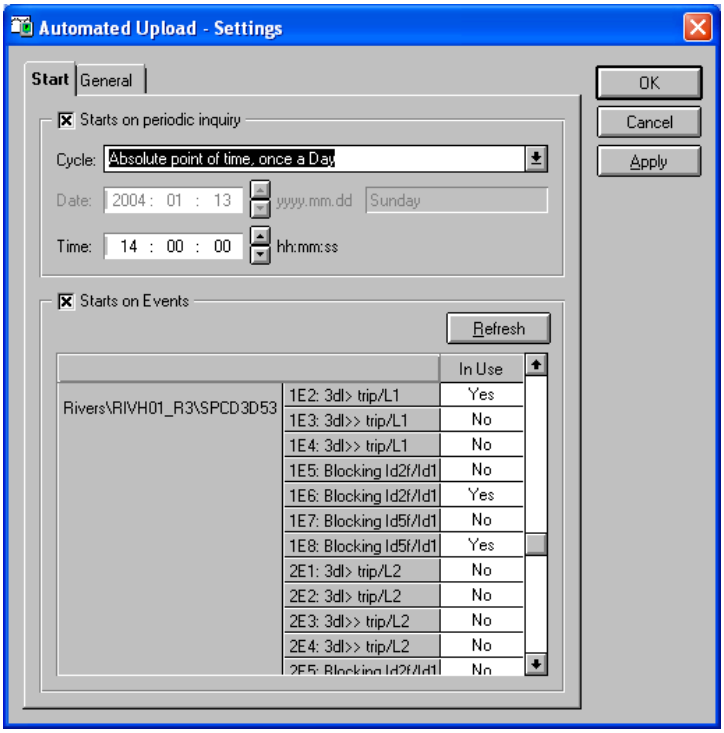
The uploading requests, that are made while uploading is still under process, are put in a queue. This queue can be seen in the Queue dialog. The queue is deleted by clicking Clear.



QueueDlg

Fig. 7.2.4.3.-12 Recorders in Queue dialog

Settings



AUSetSta1

Fig. 7.2.4.3.-13 Automated Upload - Settings dialog/Start page

The configuration of automated upload is done on the **Start page** of the Settings dialog. Open the Settings dialog by clicking the Settings button in the Automated upload dialog. You can define the uploading to start regularly at certain periods and/or on the basis of certain events.

The Settings dialog consists of two pages: Start and General. The Start page contains two group boxes: Starts on periodic inquiry, and Starts on Events (see Fig. 7.2.4.3.-13). If you clear both check boxes 'Starts on periodic inquiry' and 'Starts on events', the automated upload is disabled.

If you check the **Starts on periodic inquiry** check box (see Fig. 7.2.4.3.-13), you can set its attributes. All recorders are always uploaded on the basis of the definitions made in the fields below. The following alternatives are available for cycle:

- Fixed intervals, no synchronization
- Absolute point of time, once an Hour
- Absolute point of time, once a Day
- Absolute point of time, once a Week
- Absolute point of time, once a Month

Define the cycle by selecting the appropriate alternative in the Cycle drop-down combo box. You can define the date and time with the help of the drop-down arrows. However, the Date and Time fields may be available or unavailable depending on which option you have selected in the Cycle drop-down combo box.

In the **Starts on Events** group box (see Fig. 7.2.4.3.-13) the objects (relays) that contain disturbance recorder are listed on the left side of the table. If you select the Starts on Events check box, the events that trigger uploading are defined in the field in the middle of the table.

The recorder table is user controlled. If the Starts on Events check box is already checked, but the table is dimmed, a manual refresh of the table must be done by pressing the Refresh button. After this the table will be accessible for editing.

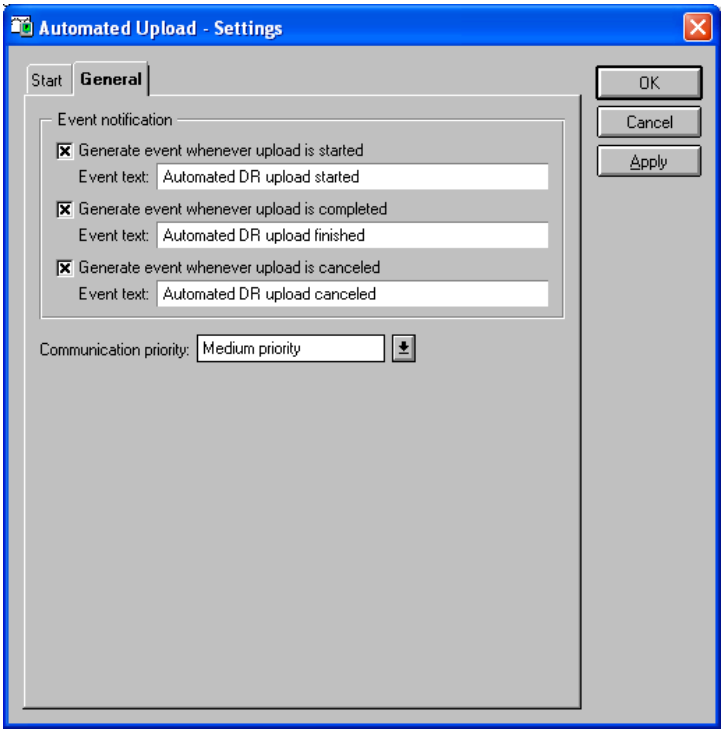
Automated upload can be defined separately for every event. The field in the right side indicates whether the automated uploading of an event has been defined to be in use or not. You can change the state of a single event by double-clicking the column In Use. The text 'Yes' and 'No' changes automatically. However, the state in the In Use field may also be e.g. Error 1 when you click the Apply button. If you select this field (Error 1), the state is changed into Yes or No. The error codes are the following.

Table 7.2.4.3-1 Error codes and their explanations:

Error Code	Explanation
1	Initialization has failed due to time out.
3	Protocol module cannot be loaded. Communication configuration is missing or has not been configured properly.
101	Process object address overlap. This status occurs in situations when trying to create a process object by using the object address (OA) and unit number (UN) that are already used by another logical name (LN). Existing process object must be removed before new configuration can be created.
102	Relay configuration does not contain the requested function block.
103	Base system configuration has not been configured properly. The definition of the STA object has probably been changed or it is missing, and therefore, event handling objects could not be created.

The option 'Yes' means that the event is sent to the Event List regardless of the settings previously defined for the event in the Event Editor. In case the state of a single event is 'Yes' in the In Use column, but the state of that same event is changed into 'No' in the Event Editor, the state is changed to 'No' also in the In Use column.

The event mask of the relay has to be set so that it allows the uploading of a certain event.



AUSetGen

Fig. 7.2.4.3.-14 Automated Upload – Settings dialog/General page

In the **Event notification** group box (see Fig. 7.2.4.3.-14) in the **General page** it is possible to make the following selections:

- Generate an event whenever uploading is started. The event text is sent to the event list when automated upload is started.
- Generate event whenever uploading is completed. The event text is sent to the event list when automated upload is finished.
- Generate event whenever uploading is canceled. The event text is sent to the event list when automated upload is canceled.

Automated upload affects the operating rate of other programs. To leave processing time for other programs as well, you are able to alter the operating rate of automated uploading. This is done in the Settings dialog/General page which contains **Communication priority** drop-down combo box (see Fig. 7.2.4.3.-14). Select the priority level in which Automated Upload is performed from the following alternatives:

- Maximum priority
- High priority
- Medium priority
- Low priority
- Minimum priority

The default alternative for communication priority is Medium priority. Maximum priority means that recordings are read as quickly as possible, and Minimum priority means that recordings have the lowest priority, and processing time is left for other programs, too. In other words, the lower priority selected in the drop-down combo box, the slower uploading.

7.2.4.4. Help menu

Fig. 7.2.4.4.-1 Help menu

About DR-Collector Tool

The dialog About DR-Collector Tool contains information on the current version of the DR-Collector Tool. Click OK to close the dialog.

7.2.5. Toolbar buttons

The most important menu functions are also available as toolbar buttons. These functions are described in detail in Section 7.2.4.

Table 7.2.5-1 DR-Collector Tool's toolbar buttons:

Button	Functionality
	Exit (for exiting the main program)
	Copy (for copying a record to a desired destination)
	Delete (for deleting the selected files; requires authorization level 1)
	Refresh (for searching and showing the files defined in a dialog)
	Recorder Tool (for opening the Recorder Tool program)
	Evaluation program (for opening the Evaluation Program for a recorded file)
	Comment (opens a dialog for writing a detailed comment)
	Remote connections (for making a connection between the workstation and the system that contains a recording)

7.3. Recorder Tool

7.3.1. General

As described in Section 7.2.4.3, start the Recorder Tool by selecting Recorder Tool in the Tools menu in the DR-Collector Tool.

The Recorder Tool contains different kinds of functions depending on the recorder, e.g. monitoring, manual uploading of functions, such as remote triggering, delete recording, and possibly other special functions, too.

7.3.2. Functions

Information given in the Recorder Tool dialog (see Fig. 7.3.2.-1, items 4 and 5) depends on what kind of relay/recorder you have selected. When entering the Recorder Tool, there are no monitoring fields on the right in the dialog (see Fig. 7.3.2.-1, items 4 and 5). Only when you select a recorder in the tree structure, the monitoring fields on the right are visible.

Information given in the monitoring fields depends on the recorder. The example given below concerns disturbance recorders configured for RED 500 relays. In addition to the standard menus, there may also be other menus available depending on the recorder.

All installed relays that contain a disturbance recorder are shown in the tree structure.

The object Eastwick in the tree structure corresponds to the information given in the Location column found in the DR-Collector Tool main view.

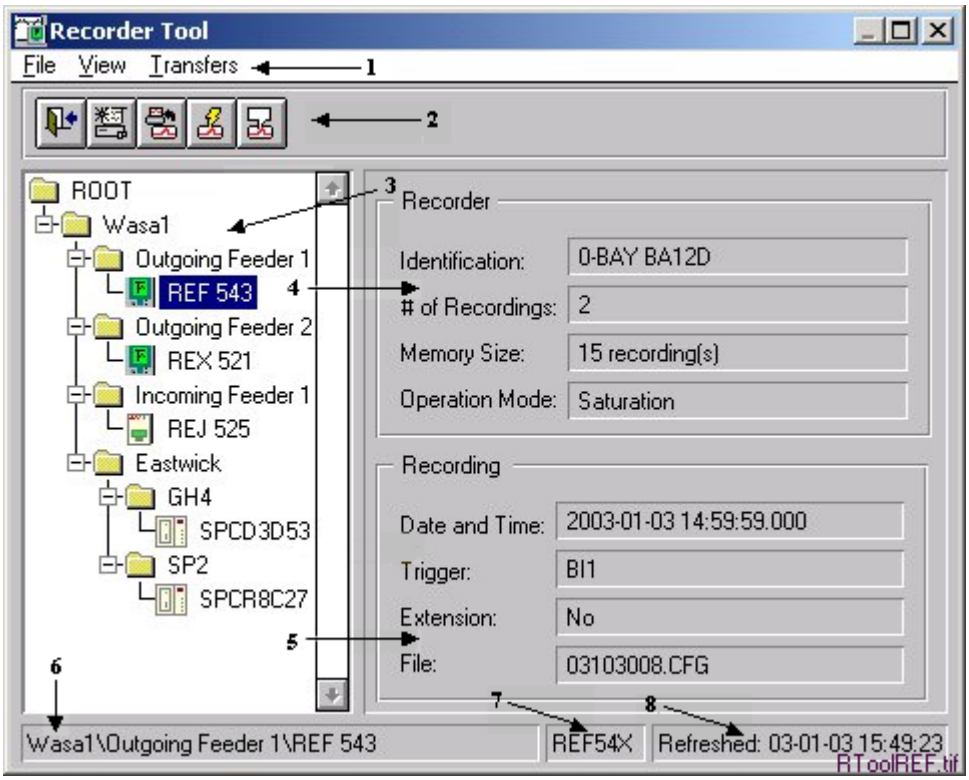


Fig. 7.3.2.-1 An example of a Recorder Tool main view with the tree structure and information concerning the MEDREC16 disturbance recorder configured for REF 54X relay.

1. Menus
2. Toolbar buttons
3. Tree structure (i.e. hierarchy of relays and disturbance recorders)
4. Object selected in the tree structure from which recordings are made
5. Type of the object selected in the tree structure (i.e. type of relay)
6. The date and time when the dialog was refreshed the last time

Table 7.3.2-1 Monitoring fields, i.e. information concerning the disturbance recorder MEDREC16 configured for REF 54x:

Identification	identifies the recorder
# of Recordings	indicates the number of recordings in the recorder
Memory Size	indicates the maximum amount of recordings the memory pool of the recorder can hold
Operation Mode	See Section 7.3.3
Date and time	indicate when triggering was generated
Trigger	specifies the reason of triggering
Extension	is a type of a recording. When the type of the recording is Extension, the program intends to combine the recording with the previous one to form only one recording. If this operation is not successful, recordings remain as separate recordings.
File	indicates the file name of the recording

7.3.3. RE_54_ transient disturbance recorder (REF 54x, REM 54x, REC 523, RET 54x)

There are three types of Operation Modes (see Fig. 7.3.2.-1, item 4); Saturation mode, Overwrite mode, and Extension mode. For more information on the different modes, please refer to the RE_54_ Transient Disturbance Recorder (MEDREC16) manual.

7.3.4. Disturbance recorder REX 521

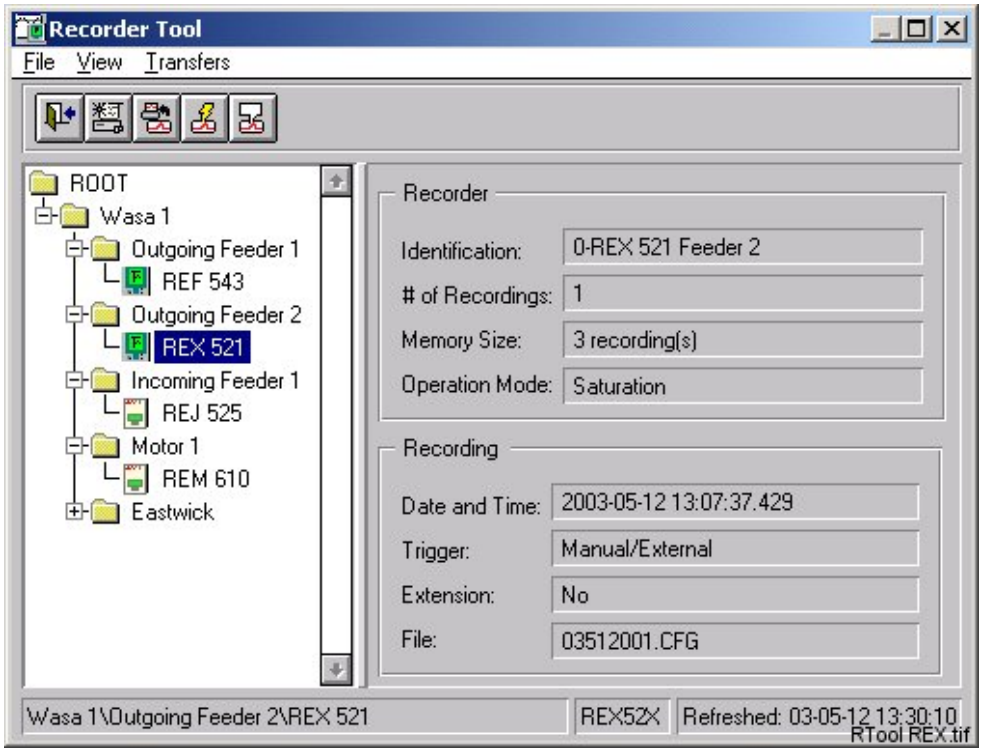


Fig. 7.3.4.-1 An example of a Recorder Tool main view with the tree structure and information concerning the internal disturbance recorder of REX 521 relay module.

Table 7.3.4-1 Description of Monitoring fields in Fig. 7.3.4.-1:

Identification	identifies the recorder
# of Recordings	indicates the number of recordings in the recorder
Memory Size	indicates the maximum amount of recordings the memory pool of the recorder can hold
Operation Mode	indicates the measurement status of the recorder, see Section 7.3.3
Date and time	indicate when triggering was generated
Trigger	specifies the reason of triggering
Extension	is a type of a recording. When the type of the recording is Extension, the program intends to combine the recording with the previous one to form only one recording. If this operation is not successful, recordings remain as separate recordings.
File	indicates the file name of the recording

7.3.5. Disturbance recorder SPCR 8C27

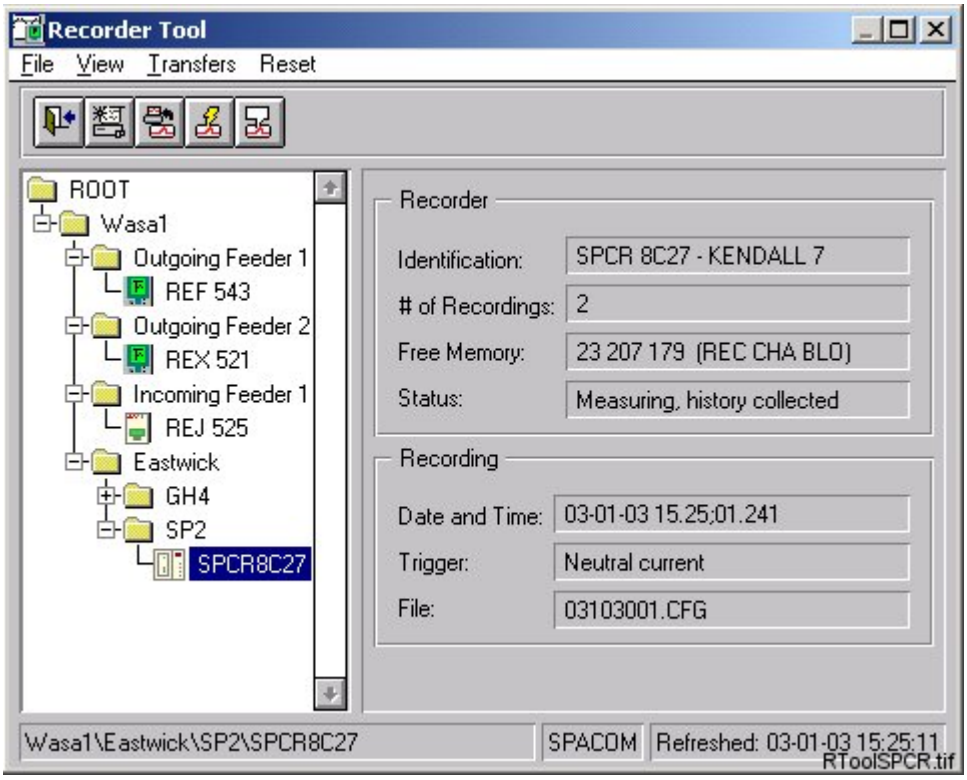


Fig. 7.3.5.-1 An example of a Recorder Tool main view with the tree structure and information concerning the SPCR 8C27 disturbance recorder configured for SPACOM relay.

Table 7.3.5-1 Description of Monitoring fields in Fig. 7.3.5.-1:

Identification	identifies the recorder
# of Recordings	indicates the number of recordings in the recorder
Free Memory	indicates the available free recording memory that the recorder try to maintain. REC = recordings, CHA = Channels and BLO blocks shows the free amount of entities
Status	indicates the measurement status of the recorder
Date and time	indicate when triggering was generated
Trigger	specifies the reason of triggering
File	indicates the file name of the recording

7.3.6. Internal disturbance recorders SPCD 2D55, SPCD 3D53

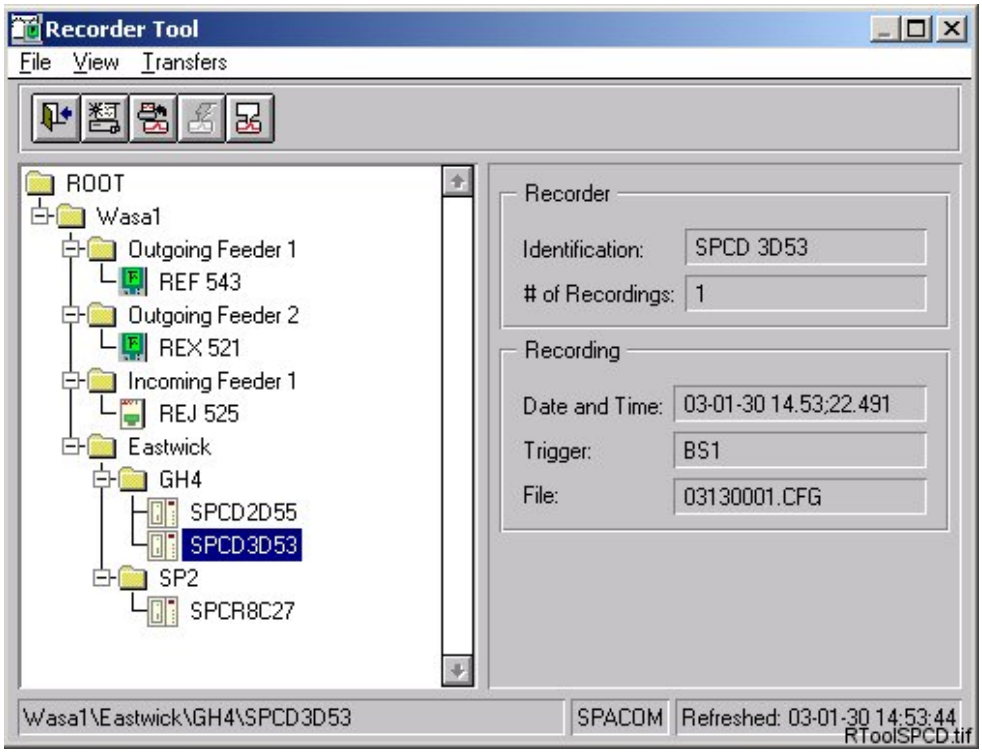


Fig. 7.3.6.-1 An example of a Recorder Tool main view with the tree structure and information concerning the SPCD 3D53 relay module.

Remote triggering is not available, because SPCD 2D55 and SPCD 3D53 do not support remote triggering.

Table 7.3.6-1 Description of Monitoring fields in Fig. 7.3.6.-1:

Identification	identifies the recorder
# of Recordings	indicates the number of recordings in the recorder
Date and time	indicate when triggering was generated
Trigger	specifies the reason of triggering
File	indicates the file name of the recording

7.3.7. Internal disturbance recorders REU5xx, REJ 5xx, REx 61x

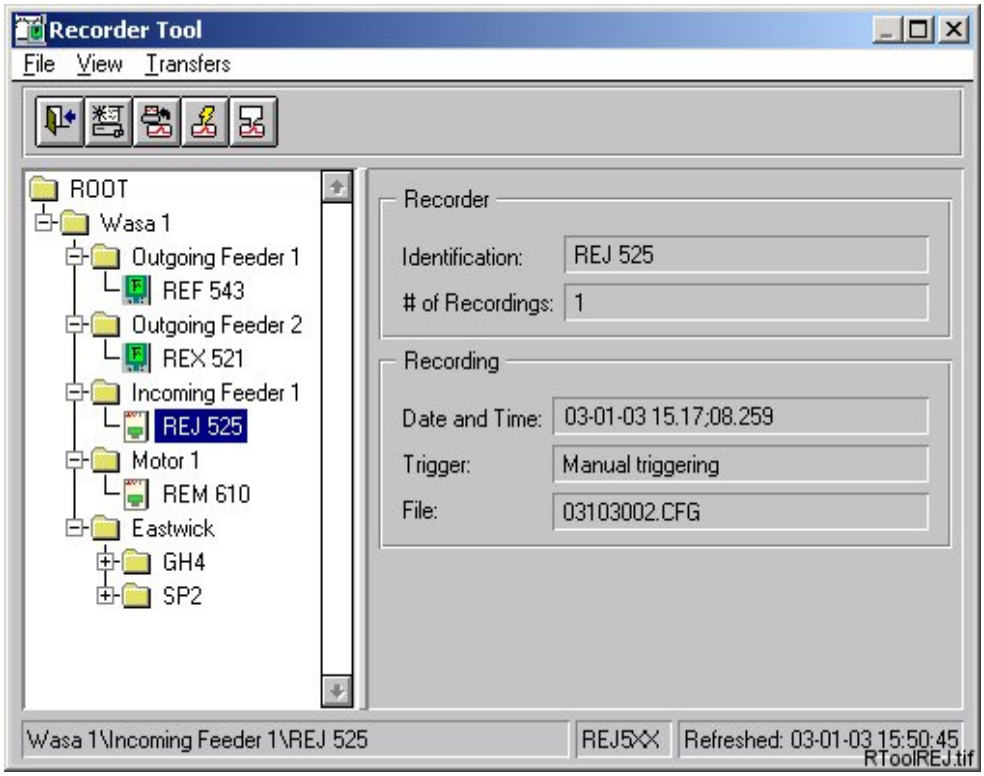


Fig. 7.3.7.-1 An example of a Recorder Tool main view with the tree structure and information concerning the internal disturbance recorder of REJ 5xx (or REx 61x) relay modules.

Table 7.3.7-1 Description of Monitoring fields in Fig. 7.3.7.-1:

Identification	identifies the recorder
# of Recordings	indicates the number of recordings in the recorder
Date and time	indicate when triggering was generated
Trigger	specifies the reason of triggering
File	indicates the file name of the recording

7.3.8. Menus

The Recorder Tool view contains three standard menus which are presented in the following sections.

7.3.8.1. File menu

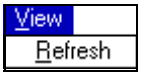
FileExit

Fig. 7.3.8.1.-1 File menu

Exit

Exit from the Recorder Tool dialog is provided by the Exit command in the File menu.

7.3.8.2. View menu



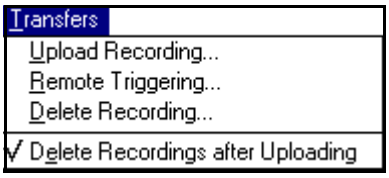
ViewMen2

Fig. 7.3.8.2.-1 View menu

Refresh

The Refresh command is available in the View menu only if you have selected a recorder in the tree structure. The Recorder Tool reads necessary information from the disturbance recorder in order for the recorder tool dialog to be updated.

7.3.8.3. Transfers menu



Transfers1

Fig. 7.3.8.3.-1 Transfers menu

Authorization level 1 is required to execute the "Upload recording", "Delete recording" and "Remote triggering" functions. If the "MV_RELAYS" authorization group has been defined in the user management, then the DR-Collector Tool uses an authorization level defined for that group. Otherwise it uses the "GENERAL" group.

Reservation of communication

The Recorder Tool reserves communication to the selected object upon a transaction. The transaction can be whatever communication between the tool and the recorder (Refresh, Upload etc.). Communication is reserved until either the tool is closed, or until fifteen (15) minutes has elapsed since the transaction ended, after which the communication will be automatically released.

Upload Recording

Uploading concerns the recorders that are shown under the selected object in the tree structure. In case you have selected the root in the tree structure, uploading concerns all recorders in the tree structure below the root. Therefore, click Yes to upload all recordings from the allocated recorders under the root in the tree structure. Click No to exit the dialog without uploading any recordings.

UplRec

Fig. 7.3.8.3.-2 Upload Recording dialog when the Root is selected

Applies to MEDREC16 only: If you interrupt the uploading procedure, the recording remains locked in the transfer buffer. This recording will not be deleted if you have emptied the memory pool by using the relevant buttons in the front panel of the relay, or when the operation mode is Overwrite. If you wish to delete a recording from the memory pool, it is recommended to use the Delete Recording function of the DR-Collector Tool.

Applies to SPCR 8C27: Uploading of disturbance recordings from SPCR 8C27 is performed over the SPA bus, i.e. using the rear connector of the host relay or the SPTO front connector (SPAC 500/600 series feeder terminals). The uploading of disturbance recordings through the front connector of the SPCR 8C27 is not supported.

In case you have selected one of the recorders below the Root in the tree structure, uploading concerns only the recordings registered by that specific recorder.

UplRec1

Fig. 7.3.8.3.-3 Upload Recording dialog when a recorder is selected

In the Upload Recording Dialog (see Fig. 7.3.8.3.-3), you may choose the following:

- Upload of all recordings from the selected recorder module, click the Upload All button.
- Upload of one recording from the selected recorder module, click the Upload One button.
- To exit the dialog without uploading any recordings, click Cancel.

The button Upload One may also be clicked repeatedly, i.e. several recordings can be uploaded one by one by clicking the button repeatedly.

Remote Triggering

Disturbance Recording is triggered by a remote command.

Remote triggering concerns the recorders that are shown under the selected object in the tree structure. If you have selected the Root in the tree structure, remote triggering concerns all recorders in the tree structure below the Root. Click Yes to trigger remotely all allocated recorders under the object Root in the tree structure. Click No to exit the dialog without triggering any recorders.

RemTrig

Fig. 7.3.8.3.-4 Remote Triggering dialog when the Root is selected

RemTrig2

Fig. 7.3.8.3.-5 Remote Triggering dialog when a recorder is selected

If you have selected one of the recorders below the Root, only the specific recorder can be triggered remotely. Click Yes to trigger the selected recorder module remotely. Click No to exit the dialog without triggering the selected recorder module remotely.

Delete Recording

Delete recording concerns the recorders that are shown under the selected object in the tree structure. If you have selected the Root in the tree structure, the command Delete Recording concerns all recorders in the tree structure below the root. Click Yes to delete all recordings from the allocated recorders under Root in the tree structure. Click No to exit the dialog without deleting any recordings.

DelRec

Fig. 7.3.8.3.-6 Delete Recording dialog when the Root is selected

In case one of the recorders below the root has been selected, the Delete Recording command concerns only recordings registered by the specific recorder.

DelRec1

Fig. 7.3.8.3.-7 Delete Recording dialog when a recorder in the tree structure is selected.

In the Delete Recording Dialog (see Fig. 7.3.8.3.-7), you may choose the following:

- Delete all recordings from the selected recorder module, click the Delete All button.
- Delete of one recording from the selected recorder module, click the Delete One button.
- To exit the dialog without deleting any recordings, click Cancel.

Delete Recordings after Uploading

In normal use the recordings are automatically deleted from the recorders after a successful uploading. This way the recorder memory does not become full and the already uploaded recordings are not uploaded again.

However, for some special purpose this deleting can temporarily be switched off by selecting Delete Recordings after Uploading in the Transfers menu. When this toggle menu item is switched off, the same recordings can be uploaded several times again. Due to the temporary nature of usage, the Delete Recordings after Uploading is always on when opening the DR-Collector Tool.

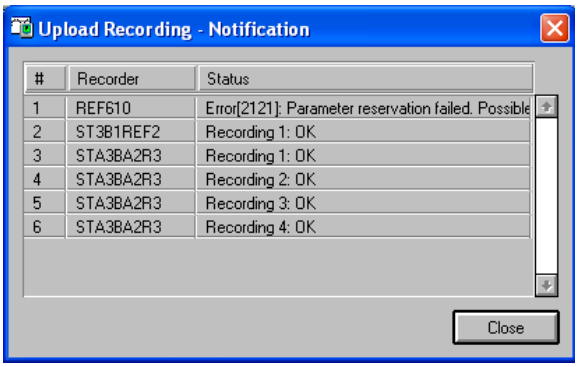
Note that if the Upload All button is clicked when uploading with the Delete Recordings after Uploading is switched off, the upload operation will be endless. For that reason the warning dialog below is shown when toggling off the option.

DelRecaUpl

Fig. 7.3.8.3.-8 Warning dialog when recordings are selected not to be deleted

Notification dialog

If you have selected a command that includes more than one recorder in the following dialogs: Upload Recording, Remote Triggering or Delete Recording, a notification dialog appears on the screen (see Fig. 7.3.8.3.-9). This notification dialog shows all recorders (i.e. objects) included in the command. It also shows the status, i.e. whether the action of the command was successful or not.

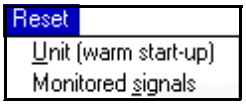


UplNot

Fig. 7.3.8.3.-9 Upload Recording - Notification dialog

7.3.8.4. Reset menu

Reset Menu is available when you have selected SPACOM object and SPCR 8C27 module in the Recorder Tool.



ResetMen

Fig. 7.3.8.4.-1 Reset menu

Unit (warm start-up)

Reset Unit (warm start-up) restarts the recorder without deleting existing recordings.

Monitored signals

The recorder records minimum and maximum values and gives time stamps for them. The minimum and maximum values and their time stamps are read from the parameters V2 … V14. The Reset Monitor signals option resets time stamps and values, i.e. the minimum value 0, maximum value 0 and time stamp 0 are written in the parameters V2 … V14.

7.3.8.5. Toolbar buttons

The most important menu commands are also presented as toolbar buttons

Table 7.3.8.5-1 Recorder Tool's standard toolbar buttons:

Button	Functionality
	Exit
	Refresh
	Upload Recording
	Remote Triggering
	Delete Recording

In addition to the standard buttons presented above, there may also be other buttons and/or objects depending on the recorder.

7.4. Using DR-Collector Tool over a remote connection

The functionality described below is supported only when two SMS 510 systems are interconnected via LAN or RAS. The disturbance recordings cannot be uploaded from the SYS 500/LIB 5xx or COM 500 to the SMS 510. However, communication from the SMS 510 to the relays is established via SYS 500/LIB 5xx and COM 500, if their application has been built using LIB 500/5x0.

If a remote connection has been established, the following functions are enabled; the DR-Collector Tool shows also the header information of the new recordings located on the remote station (see Fig. 7.4.-1). The disturbance recordings that are located in the remote SMS 510 computer are marked with the *[remote]* keyword and the recordings that reside on the local computer are marked with the *[local]* keyword.

You can upload the [remote] disturbance recordings from the remote station/SMS by selecting Upload Recording Files on the Tools menu or by clicking the respective toolbar button. You can either copy or move the disturbance recordings from the remote station (see Fig. 7.4.-2). A remotely stored recording can be uploaded only once regardless of the selected option (copy/move).

Internally, the DR-Collector Tool maintains a locally stored list, which contains the new recordings that the tool has uploaded from the disturbance recorders. When a connection between two SMS 510 systems has been established, the local DR-Collector Tool reads the list on the remote computer and indicates the remotely stored recordings using the keyword [remote]. Upon completion of every successful recording upload from a remote to local SMS 510, the list on the remote computer is cleared. This means that the recordings are available for upload only once.

The Copy, Move, Delete, Evaluation Tool and Comment functions are enabled for [local] recordings only.

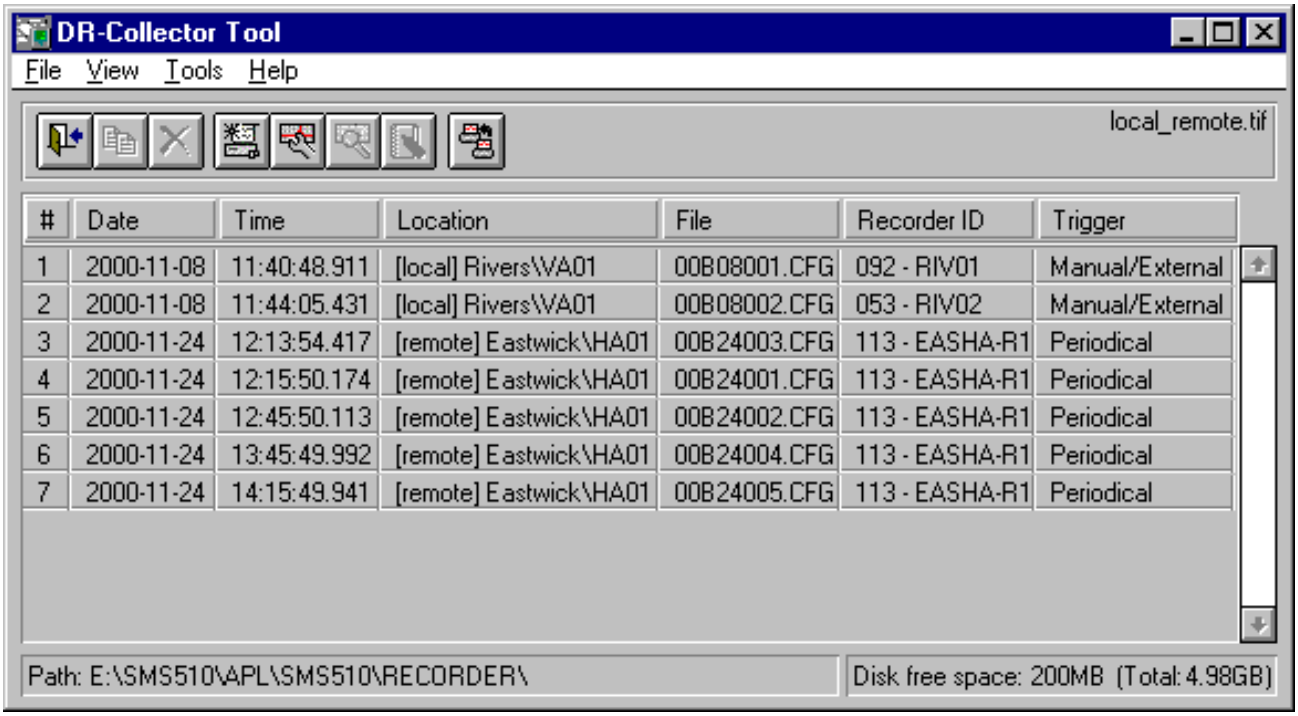


Fig. 7.4.-1 Disturbance recording list in the DR-Collector Tool. Both remotely and locally stored recordings are displayed.

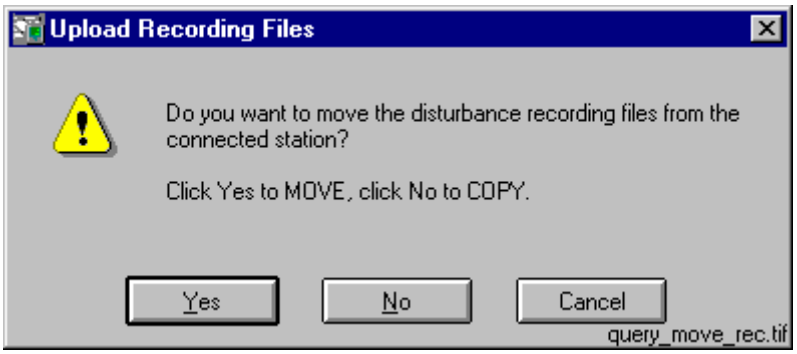


Fig. 7.4.-2 The prompt for the type of the upload

7.5. Engineering information

7.5.1. LIB 500 menu configuration for DR-Collector Tool

The DR-Collector Tool is started from a menu in the station picture. By default, the menu item of the DR-Collector Tool is located in the Options menu. The menu item uses the settings as defined in Fig. 7.5.1.-1 and in Fig. 7.5.1.-2. The menu configuration can be done by using the Menu Configuration Tool of the LIB 500.

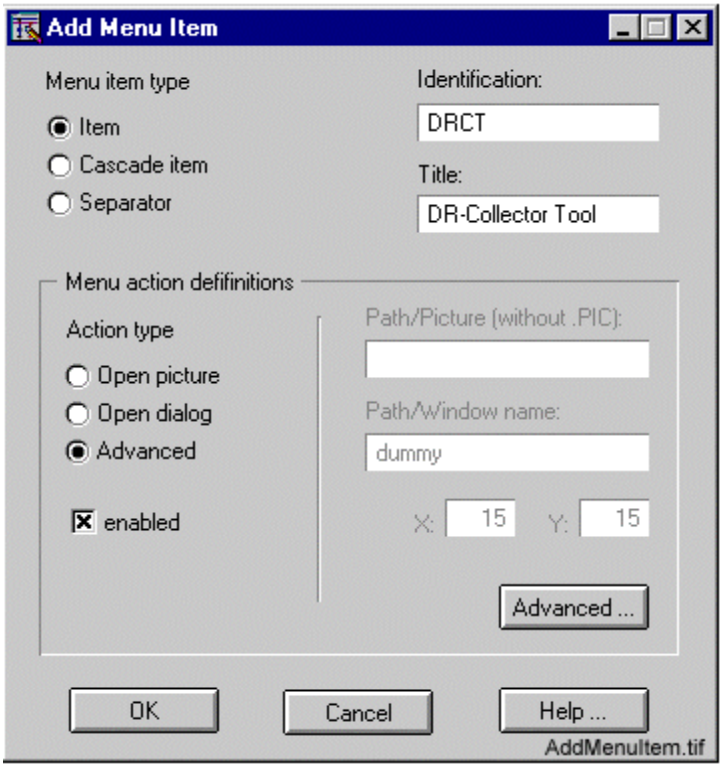


Fig. 7.5.1.-1 Add Menu Item dialog

By clicking the Advanced button in Fig. 7.5.1.-1, the following dialog appears on the screen:

```
;Here you can define a SCIL-program to be executed, when the menu
;item is selected. Note! Do not use #CASE structure in this program.
;------------------ Enter your code under this line ------------------

#error ignore
.load root\toolmenu = vs_main_dialog("bbone/bgu_tmenu.vso", "ToolMenu")
#error stop
root\toolmenu.run_tool("DRCT")
```

Scil.tif

Fig. 7.5.1.-2 Advanced settings for the menu item

7.5.2. Command procedures

Automated upload uses some command procedures that are executed as parallel tasks.

The default queue for automated uploading is six (PE = 6). If this queue is already in use for time critical objects, the value of this attribute can be changed but NOT set to 0. To change the default value 6, open the following file: \Sc\Lib4\base\bbone\use\BGU_Product.ini, and change the value of the following attribute: DRCT_Parallel_Queue = 6.

The value of the Parallel queues attribute in the base system configuration may not be lower than the value of the PQ attribute (APL:BPQ).

7.5.3. Configuring SRIO parameters when connected to MicroSCADA

If recordings are read through SRIO, SRIO's timeout value must be increased from 50 ms to 300 ms. The disturbance recorder has several exceptionally long parameter values that can cause communication problems, if the timeout default value (50 ms) is used. Please refer to SETUP 2 command in the programming manual for SRIO 1000M and 500M for more details of this command.

7.5.4. Other information

Only SPCR 8C27 is supported, not SPCR 8C19.

8. SPA Terminal Emulator

8.1. Description

The SPA Terminal Emulator program is a DOS based tool intended for low level communication on parameter level over the SPA protocol to SPA protocol relays. The tool uses the serial port of the PC for the communication.

The SPA Terminal Emulator provides the user with a convenient method of communicating with SPA relays without having to write the whole SPA protocol syntax. The communication is done on a manual basis and initiated by the user.

The tool is used for the following purposes:

- Testing and analysing the communication to certain SPA devices, e.g. trouble shooting communication failure situations from CAP 50x/SMS 510.
- Simple setting operations, such as changing of addresses of the relay.
- Reading parameter values.

The SPA Terminal Emulator is a powerful tool. For relay setting or relay configuration purposes the user shall therefore use dedicated tools provided by CAP 50x/SMS 510. However, if the user uses SPA Terminal Emulator for setting purposes, other than changing SPA addresses, the user shall carry the responsibility.

8.1.1. Communication support

The SPA Terminal Emulator can be connected to the SPA devices by using a cable directly between the PC serial port and the SPA device (see hardware section for list of cables in CAP 501 or CAP 505 Installation and Commissioning Manuals). It can also be connected to a fiber optical SPA bus with numerous units. Telephone modems are not supported.

Limitations: SPA Terminal Emulator supports only communication via rear (SPA) communication port.

8.1.2. Starting the program

The SPA Terminal Emulator is activated from the Tools folder in CAP 50x/ SMS 510.

You cannot have other programs running, which have access to the same serial port that you intend to use with the SPA terminal program. Therefore, close e.g. CAP 50x/SMS 510 before running the SPA Terminal Emulator.

In Table 8.1.2-1 you can see the start-up screen for the SPA Terminal Emulator. The last two lines contain the actual communication parameter settings.

Table 8.1.2-1 The standard start-up screen for the SPA Terminal Emulator:

```
SPA program for SPACOM communication. Version 4.0

Type SPA commands without address and checksum. For example: RF (not >3RF:XX).
To change a parameter value on line type -ParametreNew_Value
e.g. -a23 to change SPA address or -b1200 to change baud rate.
To exit type CTRL/Z ENTER
Com1 9600 bps 7 dbits parity=e No handshake SPA-addr=1 multi_line_answer=2
lower_case=0
```

Exiting the program

To exit the SPA Terminal session, press <Ctrl> Z followed by <Enter>.

8.1.3. Communication setup

The communication settings are changed by typing the following: "- + corresponding letter + new value (-ParametreNew_Value)"

Parameters that can be set:

- The SPA slave address to which communication will take place
- Baud rate used
- The communication port of the computer
- Databits
- Parity

Example: -a29 changes the settings of the SPA Terminal Emulator to use address 29 for all SPA messages sent, until other is defined.

After the setting of the communication parameters is completed, the communication to the SPA device can begin, provided that the SPA Terminal is properly connected to the SPA device.

8.1.4. Reading and sending of SPA messages

Messages are sent either to the module as a read (R = Read) or a write (W = Write) message. Write messages change the actual parameter setting in the SPA device.

Some parameters depending on the SPA device are protected by a remote setting password (concerns only the Write function). Refer to the parameter listings in the related SPA device manuals.

Give the messages you want to send without start characters, address or checksum. These are added automatically by the tool.

See also the communication examples in Section 8.1.5.

Table 8.1.4-1 The example below shows a module type request (F) and the reply from the module:

• Master - RF	• F should give the relay type as a reply
• Slave - <1D:SPCJ 4D29:18	• This is a SPCJ 4D29 module!

In certain types of relay modules, the settings have to be stored by a separate store command: WV151:1. This concerns, for example, SACO annunciators and SPTO control modules.

8.1.5. SPA Terminal Emulator examples

This section illustrates the communication between a SPA device e.g. a SPAJ 140 C and the SPA Terminal Emulator. Refer to the SPA device manual for listing of all available parameters, with settings, ranges and identity.

R = Read, i.e. read parameters from the module, W = Write, i.e. send new settings for a parameter in the module. Capital letters may also be used.

Conditions in the example:

A SPAJ 140 C relay with the module SPCJ 4D29 with SPA slave address 12 is connected via a SPA-ZP-5A3 cable to the COM2 port of the PC. The example features also a change of the address to 43.

To avoid mixing the comments with the original texts presented in the SPA Terminal Emulator, the comments are written in bold.

Default tool settings

COM1 9600 bps 7 dbits paritet=e No handshake SPA-addr=1

multi_line_answer=2 lower_case=0

Change the communication address to 12, (SPA Device with address 12)

COM1 9600 bps 7 dbits paritet=e No handshake SPA-addr=1

multi_line_answer=2 lower_case=0

-a12

The address is changed to 12 in the tool

COM1 9600 bps 7 dbits paritet=e No handshake SPA-addr=12

multi_line_answer=2 lower_case=0

Identify the module with RF command

COM2 9600 bps 7 dbits paritet=e No handshake SPA-addr=12

multi_line_answer=2 lower_case=0

rf

>12RF:13 **(Master request)** <12D:SPCJ 4D29:2A **(Slave reply)**

The message *>12RF:13 <12D:SPCJ 4D29:2A* consists of two parts; the master request and the slave reply. *>12RF:13* is the message sent by the master (*> sign*). *<12D:SPCJ 4D29:2A* is the message sent by the slave (*< sign*). In this case it is a *SPCJ 4D29* module and has the address 12. 2A is the checksum.

What will happen if you test with the wrong address or there is a communication failure?

Change address to 13

COM2 9600 bps 7 dbits paritet=e No handshake SPA-addr=12
multi_line_answer=2 lower_case=0

The address is now 13, identification by RF.

COM2 9600 bps 7 dbits paritet=e No handshake SPA-addr=13
multi_line_answer=2 lower_case=0
rf

Identify yourself!

>13RF:12 TIMEOUT***ERROR***

The message *>13RF:12 TIMEOUT*ERROR**** means that no contact has been established with address 13. The reason does not appear, but usually some communication parameters are set wrong, (check with the settings in the module on the front panel display), wrong cable is used, serial port broken on PC etc.**

Change back to the right address, 12.

COM2 9600 bps 7 dbits paritet=e No handshake SPA-addr=13
multi_line_answer=2 lower_case=0
-a12

Check if connection is achieved.

COM2 9600 bps 7 dbits paritet=e No handshake SPA-addr=12
multi_line_answer=2 lower_case=0
rf
>12RF:13 <12D:SPCJ 4D29:2A

Change of the SPA device address to e.g. 43 means that parameter V200 shall get a new value.

wv200:43
>12WV200:43:09 <12A:44

Also change the address to the SPA Terminal Emulator.

-a43

COM1 9600 bps 7 dbits parity=e No handshake SPA-addr=43
multi_line_answer=2 lower_case=0

Check the communication, rf command.

rf
>43RF:17 <43D:SPCJ 4D29:2E

With e.g. SACO and SPTO SPA devices you also need to separately store the settings and address changes.

wv151:1

>43WV151:1:3C <43A:40

Exit by pressing <Ctrl> <Z> and <Enter> .

^Z

9. Disturbance Draw Tool

9.1. General

Disturbance Draw is an application for displaying data from COMTRADE files (IEEE C37.111-1991). COMTRADE format specifies three different file types: header file (.HDR), configuration file (.CFG) and data file (.DAT). This application is developed for displaying disturbance recorder data uploaded from protection relays. However, all the COMTRADE format features are not supported, e.g. multiple sampling rates.

Features

- Independently scalable Y-axis for each analog channel.
- Zooming in time axis (in percents).
- Two markers, with time difference (sec) and inverse value of time difference (1/sec) measures.
- Displaying and printing of the COMTRADE configuration file information.
- Channels to be displayed are selectable.
- Selected channels can be printed with installed system printers.
- Ability to scroll the time axis.
- Channel windows can be arranged to horizontal, cascade or tile.

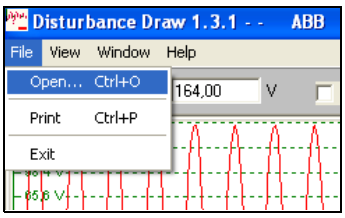
9.2. Using Disturbance Draw Tool

9.2.1. Starting

The Disturbance Draw Tool is intended to be used with the DR-Collector Tool. It can be started by selecting **Tools -> Evaluation tool** from the DR-Collector Tool menu. The DR-Collector Tool should be configured properly to enable this feature. Refer to Chapter 7, DR-Collector Tool in this manual for more details.

9.2.2. Opening COMTRADE File

Disturbance Draw supports the COMTRADE file format or ABB extended COMTRADE format. Fig. 9.2.2.-1 shows how files can be opened from the menu **File -> Open**.



FileOpen

Fig. 9.2.2.-1 The File menu

The user can browse a COMTRADE configuration file (.CFG) from the disk with Open dialog. The COMTRADE data file must exist in the same directory as the COMTRADE configuration file. It must also have the same name with the extension .DAT.

9.2.3. Handling channels

This section deals with changing the scale, zooming, selecting channels, etc.

Fig. 9.2.3.-1 shows the Application window, which presents e.g. the following functions (see the bolded black numbers in the picture):

1. Scrolling the time axis
2. Channel scaling
3. Scaling of active channel
4. Auto-scaling option enabled/disabled for active channel
5. Zooming: how many percent from the complete record is displayed

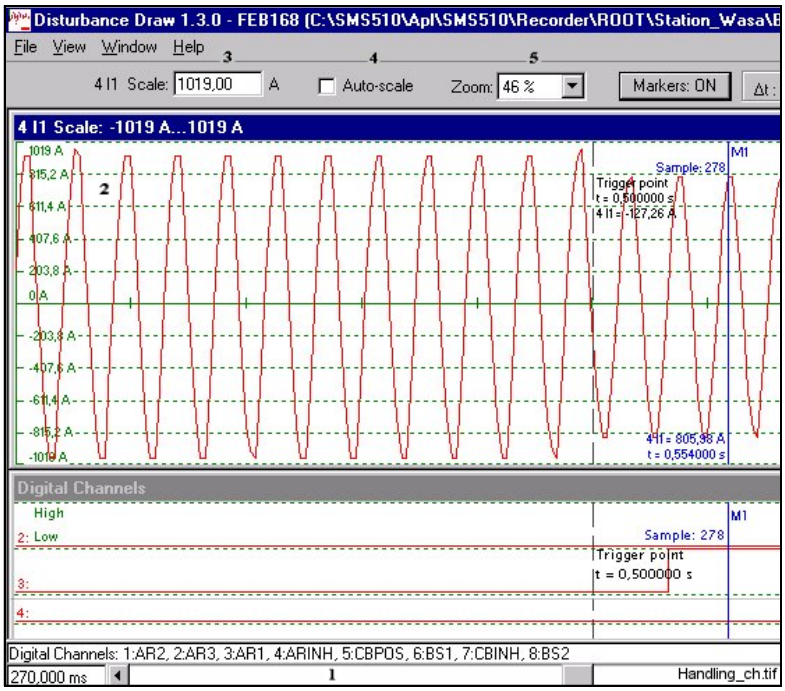


Fig. 9.2.3.-1 Application window

Changing the scale of Y-axis

The current scale of each analog channel is shown in the title bar of the signal window. The scale can be changed by first activating the channel window. Channel windows can be activated by clicking them with the mouse. The title bar changes its color and the scale value in the toolbar changes to the maximum of the active window scale value. The new maximum scale value can be entered to the scale field in the toolbar. The entered scale value takes effect after the Enter key is pressed. The scale is always ± the scale field value.

Zooming in time axis

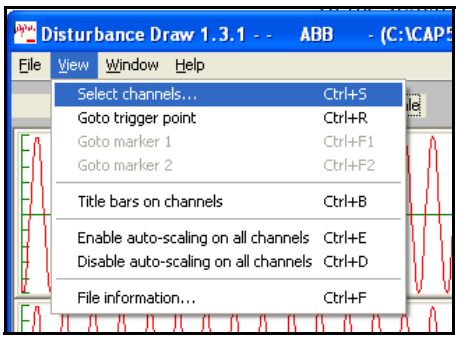
The mouse can be used for zooming when markers are OFF. If markers are ON, zooming is possible via keyboard with the **up/down cursor keys** or by changing the value in the **zooming field**. The user can select how many per cents are to be displayed by changing the value in the zooming field. The user can also select the area to be zoomed in by pressing the left mouse button and holding it down while selecting the area. The size of the currently selected area is shown beside the cursor. Zooming out can be performed by a right mouse click. Zooming with the mouse is possible only when the cursor looks like a magnifier (markers are OFF).

Moving in time axis

Signals can be scrolled in the time axis, if the zoom value is smaller than the length of the signal. Fields beside the scroll bar indicate times of the first and the last data sample in a channel window. By clicking these fields, the sample number is shown instead of the time value.

Selecting channels to be displayed

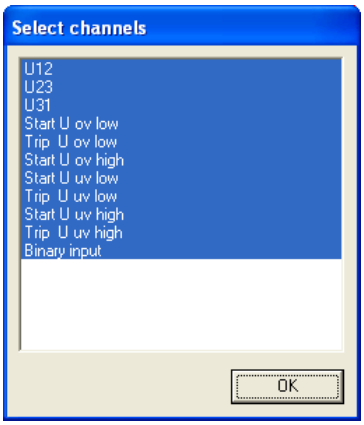
First, Fig. 9.2.3.-2 shows how to select channels to be displayed from the menu **View -> Select channels**



Selecting

Fig. 9.2.3.-2 The View menu

Then, the Select Channels dialog appears on the screen (see Fig. 9.2.3.-3). The user can select channels to be displayed from this list by clicking the appropriate channel with the mouse.



Selecting1

Fig. 9.2.3.-3 The Select Channels dialog. The colored channels have been selected.

Goto trigger point

A trigger point is indicated with a black dash line. To move the view to the trigger point, select **View -> Goto trigger point** from the menu.

Goto marker

Markers are indicated with blue solid lines (if markers are set on). To move the view to the point where a specified marker is located, select **View -> Goto marker 1** or **Goto marker 2** from the menu. The cursors of markers 1 and 2 are shown by Fig. 9.2.4.-2 and Fig. 9.2.4.-3.

Title bars on channels

This option can be changed from the menu **View -> Title bars on channels**. If this option is enabled, each channel window has a title bar. If this option is disabled, the title bars are not shown and there is more space for signals.

Enable/Disable auto-scaling on all channels

Features in menu **View -> Enable auto-scaling on all channels** and **View -> Disable auto-scaling on all channels** are used for enabling or disabling auto-scaling on all analog channels.

9.2.4. Using Markers

Fig. 9.2.4.-1 shows a dialog, which presents the following functions (see the bolded black numbers and arrows in the picture):

1. Trigger point
2. Time of trigger point and amplitude of signal
3. Markers: ON/OFF button
4. Signal amplitude and time
5. Markers M1 and M2
6. Delta t (time difference) and 1/Delta t between M1 and M2

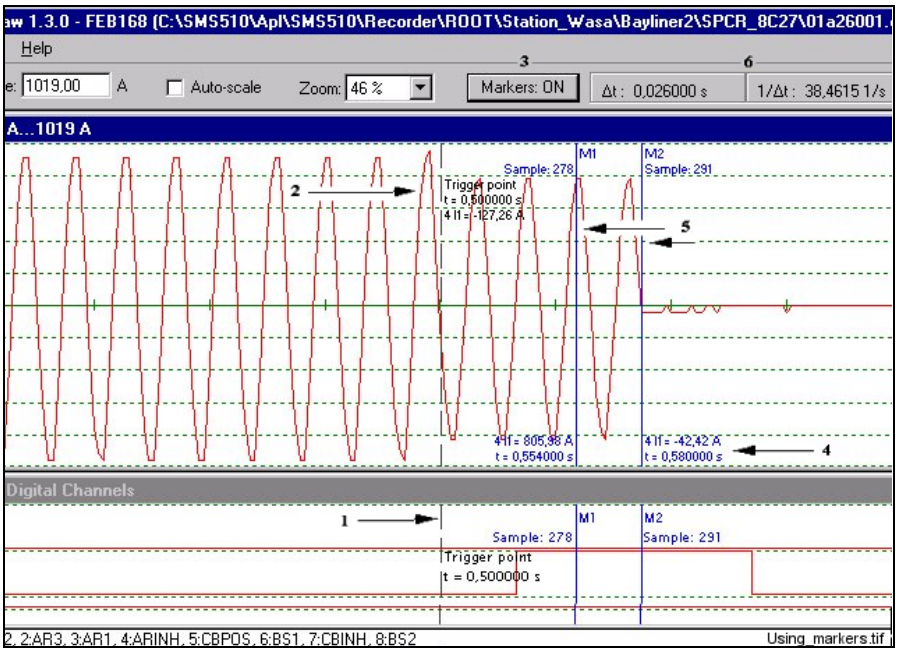


Fig. 9.2.4.-1 Markers

Markers can be activated by clicking the **Markers ON/OFF button** in the toolbar. The button text tells whether the markers are enabled (ON) or disabled (OFF). The option to change a marker can be selected from the pop-up menu (click the right mouse button when markers are enabled). An active marker can be moved by holding the left mouse button down while moving the mouse or by using the **left/ right cursor keys**. The cursor shows which marker is currently active (M1 or M2).

Fig. 9.2.4.-2 The cursor of Marker 1

Fig. 9.2.4.-3 The cursor of Marker 2

A marker includes the following data:

- Marker number (M1 or M2)
- Sample number
- Current value of the signal
- Time from the beginning of the record

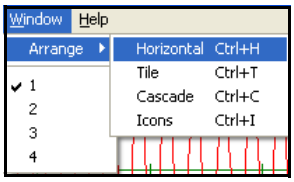
The calculated time difference and inverse time difference between Marker 1 and 2 are shown in the toolbar on the right hand side of the Markers ON/OFF button.

9.2.4.1. Window menu

The Windows menu contains two parts: one part for arranging the presentation of curves and another for selecting which curve in the actual disturbance should be brought into immediate focus.

Arranging curves on screen

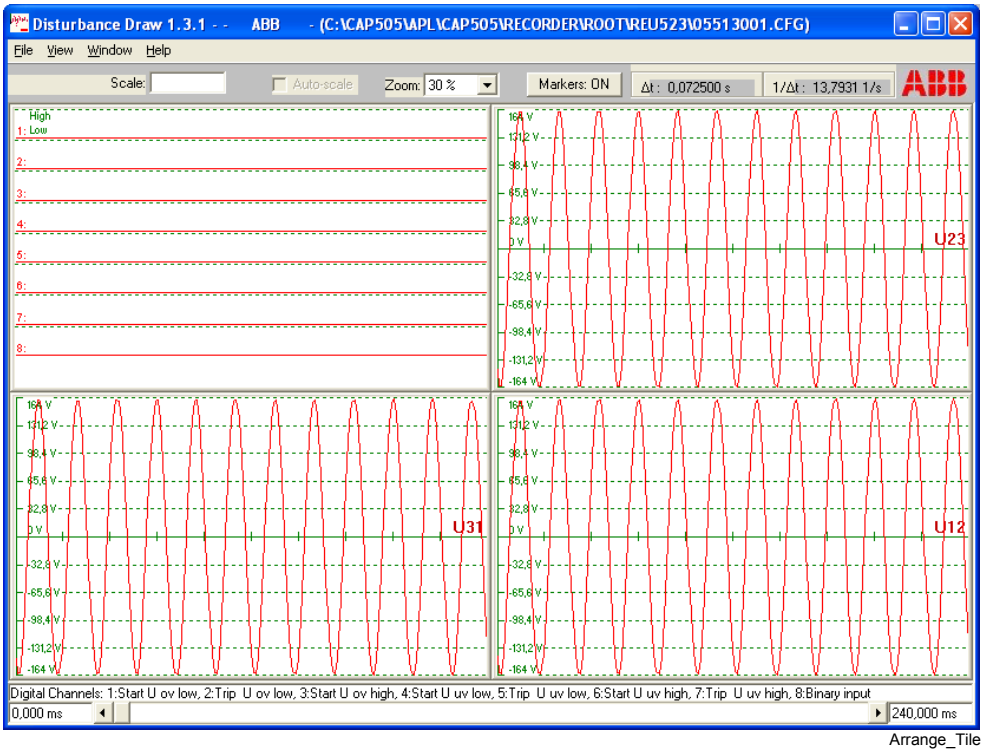
Individual curves can be presented as Horizontal (default), Tile, Cascade or Icons (see Fig. 9.2.4.1.-1).



Window_Arrange

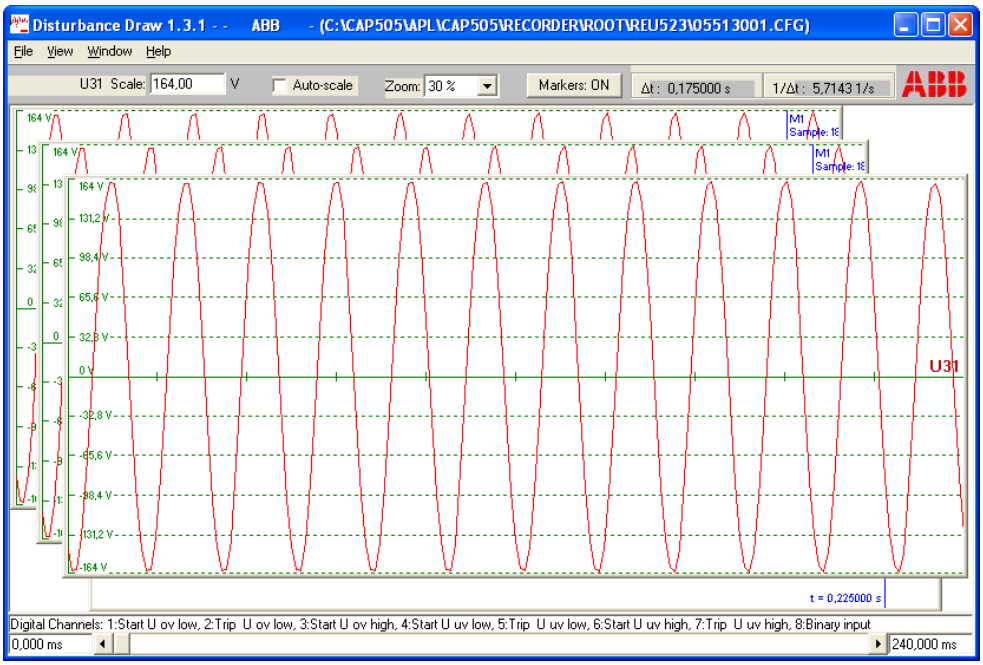
Fig. 9.2.4.1.-1 Options for arranging of curves on screen

Below you can see examples of curves arranged with the above mentioned options. The first example shows the Tile option (see Fig. 9.2.4.1.-2) and the second example shows the Cascade option (see Fig. 9.2.4.1.-3).



Arrange_Tile

Fig. 9.2.4.1.-2 Curves arranged with the Tile option

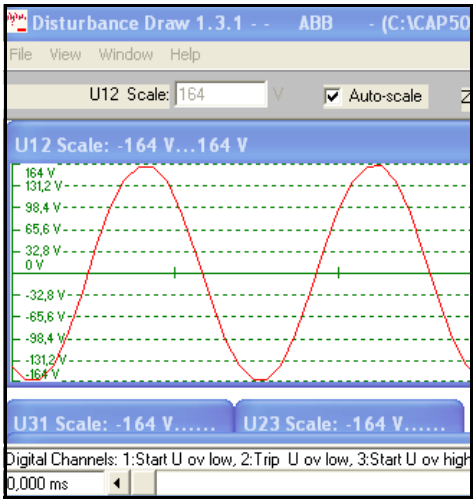


Arrange_Cascade

Fig. 9.2.4.1.-3 Curves arranged with the Cascade option

Icons are curves that are made when selecting channels from the View menu. The not selected channels are moved down on the screen as Icons (see Fig. 9.2.4.1.-4).

The default is that when opening a recording in the Disturbance Draw Tool, all the curves are presented on screen.

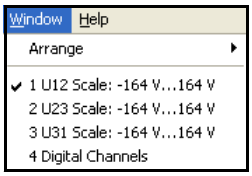


Arrange_Icons

Fig. 9.2.4.1.-4 Examples of Icons

Selecting curves to be highlighted

Fig. 9.2.4.1.-5 shows that the curve IL1 is selected, thus it is brought into focus on the screen. You can also see the actual scaling for each curve.



Window

Fig. 9.2.4.1.-5 Example of a highlighted curve with scaling

9.2.4.2. Help menu

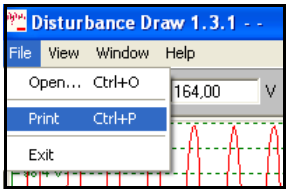
The Help menu contains two items: Contents (F1) and About.

The Contents gives guidance upon using the Disturbance Drawer and the About shows the program version.

9.2.5. Printing curves

There are two different ways to print curves:

- Printing via keyboard with key combination **Alt**+**PrintScrn** (Alt+Print Screen key).
- By selecting **File -> Print** from the menu (see Fig. 9.2.5.-1).

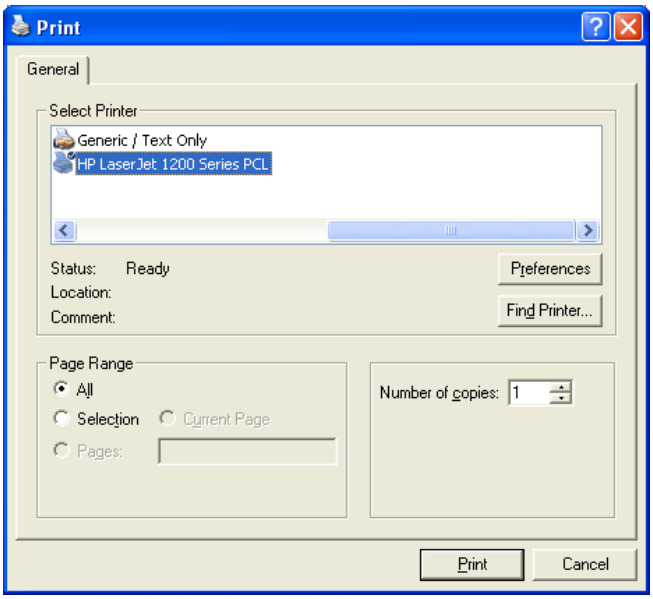


FilePrint

Fig. 9.2.5.-1 The File menu / Print

Use the **Alt**+**PrintScrn** key combination, if you want all the curves to be printed on one page. It copies the whole application window to the clipboard as a bitmap image. The bitmap image can then be printed with a selected printer.

The print settings can be set via the following dialog (see Fig. 9.2.5.-2):



Print1

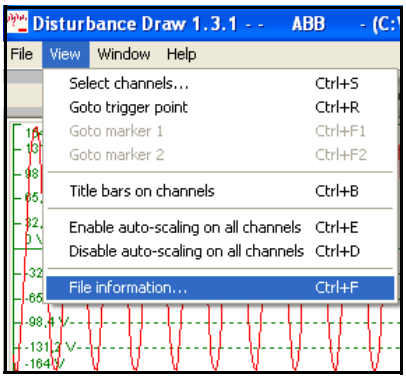
Fig. 9.2.5.-2 The Print dialog

9.2.5.1. Print settings

- The user can select a printer to be used from the list (installed system printers)
- The user can select the number of copies to be printed
- Orientation is selectable, either landscape or portrait (landscape is recommended)
- Used paper sizes are A4, A3 and Letter

9.2.6. Displaying COMTRADE File Information

COMTRADE file information can be viewed by selecting **View -> File information** from the menu (see Fig. 9.2.6.-1).



Display

Fig. 9.2.6.-1 The View menu

File information is based on data in the COMTRADE configuration file (.CFG).

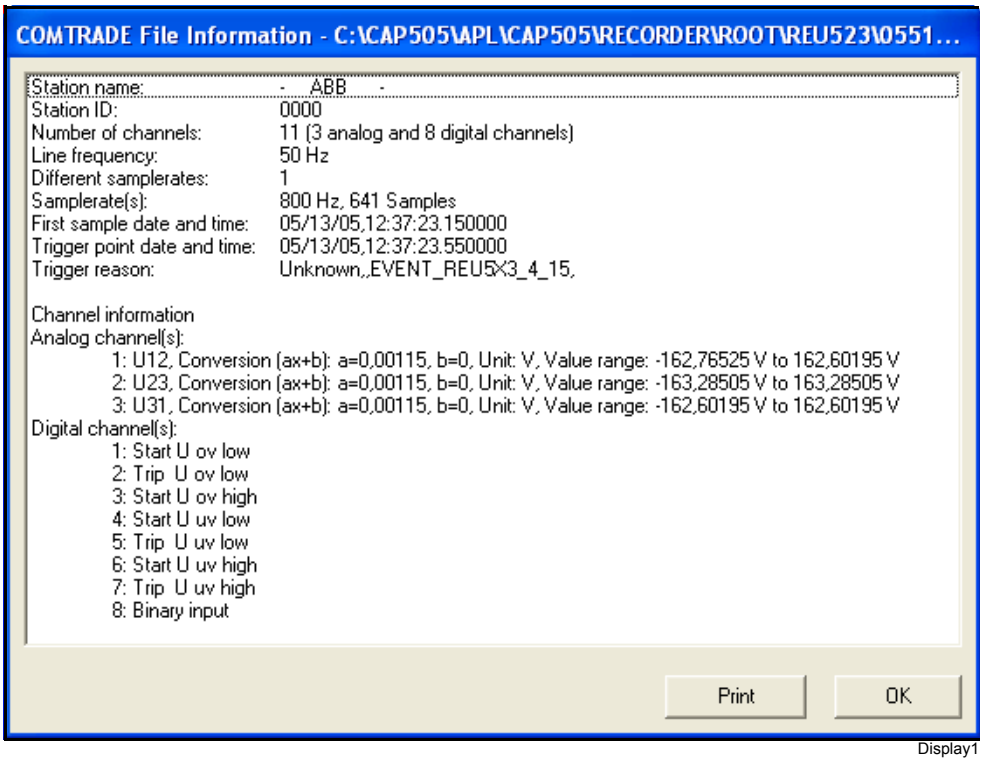


Fig. 9.2.6.-2 The File Information dialog

File information can be printed by clicking the **Print** button (see Fig. 9.2.6.-2).

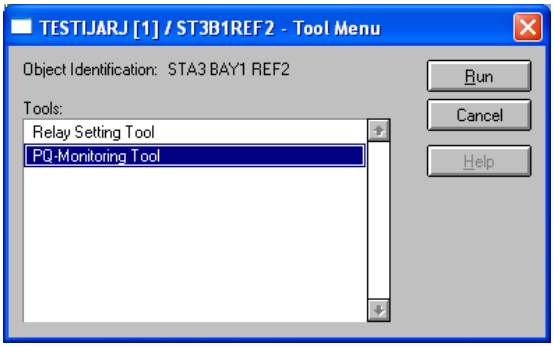
10. Power Quality Monitoring Tool

10.1. General

The Power Quality Monitoring Tool is used to visualize the data generated by PQ IEDs (Power Quality Intelligent Electronic Devices) and uploaded by MicroSCADA. This tool is only available in LIB 510/MicroSCADA.

10.2. Start-up

Start by clicking the relay unit's push-button in the station picture. Select the PQ-Monitoring Tool from the opened dialog and click Run.



pqm_o_tool

Fig. 10.2.-1 Tool Menu for a relay unit object

If the selected relay unit does not have any PQ-Monitoring Function, the Monitoring Tool will not open and the following dialog will appear on the screen.

ErrorDlg

Fig. 10.2.-2 A dialog indicating that PQ function is not available

10.3. Main view

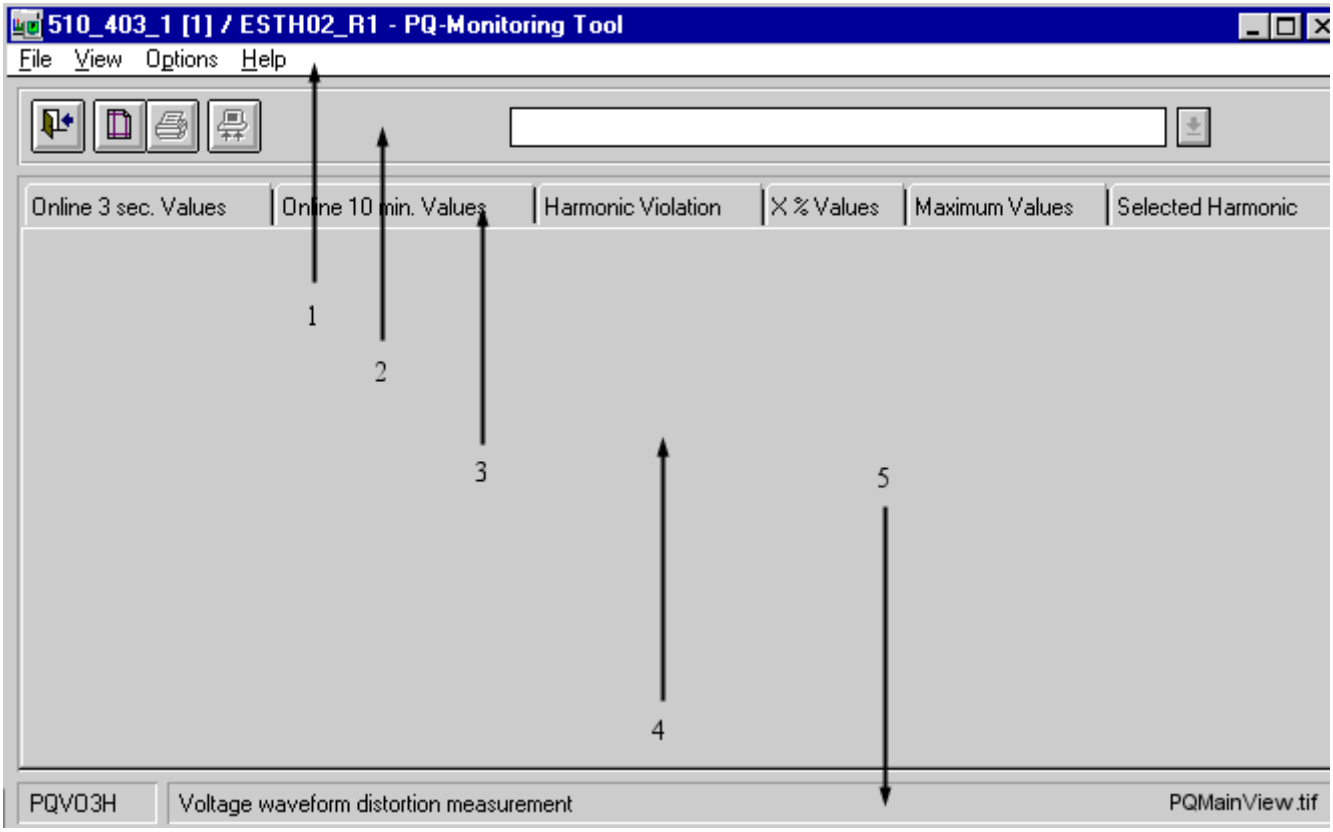


Fig. 10.3.-1 Main view of the PQ-Monitoring Tool

This is a main view of the tool when Voltage waveform distortion measurement is selected (the other implemented function, Current waveform distortion measurement, looks exactly the same). The main view consists of the following functions:

1. Menu bar

A set of menus for basic functions of the tool.

2. Toolbar

A bar of buttons for commonly used operations.

3. Tabbed page

A tabbed page where each page opens a new visualization area depending on the used monitoring function.

4. Visualization area

An area where the monitored data is displayed.

5. Status bar

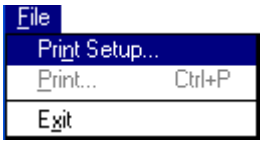
A bar where some various monitoring information is displayed.

10.3.1. Menu bar

The Menu bar includes the following menus.

File menu

The File menu contains the file handling functions.



PQFileMe

Fig. 10.3.1.-1 The File menu

Table 10.3.1-1 The Print Setup function:

Selection	Functionality
Print Setup	Opens a dialog in which the used printer setup can be modified, if the used MicroSCADA Monitor type is VS Local.

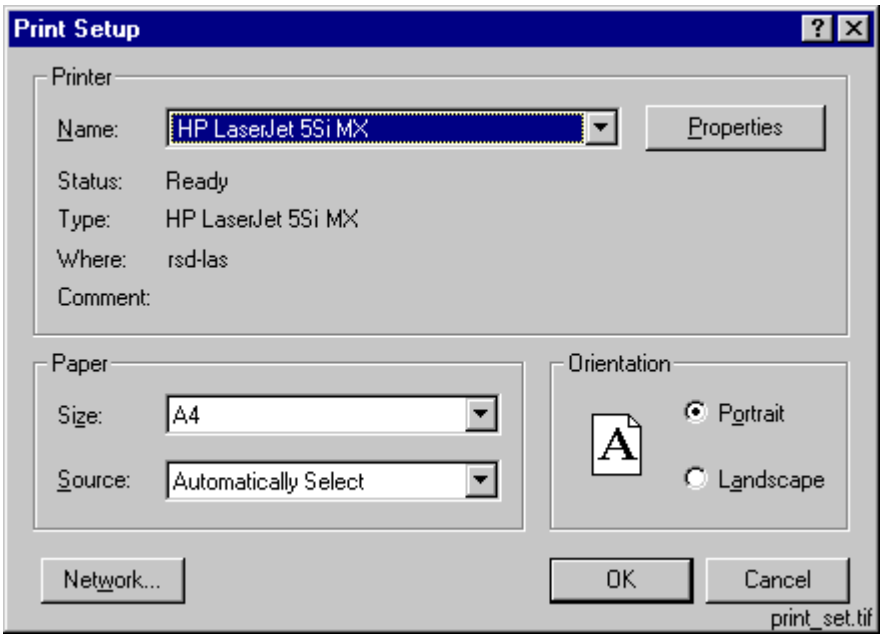


Fig. 10.3.1.-2 Print Setup dialog

If the used MicroSCADA Monitor type is VS Remote, the following error dialog appears on the screen.

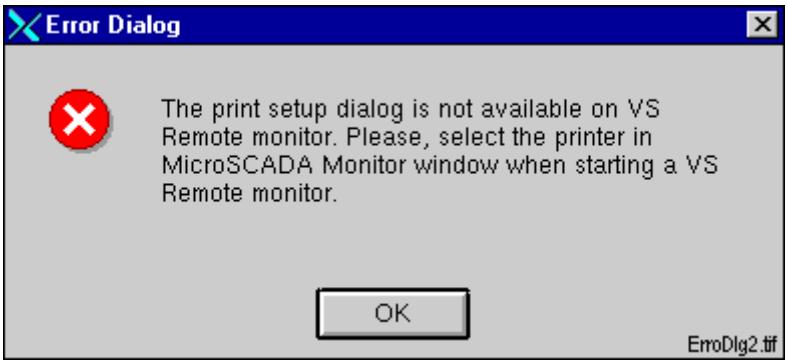


Fig. 10.3.1.-3 Print Setup error dialog

When the VS Remote monitor is used, the printer selection must be done when starting the MicroSCADA monitor.

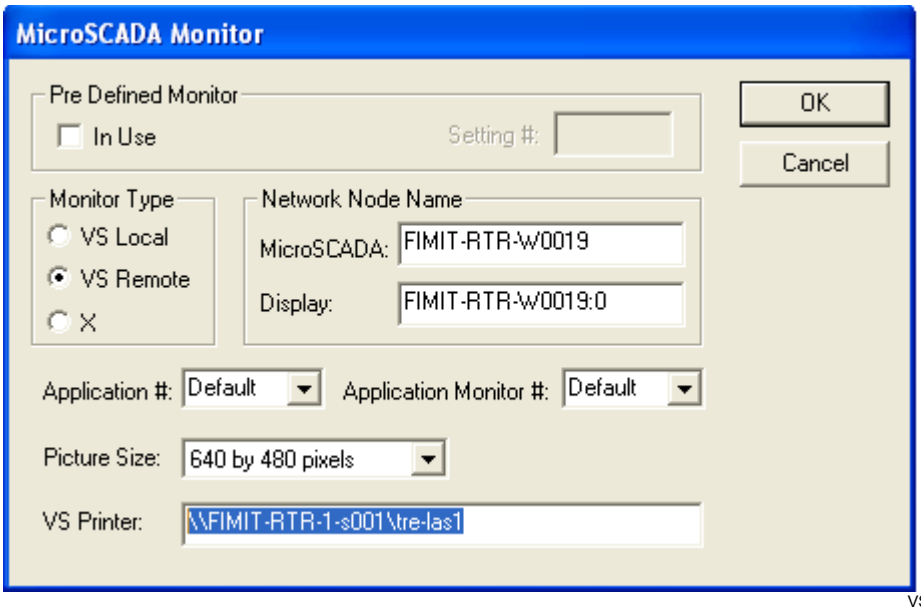


Fig. 10.3.1.-4 VS Printer selection in MicroSCADA VS Remote Monitor start-up

Table 10.3.1-2 The Print function:

Selection	Functionality
Print	Opens a printing dialog of the current page where the setup can also be changed (VS Local Monitor type). If the used Monitor type is VS Remote, the Print dialog is another.

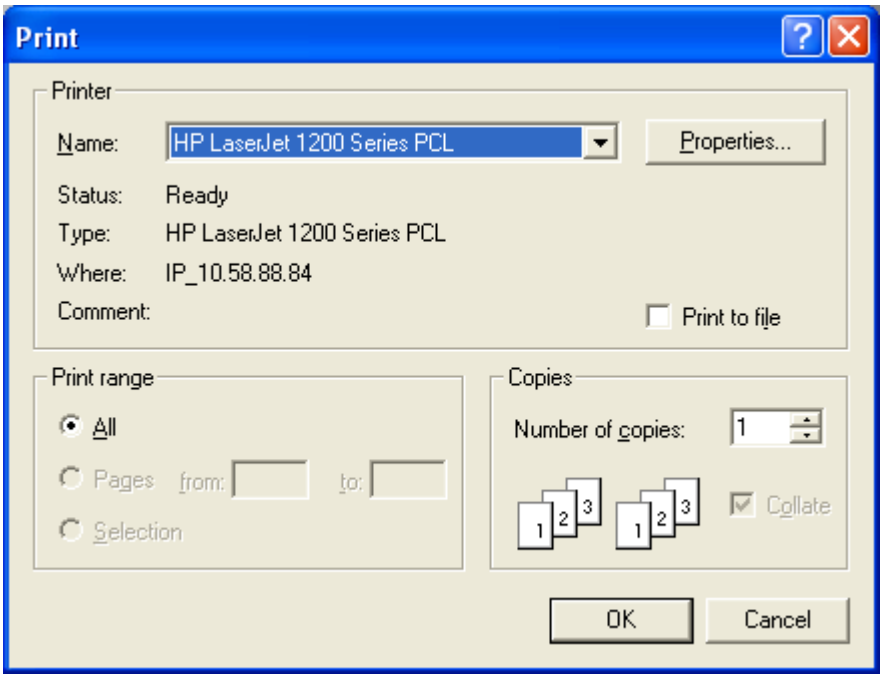


Fig. 10.3.1.-5 Print dialog on a VS Local Monitor

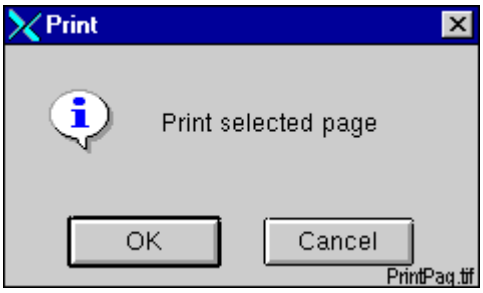


Fig. 10.3.1.-6 The Print dialog on a VS Remote Monitor

Printing needs information from the active menu of the used relay. If the active menu file of the relay is not found, an error dialog pops up (see Fig. 10.3.1.-7) and the menu should be build with the Relay Setting Tool.

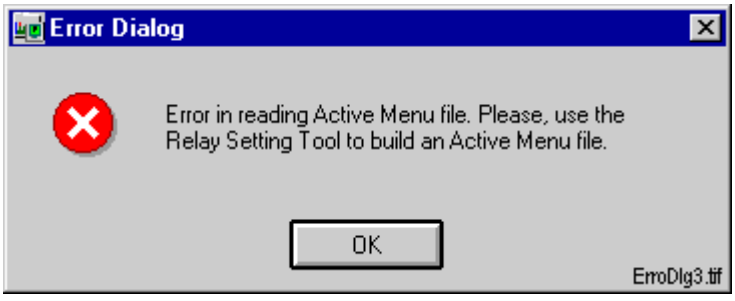


Fig. 10.3.1.-7 Error dialog when the Active Menu file was not found

Table 10.3.1-3 The Exit function:

Selection	Functionality
Exit	Exits the PQ-Monitor Tool.

Exit

Fig. 10.3.1.-8 The Exit dialog

View menu

The available PQ-Monitoring functions are listed and selectable in the View menu of the tool.

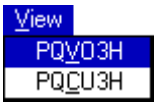


Fig. 10.3.1.-9 The View menu

Table 10.3.1-4 The selectable PQ-Monitoring functions:L

Selection	Functionality
PQVO3H	Opens a view of "Voltage waveform distortion measurement". The monitorable PQ indices can be seen and selected on the pages of the opened page.
PQCU3H	Opens a view of "Current waveform distortion measurement". The monitorable PQ indices can be seen and selected on the pages of the opened page.

Options menu

This menu includes some configurable options of the PQ-Monitoring Tool.

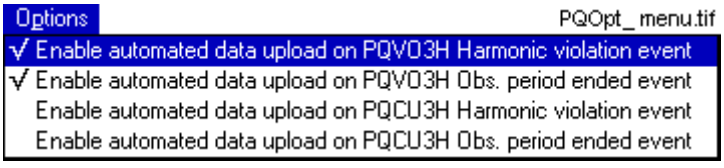


Fig. 10.3.1.-10 The Options menu

The automated data uploading is started by selecting "Harmonic violation" and "Obs. Period ended" events. In this menu you can enable or disable (toggle on and off) the auto-upload feature by selecting the modifiable item. In the menu above, the first two items are enabled and the last two disabled.

Enabling and disabling automated data upload is only allowed on authorization level Engineering (2), or higher. If the user rights are insufficient, the following error dialog will appear on the screen.

Fig. 10.3.1.-11 Insufficient user rights to change the auto-upload option

Help menu

The Help menu includes the on-line help of the tool functions.

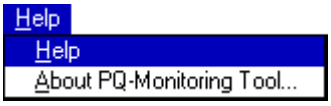


Fig. 10.3.1.-12 The Help menu

Table 10.3.1-5 The Help menu functions:

Selection	Functionality
Help	Opens a dialog containing the on-line help of the tool functions.
About PQ-Monitoring Tool	Opens a dialog containing some general information of the PQ-Monitoring Tool.

10.3.2. Toolbar

The Toolbar includes the commonly used buttons presented in the following table: The first three buttons do the same file handling functions as the choices in the File menu.

Table 10.3.2-1 Commonly used buttons in the toolbar:

Button	Functionality
	Exit
	Print Setup
	Print
	Upload button used to upload on-line data from the relay

Some further information is also viewed on the toolbar. The presented information depends on what is being monitored. If the on-line values are viewed, the information of "Measured input" is shown. In the case of harmonic violation the "Violation Period" is shown and can be selected from the toolbar. If the values from a certain period are monitored, the "Observation Period" is shown and selectable on the toolbar.

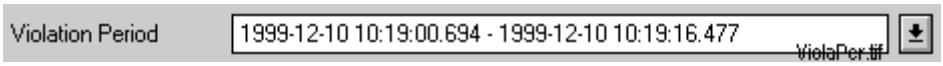


Fig. 10.3.2.-1 Information of the selected Harmonic Violation Period

10.3.3. Tabbed page

A tabbed page is opened, when you make a selection of the monitoring function (Voltage or Current waveform distortion measurement) from the View menu. When you click the wanted page, the actual page opens for visualization.

Fig. 10.3.3.-1 The list of monitored data on Voltage or Current Harmonics

If there is no saved data for a Harmonic Violation Period or an Observation Period the following information dialog appears on the screen.

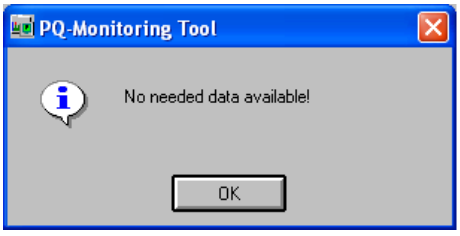


Fig. 10.3.3.-2 An information dialog of saved data not available

10.3.4. Visualization area

This is the area where the actual results are being visualized. The uploaded or saved data is shown on a bar chart of harmonics or on a cumulative curve of the selected harmonic.

The bar chart of a Harmonic Violation Period consists of bars and a curve.

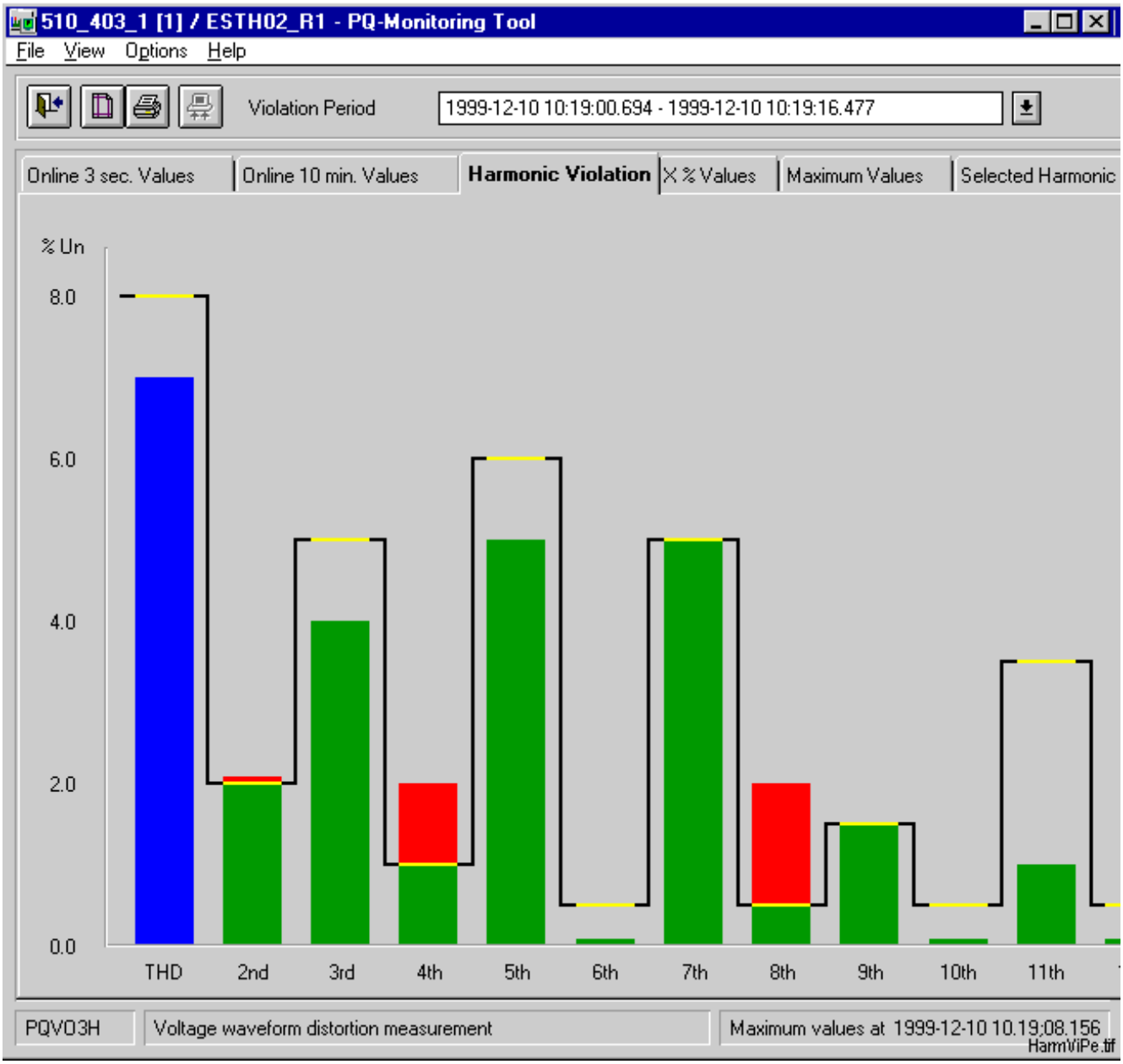


Fig. 10.3.4.-1 A bar chart of a Selected Harmonic Violation Period

In this picture, the height of each bar describes the magnitude of a harmonic value. The values under the adjustable limits (yellow lines) are shown with green bars and the values over the limits with red bars. The continuous black curve describes the limits of the EN 50160 Standard for each harmonic.

A picture of a Selected Harmonic during a selected Observation Period is shown in the following figure (see Fig. 10.3.4.-2).

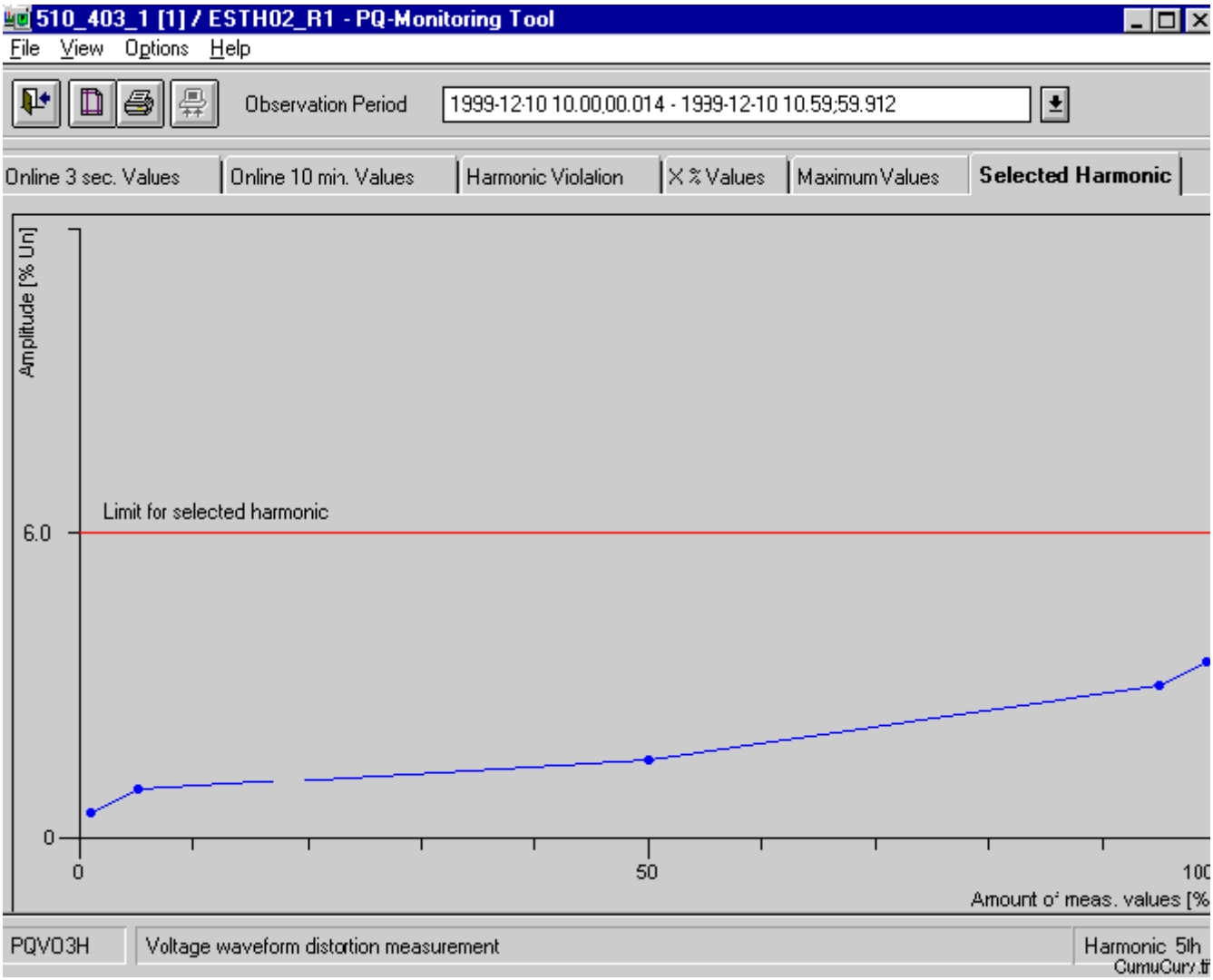


Fig. 10.3.4.-2 A cumulative curve of selected harmonic during an Observation Period (Requirements fulfilled)

This curve is drawn according to five percentiles (1%, 5%, 50%, 95% and 99%) calculated by the relay unit. The adjusted limit value for a selected harmonic is shown with a red horizontal line. If the 95% percentile value for the selected harmonic is under the adjusted limit, the cumulative curve is blue and the requirements are fulfilled.

If the 95% percentile value for the selected harmonic exceeds the adjusted limit, the cumulative curve changes to red and the requirements are not fulfilled.

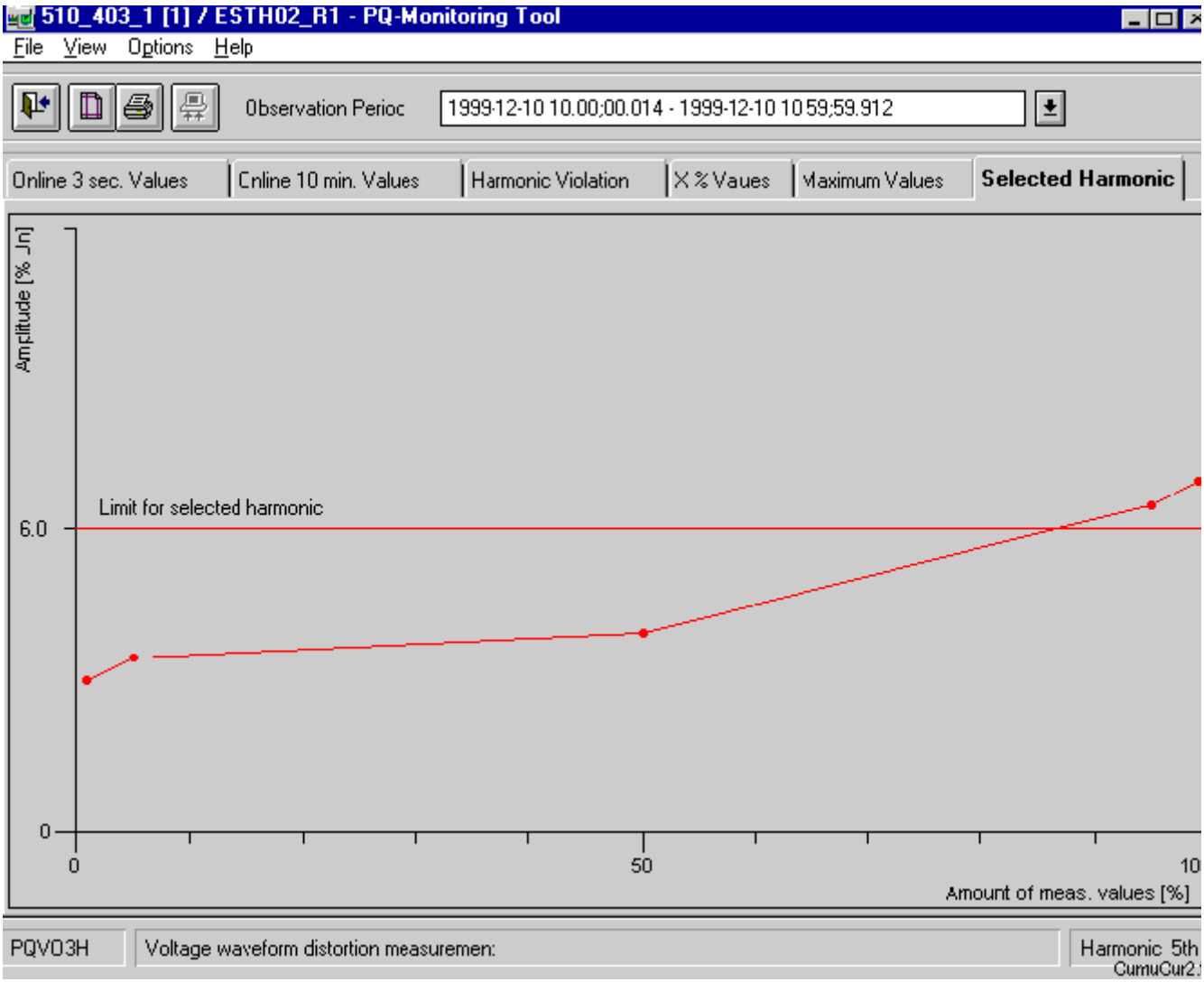


Fig. 10.3.4.-3 A cumulative curve of selected harmonic during an Observation Period (Requirements not fulfilled)

10.3.5. Status bar

Various information is displayed on this bar depending on the monitoring function.

Fig. 10.3.5.-1 A status bar information on a selected Harmonic Violation period

The status bar presents always the information and explanation of the data generating Function Block. The rest depends on what is being monitored:

- If on-line values are monitored, the status bar includes the information of the ending of current observation period.
- When a harmonic violation period is displayed, the status bar shows the time stamp of the recorded maximum values.

- If the X% values are monitored, the adjusted X (percentile) is shown.

A number of the harmonic (or THD) is viewed, when the curve of selected harmonic is presented.

10.4. Monitoring functionality

After the PQ-Monitoring Tool has been started, you should select the wanted monitoring function from the View menu. By selecting the first or second page from the opened page (On-line 3 sec. Values and On-line 10 min. Values), the on-line values from the relay can be uploaded. The on-line mode is also indicated by the upload button.

The rest of the pages are used for saved data visualization. When any of these tabbed pages is selected, the upload button is disabled.

10.4.1. On-line monitoring

The on-line monitoring is started by pressing the upload button on the toolbar. When the uploading begins, the following indicator of the process proceeding pops up.

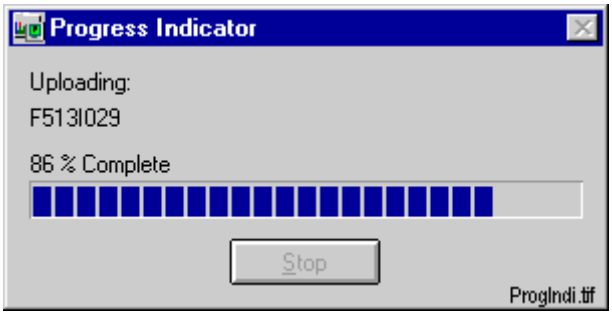


Fig. 10.4.1.-1 An indication dialog of the uploading process proceeding

If the relay unit does not answer or there is some other communication problem, an error dialog appears on the screen (see Fig. 10.4.1.-2)

Fig. 10.4.1.-2 An error dialog of communication problem

The manual data uploading requires authorization level Control (1) or higher. Otherwise, the following information dialog is opened (see Fig. 10.4.1.-3).

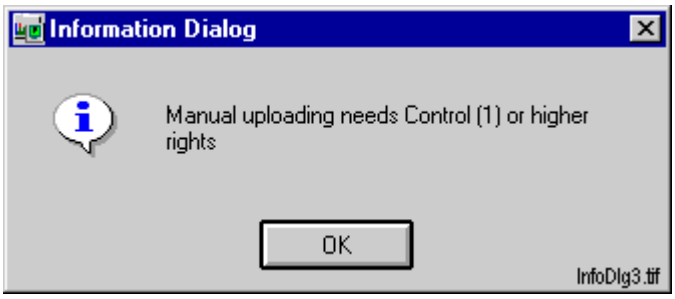


Fig. 10.4.1.-3 Insufficient user rights to manual data uploading

10.4.2. Monitoring of saved data

To monitor the previously saved data, select the wanted time period from the drop-down list on the toolbar.

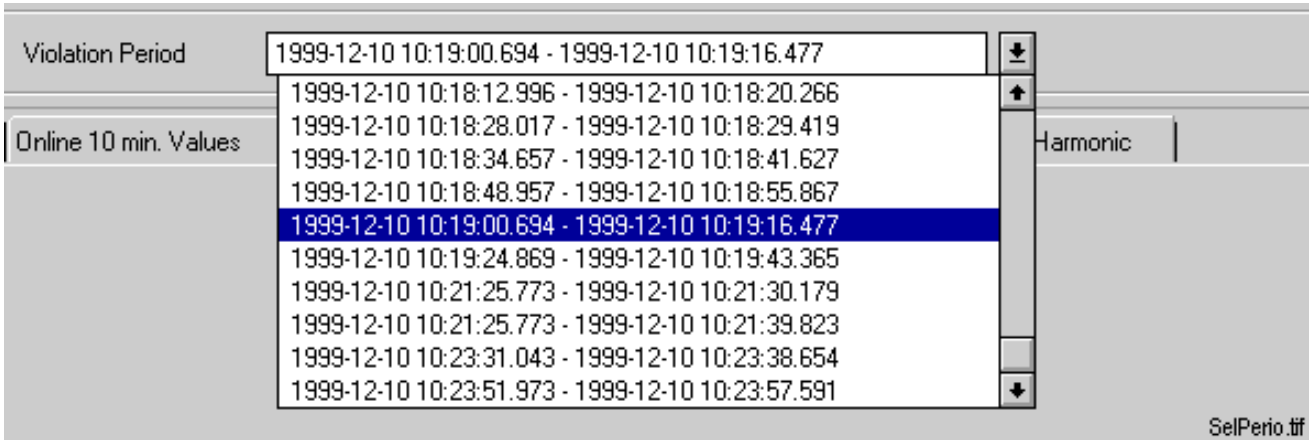


Fig. 10.4.2.-1 Selection of a harmonic violation period from a drop-down list

When you have selected a period, the progress indicator opens and the saved data is read from the disk. After that, the results are ready to be visualized.

11. Event Log Viewer

11.1. General

The Event Log Viewer is a tool for uploading and viewing of event logs uploaded from RED 500 platform relays. The tool is used for the following purposes:

- Uploading new event logs from the connected relay
- Viewing uploaded event logs
- Saving uploaded event logs
- Opening saved event logs
- Exporting event logs to a text file
- Printing event logs

The purpose of the Event Log Viewer is to provide means to get a snapshot of the current events in the event view of the relay. The events and their order in the file is the same as in the event view seen on the HMI of the relay. The contents of the uploaded log can be considered to be like history events.

The Event Log Viewer is used in CAP 501, CAP 505 and SMS 510 environments. It is available only for certain RED 500 platform relays supporting this feature. The first relay types having this support are REF 54x rel. 3.0 and REX 521 rev. E. REF 543 relay has been used here as an example for capturing figures.

11.2. Start-up

The Event Log Viewer 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. 11.2.-1. By default, the Event Log Viewer is not available as an object tool in the Project Structure Navigator for a newly created relay object, since it is available only for certain relay types and revisions. To be able to use the tool, the relay object has to be configured so that the selected configuration supports event log uploading.

The Event Log Viewer tool can be opened by double-clicking its name on the list.

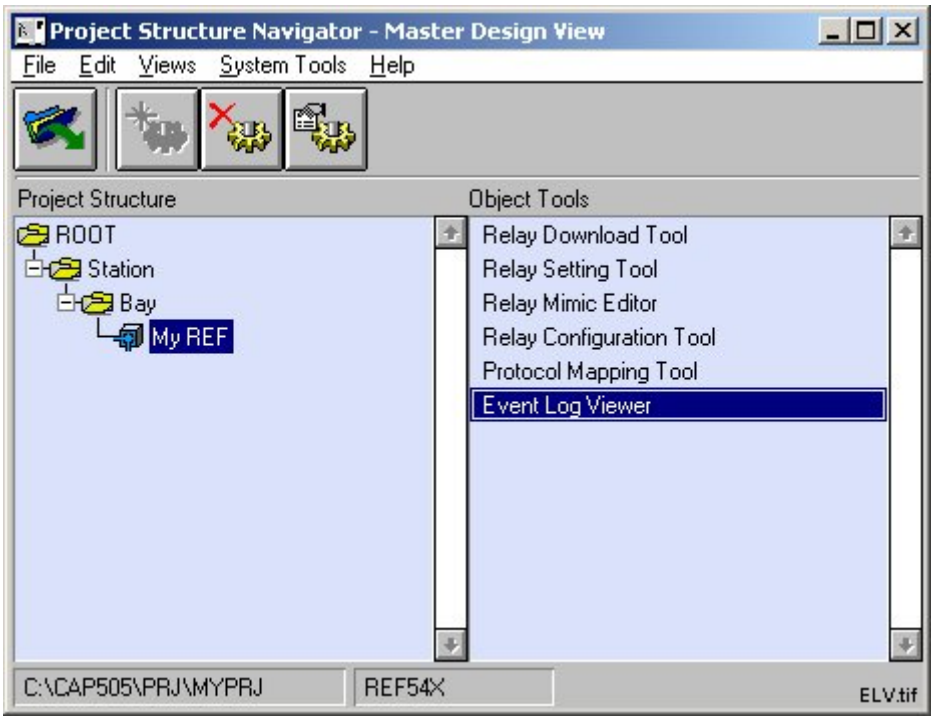


Fig. 11.2.-1 Starting the Event Log Viewer tool from the Project Structure Navigator.

11.3. User interface

The main view of the Event Log Viewer is shown in Fig. 11.3.-1.

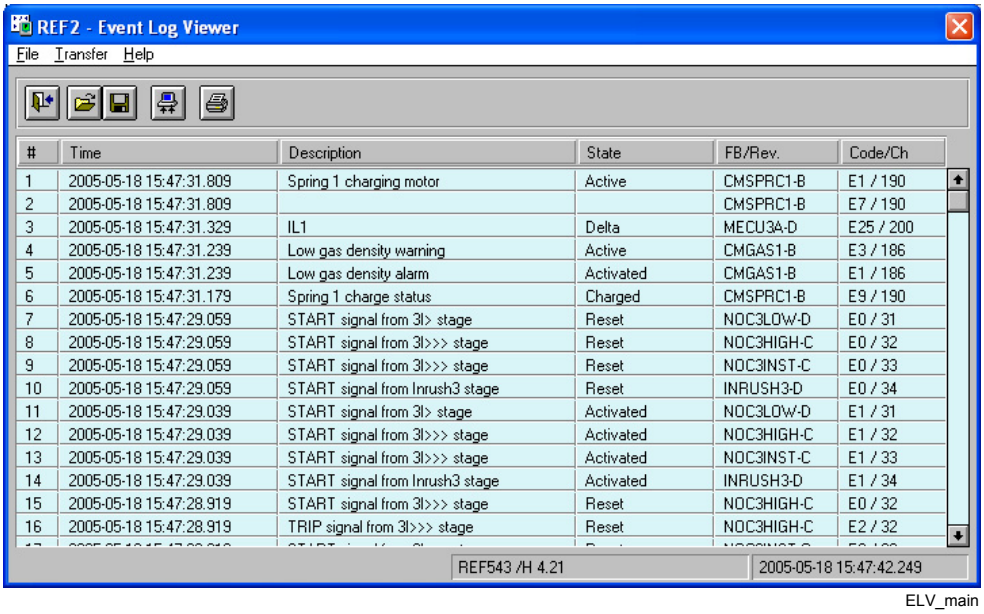


Fig. 11.3.-1 The main view of the Event Log Viewer

The main view contains the following elements:

- Menu bar
- Toolbar
- Event view
- Status bar

11.3.1. Menu bar and toolbar commands

The menu bar contains the following commands:

- File
  - Open…
  - Save
  - Export…
  - Page Setup…
  - Print
  - Exit
- Transfer
  - Upload
- Help
  - About Event Log Viewer

Table 11.3.1-1 explains the functionality of the commands and the corresponding toolbar buttons.

Table 11.3.1-1 Menu bar and toolbar commands:

Command:	Toolbar button:	Functionality:
File - Exit		Exits from the tool.
File - Open...		Opens the saved event log.
File - Save		Saves the uploaded event log.
File - Export…		Exports the current event log to a text file.
File - Page Setup…		Opens the Page Setup dialog.
File - Print		Prints the event log.
Transfer - Upload		Uploads a new event log from the device.
Help - About Event Log Viewer		Opens the About dialog.

Event view

The event view contains the events uploaded from the relay as such. This means that the events, their order and the time stamps are exactly what they were when written into the event view of the relay. Due to this fact, it should be noticed that the time stamps may not always be in the time order. This is because the real-time clock of the relay may have been set to any time, depending of the existence or non-existence of the time-synchronization.

The columns of the event view are described in Table 11.3.-1..

Table 11.3.-1 Event view columns:

Column:	Description:
#	Order number of the event in the file.
Time	Event registration time stamped by the relay.
Description	Fixed part of the text corresponding to the event code and the function block.
State	Dynamic part of the text corresponding to the event code and the function block.
FB/Rev.	Function block name and revision corresponding to the channel producing the event.
Code/Ch	Event code and channel number producing the event.

Status bar

When an event log is shown, the status bar contains the following information about the log:

- Relay product definition, revision and build number taken from the event log file header. For example, "REF543 /H 4.18" for a REF 54x or "REX521 /H02 E 4.03.00" for a REX 52x.
- Date and time stamp of the event log file generation.

11.4. Using the Event Log Viewer

11.4.1. Uploading an event log

A new uploading of an event log file is started by selecting Transfer - Upload from the menu or by clicking the corresponding toolbar button. If the uploading process is started successfully, a progress window will be shown during the uploading (see Fig. 11.4.1.-1).

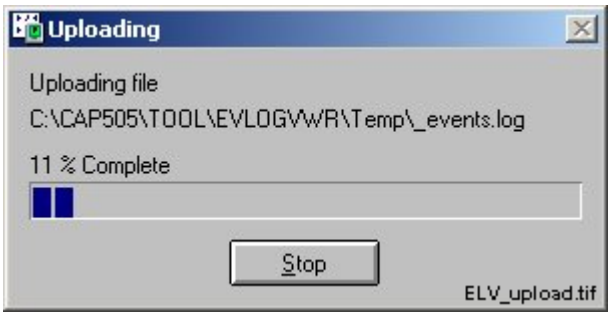


Fig. 11.4.1.-1 Uploading progress window

After the uploading has been finished successfully, the new event log will be shown in the main view (see Fig. 11.3.-1).

11.4.1.1. Communication problems

Communication problems may occur when initializing the communication or during the communication process. A proper error dialog will be shown in these cases. A couple of examples are described below:

If, for some reason, there is a mismatch between the object settings and the connected relay (and the connected relay does not support event log uploading), the following dialog may be shown for a long time before another error message will be shown.

Fig. 11.4.1.1.-1 Checking event log support

If the communication settings of the object are invalid, then an error dialog will be shown (see Fig. 11.4.1.1.-2). Improper address settings can be the reason for this.

Fig. 11.4.1.1.-2 Error dialog for invalid communication settings

11.4.2. Saving an event log

The uploaded event log can be saved to a disk. To save the event log, select File - Save from the menu or click the corresponding toolbar button.

The file is saved with an automatically generated name to a fixed location, so no additional questions are asked when the saving is done. The name consists of the time stamp of the uploaded log, and the location is a dedicated folder under the current object folder in the CAP 505/SMS 510 project.

Due to the reasons stated above, each uploaded log can be saved only once.

11.4.3. Opening a saved event log

A saved event log can be opened any time by selecting File - Open… from the menu or by clicking the corresponding toolbar button. By doing this, the Event Logs dialog will be opened (see Fig. 11.4.3.-1).

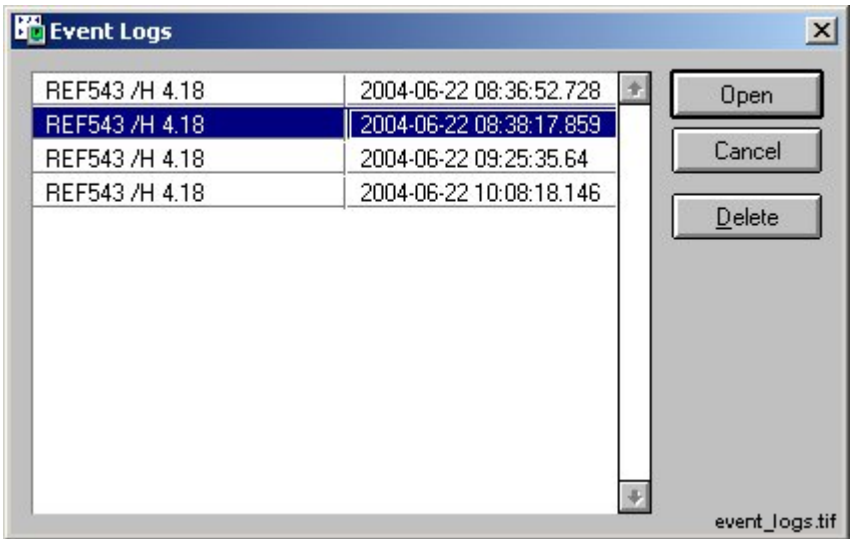


Fig. 11.4.3.-1 Event Logs dialog

The Event Logs dialog contains a list of the previously saved logs. Each log is identified with the same information (i.e. relay product and time stamp), which was visible on the status bar after uploading from the relay.

To open an existing event log, select a row on the list and click the Open button. To delete an event log, select a row on the list and click the Delete button.

11.4.4. Exporting an event log into a text file

The File - Export… menu command is used to export the current event log file into a text file. To start the operation, select the menu command and the file selection dialog appears on the screen.

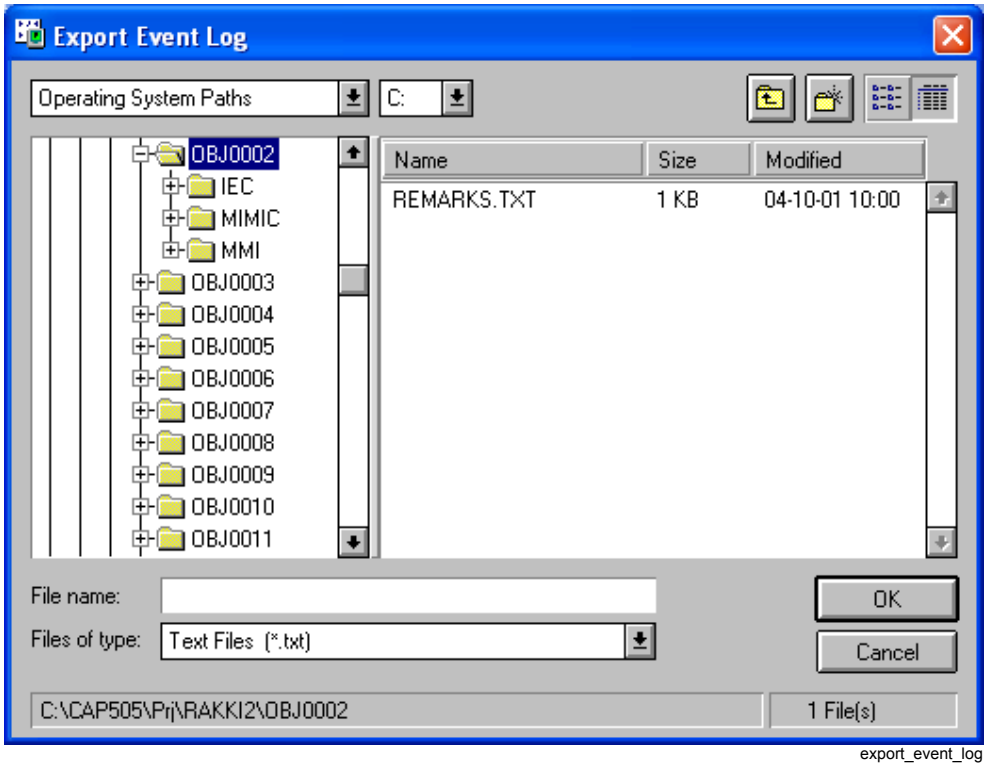


Fig. 11.4.4.-1 Export Event Log dialog

To complete the export operation, type a file name or select an existing file and click the OK button. Overwriting an existing file is confirmed.

The export file contains a few header rows and the actual event rows exactly as shown on the event view list. The header rows begin with a "#" character and the columns in the event rows are separated with tabulator characters.

The difference between saving and exporting is that the export format contains also descriptive texts, and the exporting can be done to any location with any valid file name.

11.4.5. Printing an event log

The current event log can be printed to any printer defined in the operating system. After selecting File - Print from the menu or by clicking the corresponding toolbar button, the standard Print 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.

The margins of the page layout can be configured before printing. By using the File - Page Setup… menu command, the margins can be specified on the Page Setup dialog (see Fig. 11.4.5.-1).

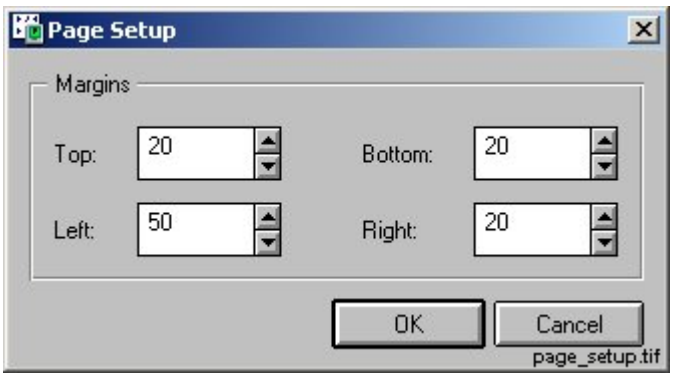


Fig. 11.4.5.-1 Page Setup dialog

12. REx 61x DNP 3.0 point configuration

12.1. General

The objective of the DNP object editing is to create a customized DNP object interface for REx 61x relays. This configuration dialog is an extension to the RED Relay Setting Tool. Editing features include removing, adding, remapping and reorganization of DNP points.

The dialog is divided into tabs by the DNP object type:

- Binary points handle DNP object groups 1 and 2
- Analog points handle object groups 30 and 32
- Counter points handle object groups 20, 21 and 22

Please note that the DNP protocol's communication line parameters and profile parameters can be found in separate tabs in the Relay Setting Tool (see Fig. 12.1.-1).

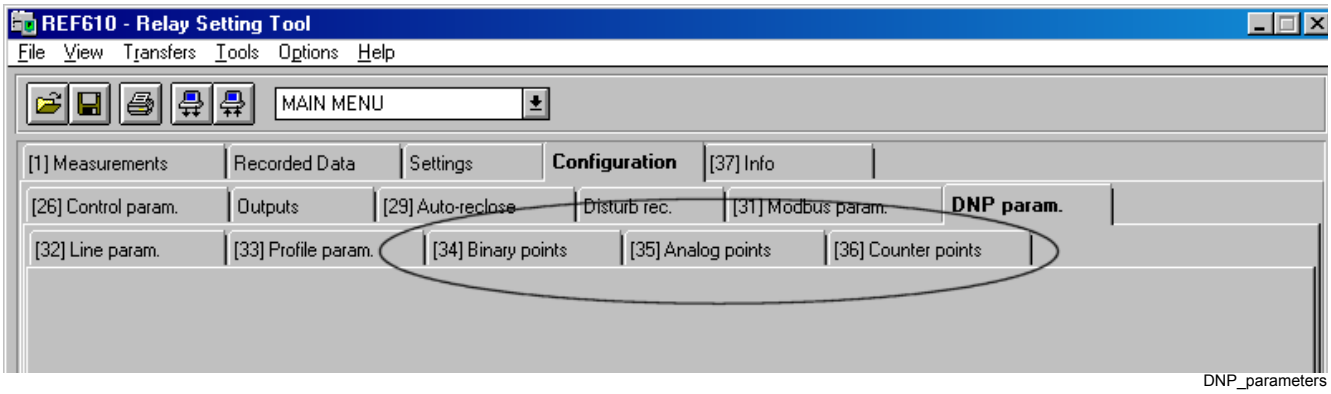


Fig. 12.1.-1 The DNP parameters of the Relay Setting Tool

All the DNP parameters (also the line parameters and profile parameters) are stored on an external DNP module in the relay. If DNP parameters have been altered, it is necessary to switch the relay back to the rear communication mode for at least 10 seconds in order for the DNP parameters to be replicated and stored on the DNP module.

12.2. Start-up

DNP 3.0 point configuration is available in CAP 501/505 and SMS 510. The configuration dialog is started from the RED Relay Setting Tool.

12.3. Using the DNP 3.0 point configuration dialog

12.3.1. Entering the DNP point editing dialog

You can enter the DNP point editing dialog from any of the three DNP parameter tabs. You can do this by setting the cursor to the New Value field and by pressing any key. The DNP configuration dialog will then open with detailed information about the DNP objects in question (see Fig. 12.3.1.-1).

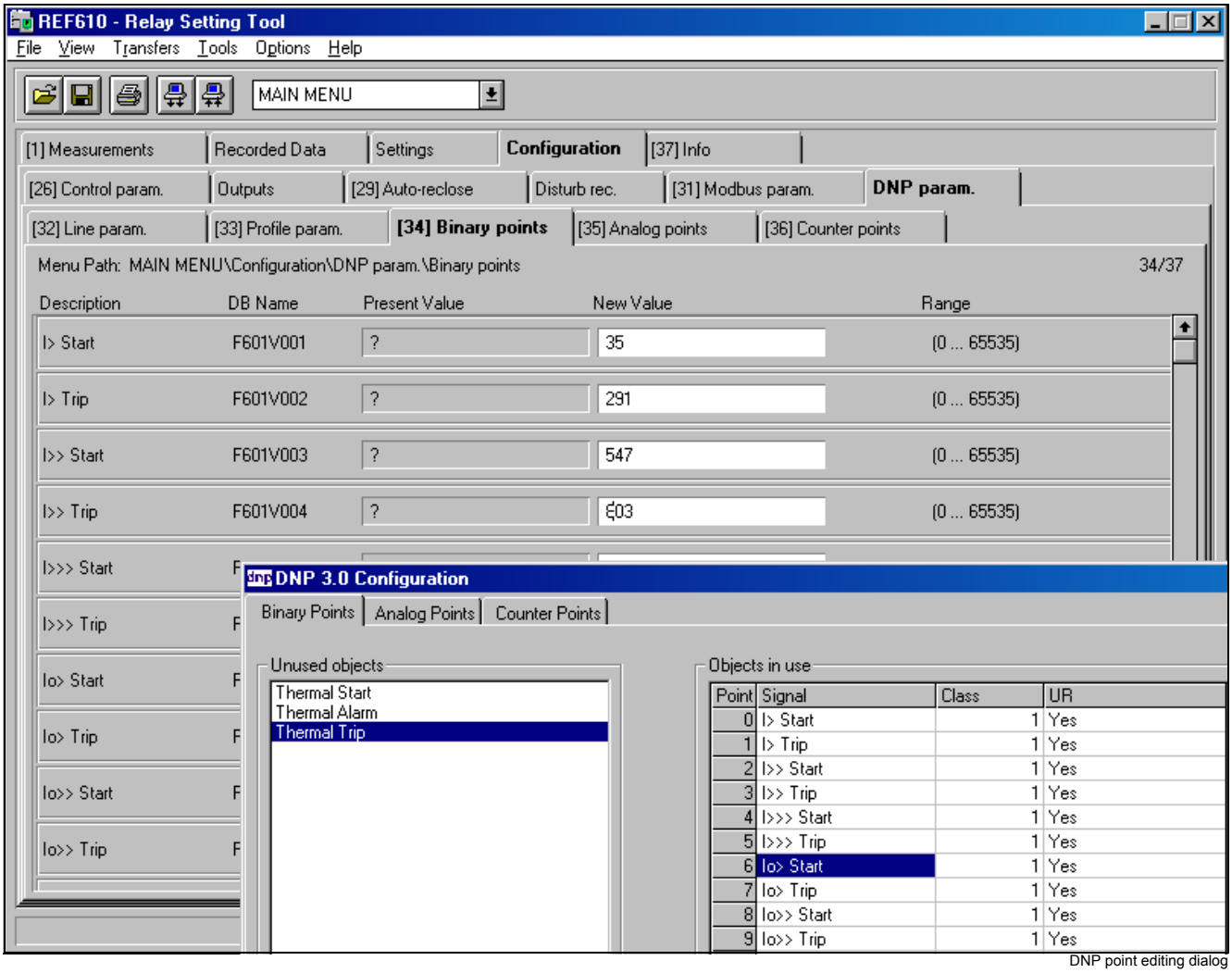


Fig. 12.3.1.-1 Entering the DNP point dialog

12.3.2. Editing DNP points

12.3.2.1. Editing in general

This section applies to all DNP parameter tabs (Binary points, Analog points and Counter points).

DNP 3.0 configuration dialog contains the following editing features:

1. Unused objects
2. Objects in use
3. Base address
4. Append and Remove buttons
5. Move signal
6. Class and UR flag
7. Force all rows
8. Deadband (Analog and Counter points specific feature)
9. Scaling index (Analog points specific feature)

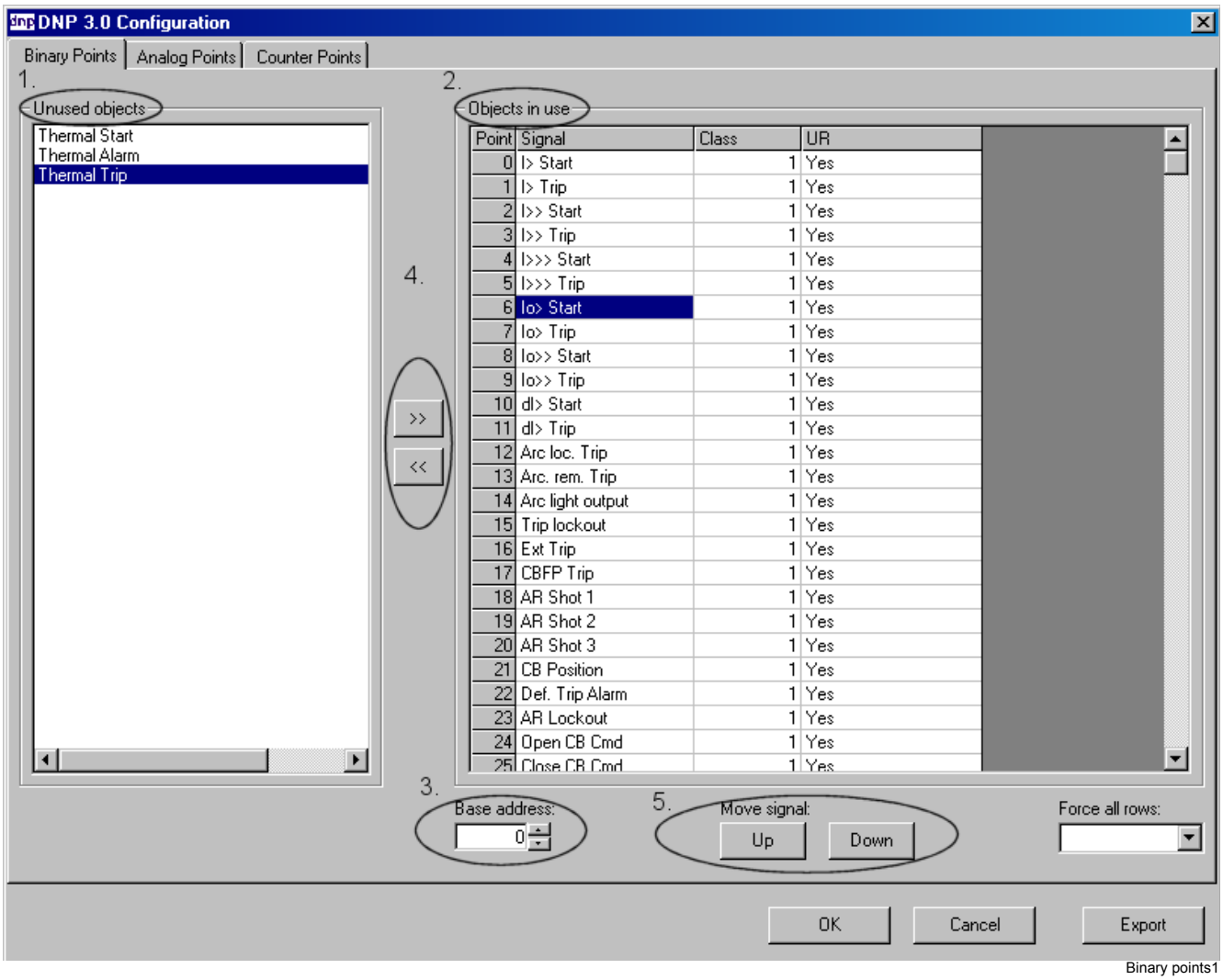


Fig. 12.3.2.1.-1 General editing features

DNP objects can be in use or not within a DNP object group. The left window shows the unused objects (1) and the right window the used objects (2), (see Fig. 12.3.2.1.-1).

Objects located in the "Objects in use" window are automatically sorted in a contiguous addressing order within the DNP object group in question. It is possible to affect only the Base address (3) of the points within the object group. If the base address is changed, the addresses of all the following DNP points will be changed accordingly.

Objects can be taken into use or out of use by moving them between the "Objects in use" and "Unused Objects" windows by selecting them and clicking the Append >> or Remove << button (4). Note that it is possible to select several objects at a time.

To select several objects you can:

- Press Ctrl and paint all the objects to be moved
- Click the right mouse-button and choose Select All
- Click Point in the "Objects in use" window

Objects which are moved to the "Objects in use" window are always appended to the end of the current point list. It is possible to remap the order of these objects by selecting an object to be moved and then clicking the Up and Down buttons (5).

12.3.2.2. Class and UR flag

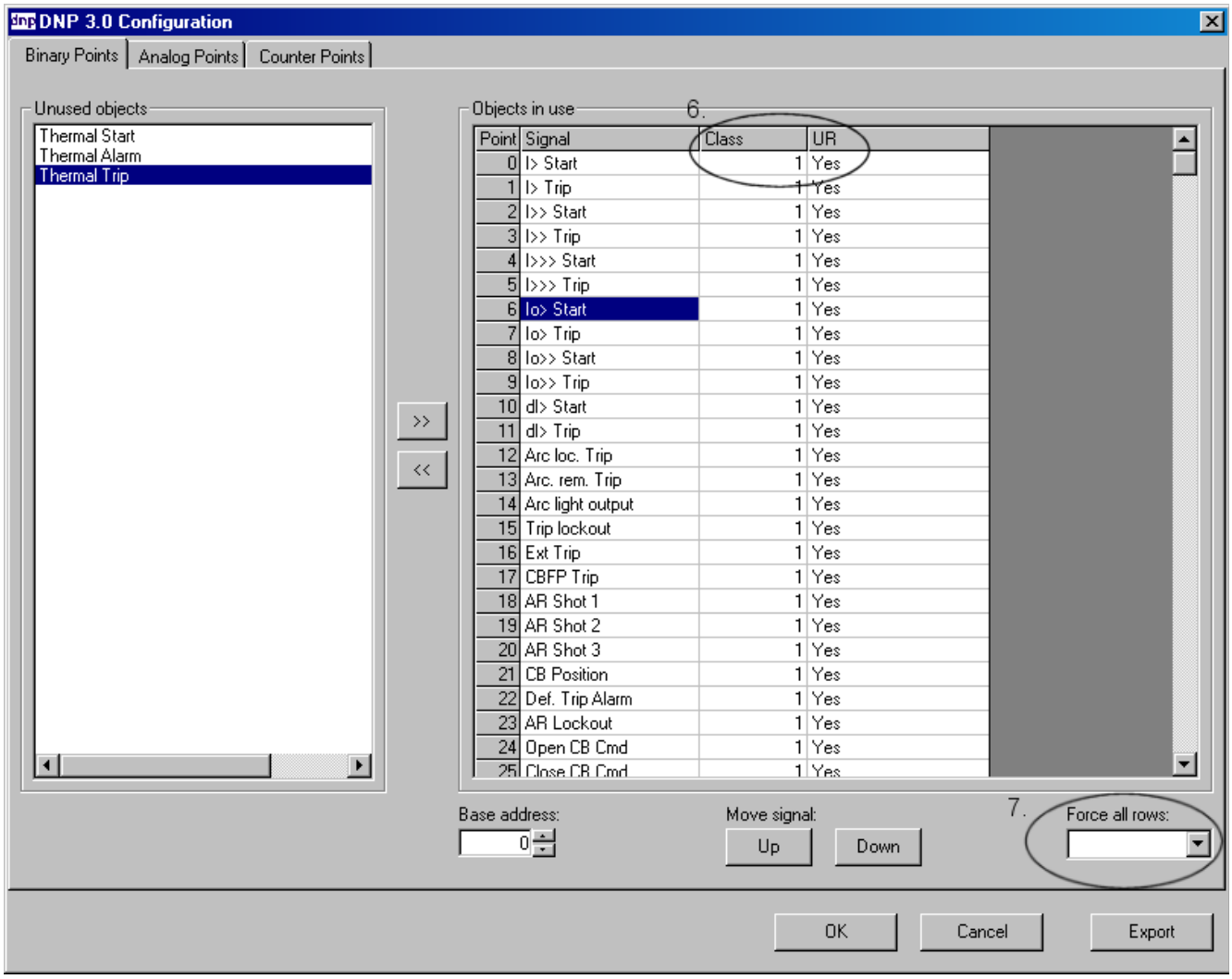


Fig. 12.3.2.2.-1 More general editing features

If an object is taken "into use", it means that it exists at least as a DNP static object (Class 0) on the DNP interface. In addition, if the object's class cell contains a DNP class number 1, 2 or 3, it means that it *also* exists as an event object in the DNP event class in question. The DNP class of a specific object can be changed by double-clicking on the Class cell (6), (see Fig. 12.3.2.2.-1).

With the UR (Unsolicited Reporting) flag it is possible to disable spontaneous event transfer from a specific DNP object even if the Class to which it belongs is enabled for unsolicited reporting. Note that the DNP unsolicited reporting mode is generally enabled for the relay by the DNP parameter 503V024. The UR flag can be toggled for specific objects by clicking on the UR Flag cell (6).

The class numbers and the UR flags within a whole object group can be set to common values by using the "Force all rows" feature (7).

12.3.2.3. Additional columns for analog points

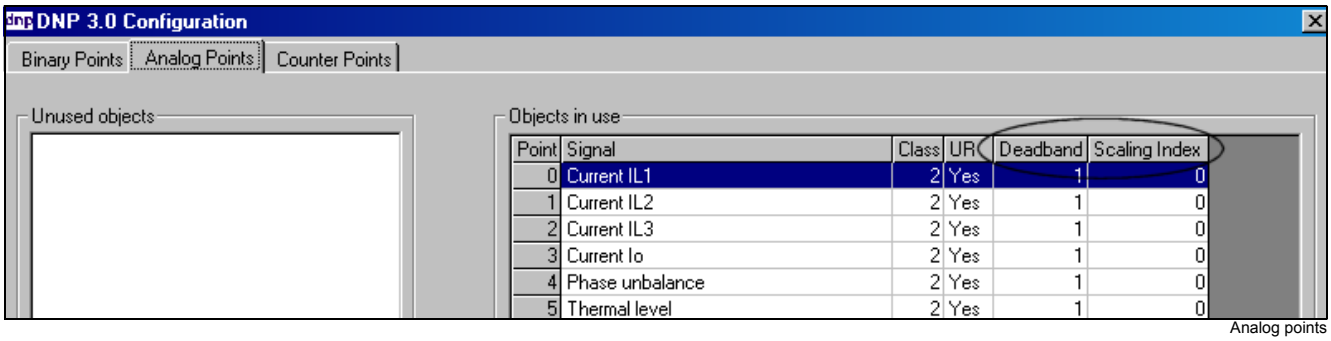


Fig. 12.3.2.3.-1 Additional editing features for analog points

Deadband

If event transfer is defined for an analog object, it is necessary to define a deadband value for the event reporting. The deadband value is always defined in units of the original DNP analog value (Not in units of the scaled analog value, if scaling is in use. See the next section). The Deadband range is 0-255. The original DNP value representations for analog objects are listed in the relay's Technical Reference Manual.

Scaling index

The user can exchange the original (internal) DNP value scaling factor with an own definition. It is possible to define up to 5 scaling factors in the DNP Profile parameters tab. The scaling of a DNP analog object should then be configured with a scaling index to the scaling factor (F503V101...105) in question. If the scaling index is set to 0 or outside the range (1-5), it means that the original (internal) scaling factor is used for the object in question.

12.3.2.4. Additional columns for counter points

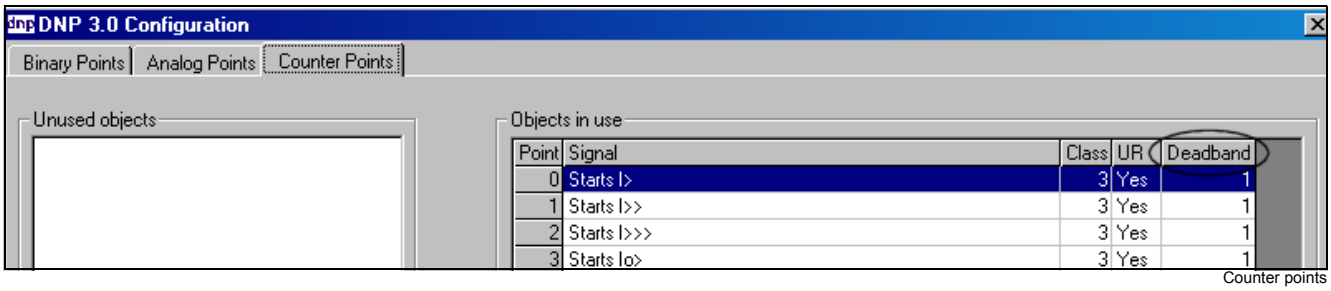


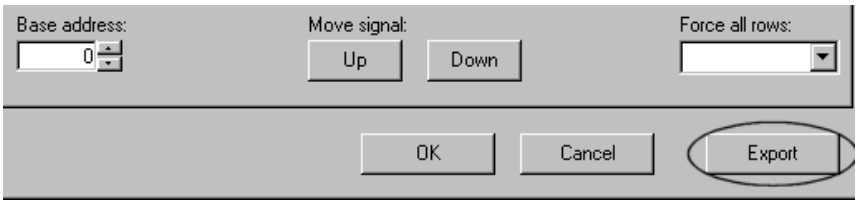
Fig. 12.3.2.4.-1 Additional editing feature for counter points

Deadband

This column defines deadband (in this case counts) for the counter objects' event transfer. The Deadband range is 0-255.

12.3.3. Export function

It is possible to export the whole DNP object list either into a HTML or text (.txt) format for documentation purposes. This can be done by clicking the Export button (see Fig. 12.3.3.-1). You can choose if you want to save the edited DNP object list into a HTML format (short list) or into a more detailed .txt (tab delimited) text format, which can be imported e.g. into a Word or Excel file.

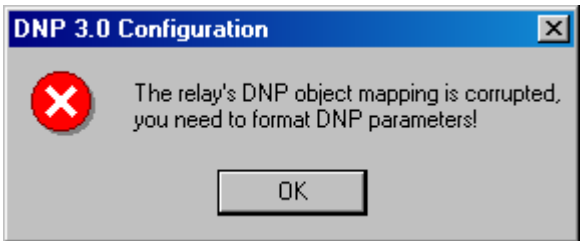


Export

Fig. 12.3.3.-1 Export function

12.3.4. Exceptions

When entering the DNP configuration dialog, the initial DNP point configuration data is checked by the tool. If the configuration data contains anomalies or is in any other way corrupt, the following message will be shown:



Exception message

Fig. 12.3.4.-1 Exception message

In this case the DNP point configuration can only be restored by formatting the DNP parameters in the relay.

Note: DNP point configuration can never be corrupt, if it has been altered and stored to the relay by using this tool.

12.3.5. Exiting the dialog

The OK button exits the dialog. It is also possible to cancel the editing that has been done (using the Cancel button). In this case the DNP point configuration data will be returned to the value it was before entering the dialog.

After exiting the dialog, the parameters in the DNP point tabs have been changed accordingly. Thereafter, downloading of the parameters to the relay follows the normal tool routines.

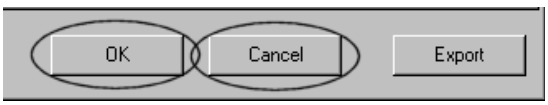


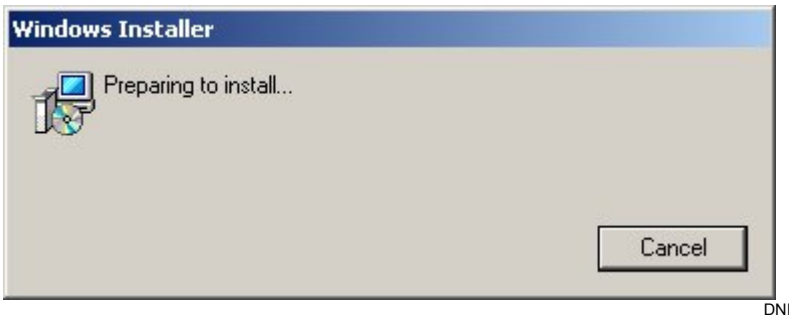
Fig. 12.3.5.-1 Exiting the dialog

13. Troubleshooting

This chapter provides information that aims to help your recovering from problems that you may have encountered during the usage of relay and terminal tools.

13.1. Windows Installer appears when a program is started

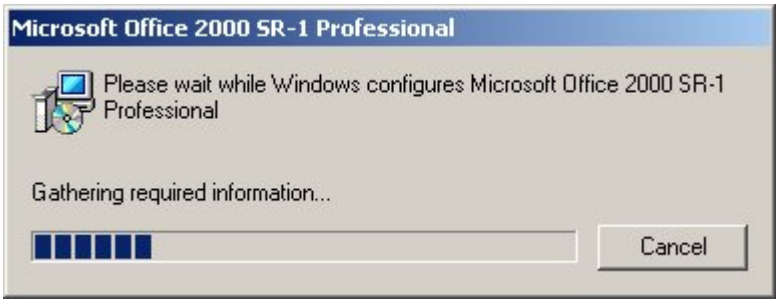
If you have the Microsoft Office installed, but have never started any Office program as the same logon user you are currently running CAP, SMS or LIB, the following happens: when you start the DNP 3.0 configuration dialog from the RED Relay Setting Tool (or any other Visual BASIC application), the Windows Installer appears:



DNP 3.0 Configuration Setup1

Fig. 13.1.-1 Windows Installer appears

After that the Microsoft Office setup begins and goes forward depending on the currently installed version. The following dialogs might be shown:



DNP 3.0 Configuration Setup2

Fig. 13.1.-2 Microsoft Office setup begins

DNP 3.0 Configuration Setup3

Fig. 13.1.-3 Microsoft Office setup goes forward

The need to run an initial setup for every user is a Microsoft Office feature. This can be solved by first cancelling the Microsoft Installer, and then just starting and closing Microsoft Word. That should prepare the current user for the Microsoft Office, and the CAP/SMS/LIB tool you tried to run should now start without problems.

13.2. Incorrect printouts

Printing from Visual SCIL based tools sometimes produces incorrect printouts. Black stripes may be added to the printout, or some images or texts are not printed at all.

Incorrect printouts are due to the "metafile spooling" option used in the current printer driver. This option should be disabled in the printer properties dialog. Different printer drivers may use different names for this "metafile spooling" feature; e.g. the term "advanced printer features" is used by some Hewlett-Packard drivers.

14. Index

D

E

F

G

H

I

O

P

Q

R

S

T

U

V

W

Y

Z

ABB Oy
Distribution Automation
P.O. Box 699
FI-65101 Vaasa
FINLAND
Tel. +358 10 22 11
Fax. +358 10 224 1094
www.abb.com/substationautomation

1MRS752008-MUM EN 2.2006