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## 10 REC 501



Figure 1. The REC 501 standard function.

### 10.1 REC 501 When Used via Opera

The network topology system OPERA can also use station pictures with disconnectors installed for operating purposes. This is convenient in case of multiple switching devices in a node (see Figure 2). Then a picture (a schematic connection diagram) can be opened via Opera and the actual REC 501 control dialogs are opened by selecting them from the station picture.

In case of a single switching device, it is often more suitable to open the plain control dialog on an empty picture. Then it is not even necessary to make any schematic connection diagram, instead the operation dialog is presented directly. This is done by creating a picture consisting of a single picture function made specially for this purpose.

The picture function consists of a grey background covering the whole picture and of the configuration support (the base picture function is not required). The configuration is done as for the normal picture function for REC 501. When the disconnector is selected on the Opera display, the picture with the switching device is opened with the control dialog already open, ready to be executed.

The picture functions are found under \LIB4\LIB510\Network Topology\ in the installation tool tree. The configuration of the picture function is done as for the normal picture function.

#### 10.1.1 Differences Compared to an Ordinary REC 501

- The picture function has no state indication since it is not presented as a button.
- During configuration the questions regarding the outlook and symbol are left out.
- The Base function is not required
- The dialogs are the same, only picture function and its configuration files are different

Files used for picture function:

Picture	Functionality
FPI_LD501.PIC	REC 501 Line disconnector picture function
FPI_LD501.DAT	REC 501 Line disconnector data file
FPI_LD501.POT	REC 501 Line disconnector Process object data file

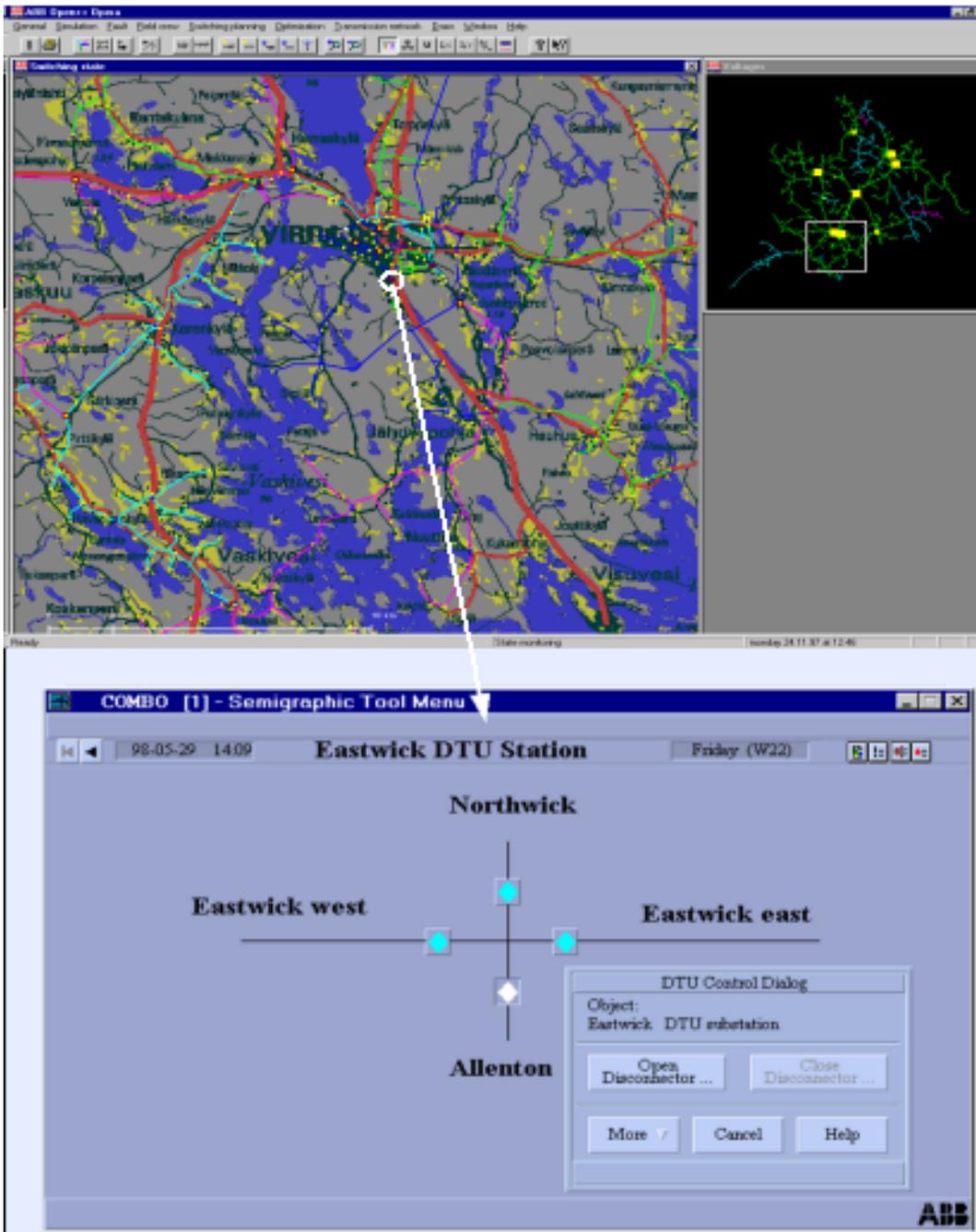


Figure 2. An example of a remotely controllable disconnector substation opened from OPERA

## 10.2

### Description

The standard function of the REC 501 is used for controlling and monitoring the REC 501 unit. The main functionality is as listed below:

- Position indication
- Operation
- Status information

The position indication of the switching device is indicated by different symbols while the status is normally shown by different colors. In addition to the color coding, the abnormal status is indicated in an information message in dialogs.

The REC 501 has the following sub-functionality:

- Alarm state/Acknowledgment
- Blocking/deblocking of update, control, alarm, event, printout and reprocessing within the database.
- Forced operation
- Normal state setting of the position indication
- Operation counting
- Object messages
- Update process data
- Internal parameters
- Binary inputs
- Clock synchronization
- Program versions
- Simulation
- Relay tool (depending on configuration)
- Station authority (depending on configuration)

## 10.3

### Features/Options

- Selectable size of the standard function (1x1, 2x2 or 3x3)
- Free choice of the symbol sets for presentation of the switching device
- Motorized/ manually operable
- Picture function presented with or without a push button
- Versatile configuration
- A large amount of predefined information messages
- Help in all dialogs

## 10.4 Process Commands

- Open/close commands to the switching device
- Reset pulse counter
- Reset operation counter
- Reset minimum battery voltage
- Battery test
- Heating set-point

## 10.5 REC 501 Dialogs

This Chapter describes the dialogs of the MV Process REC 501. These dialogs are found in the directory /LIB4/FMOD/MVPROCESS/USE and they can be opened by clicking the REC 501 picture function or from the control dialogs.

The REC 501 dialog is used for monitoring and controlling the REC 501 objects.

### 10.5.1 Object Presentation

The current state is indicated by different symbols. The color of the symbol gives additional information about the status. Please refer to the General chapter in this MV Process Operator's Manual regarding the color and the corresponding status.

### 10.5.2 Functionality

Operations can be made, if the authorization level of the operator is Control (1) or higher and the object state allows controls. If operations can be made, the button Open 'switching device' or Close 'switching device' will be active.

The dialog shows messages of the object state on the information bar. Only the most important message is shown, but all active messages can be seen in the dialog Object messages which can be selected after clicking the More... button. Active messages can be seen in the dialog Object messages, and more detailed explanations of their meaning can be found in Help.

When Open 'switching device' or Close 'switching device' is selected, the selection command is sent to the REC 501 unit. If selection is successful, the final execution or cancellation can be done in the opening confirmation dialog. In case of errors, e.g. in communication, the SCIL error code is shown. The actual meaning of the code can be found in the system documentation.

If process objects are not connected to the process, the dialog simulates the actual operation within the MicroSCADA database.

Access to other supported features is made available by the More... button. Help on each sub-dialog is found by clicking the Help button in the sub-dialog .

### 10.5.3 REC 501 Main Control Dialog



Figure 3. The REC 501 control dialog

The object identification text (OI) of the selected object is shown on the upper part of the dialog.

**Table 1 The dialog buttons have the following functionality:**

Button	Functionality
Open disconnecter	If the REC 501 is connected to a real process, this button sends open selection command to control unit and displays control action acknowledgment dialog shown later on in Figure 5. If there is no connection to a real process, this dialog simulates control selection.
Close disconnecter	If the REC 501 is connected to a real process, this button sends close selection command to control unit and displays control action acknowledgment dialog shown later on in Figure 5. If there is no connection to a real process, this dialog simulates control selection.
More	Opens the subfunctionality
Cancel	Erases the dialog and its sub-dialogs.
Help	Opens the general LIB 500 help dialog with the help text FPU_C501A.HLP.

### More... Menu

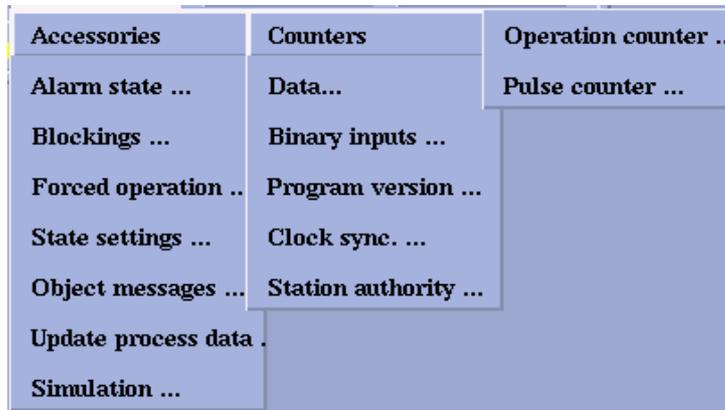


Figure 4. The REC 501 dialog offers a More... menu with several sub-functions

### 10.5.4 Control Confirmation Dialog

Figure 5 presents the control confirmation dialog which is opened in the main control dialog of REC 501. The function of this dialog is to confirm the selected action before executing it, i.e. before performing the second step of the secured control.

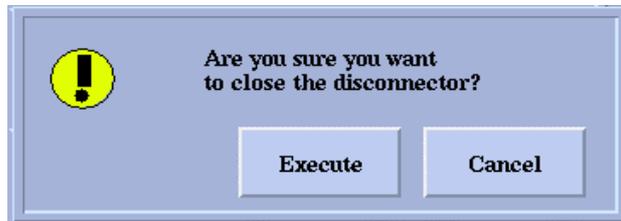


Figure 5. REC 501 control confirmation dialog (FPU\_C501B.PIC)

The operation to be carried out is described in the dialog for the user to verify it.

**Table 2 The dialog buttons have the following functionality:**

Button	Functionality
Execute	Executes selected command. In case of simulated process, the change in the database is simulated.
Cancel	Deselects the object and closes the dialog.

### 10.5.5 Alarm State Dialog

The alarm state dialog can be opened by selecting Alarm state... which can be found by clicking the More button in the main control dialog.

The dialog presents all persisting or fleeting alarms for the device (REC 501), and the unacknowledged alarms can be acknowledged. For details, please refer to the General chapter in this MV Process Operator's Manual, which contains more detailed information about the Alarm state dialog.

### 10.5.6 Blockings Dialog

The blocking dialog can be opened by selecting Blockings... which can be found by clicking the More button in the main control dialog.

The REC 501 blockings dialog is for making blockings within the selected REC 501 object in MicroSCADA/SCS database. For details, please refer to the General chapter in this MV Process Operator's Manual, which contains more detailed information about the Blockings dialog.

### 10.5.7 Forced Operation Dialog

The forced operation dialog can be opened by selecting Forced operation... which can be found by clicking the More button in the main control dialog.

The Forced operation dialog enables controls to both operation directions regardless of the object state indication. If normal operations are possible, forced operations are possible, too. In addition to this, the operations can be tried even if:

- The REC 501 is already under command
- The REC 501 is selected on another monitor
- The REC 501 is interlocked/blocked
- The REC 501 indication object(s) is not sampled
- The bay is in local state
- The bay interlocking objects are not sampled
- The bay local/remote object is not sampled

Operations are prevented if:

- The REC 501 is control blocked
- The REC 501 is externally control blocked
- The REC 501 process objects are not in correct switch states (discrepancy in indication or command objects)
- Station local/remote switch is not sampled or does not allow controls.
- The control authority for the station is not given for this application
- The personal authority level of the user is View (0)

## Functionality

Operations can be made, if the REC 501 is remotely controllable, the authorization level of the operator is Control (1) or higher and the REC 501 state allows controls. If operations can be made, the buttons Force 'switching device' open and Force 'switching device' closed will be active.

When Force 'switching device' open or Force 'switching device' closed is clicked, the selection command is sent to the control unit. If selection is successful, the final execution or cancellation can be made in the opening confirmation dialog. In case of errors, e.g. in communication, the SCIL error code is shown. The actual meaning of the code can be found in the system documentation.

If the REC 501 process objects are not connected to the process, the dialog simulates the actual operation within the MicroSCADA database.

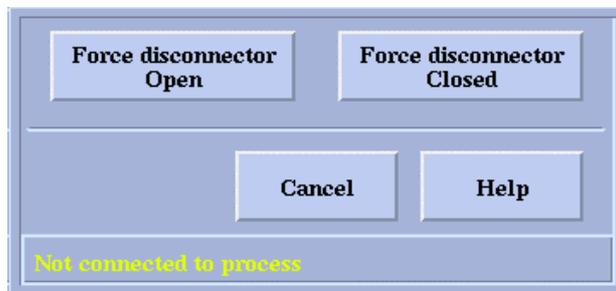


Figure 6. REC 501 forced operation dialog (FPU\_C501C.PIC)

The operation to be carried out is described in the dialog for the user to verify it.

**Table 3 The dialog buttons have the following functionality:**

Button	Functionality
Force disconnecter Open	If the REC 501 is connected to a real process, this button sends open command to control unit and displays control action acknowledgement dialog shown earlier in Figure 5. If there is no connection to a real process, this dialog simulates control selection.
Force disconnecter Closed	If the REC 501 is connected to real process, this button sends close command to control unit and displays control action acknowledgement dialog shown earlier in Figure 5. If there is no connection to a real process, this dialog simulates control selection.
Cancel	Closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C501C.HLP.

### 10.5.8 Normal State Settings Dialog

The normal state settings dialog can be opened by selecting State settings... which can be found by clicking the More button in the main control dialog.

The normal value has a meaning only, if all spontaneous object state changes are defined to activate an alarm (= the LA attribute value of the indication object is 15).

The value of normal state is checked at system start-up. If the state of the object at start-up is not equal to normal state, an alarm is activated. If normal state is not defined, an alarm is not activated at start-up regardless of the object state.

For details, please refer to the General chapter Normal state settings dialog (in this MV Process Operator's Manual) which contains more detailed information.

### 10.5.9 Operation Counter Dialog

The operation counter dialog can be opened by selecting Accessories/Counters/Operation counter ... which can be found by clicking the More button in the main control dialog.

The number of the REC 501 object state changes is tracked with the operation counter. The counter is increased with one every time the object is closed.

#### Functionality

Operations can be made, if the authorization level of the operator is Control (1) or higher. The counter can be reset by the Reset button. The operation is confirmed or cancelled in the opening information dialog. Figure 7 presents the REC 501 operation counter dialog.

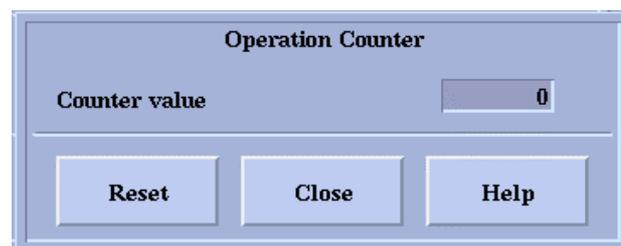


Figure 7. REC 501 operation counter dialog (FPU\_C501H.PIC)

**Table 4 The dialog buttons have the following functionality:**

Button	Functionality
Reset	Resets operation counter value of the selected object.
OK	Closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C501H.HLP.

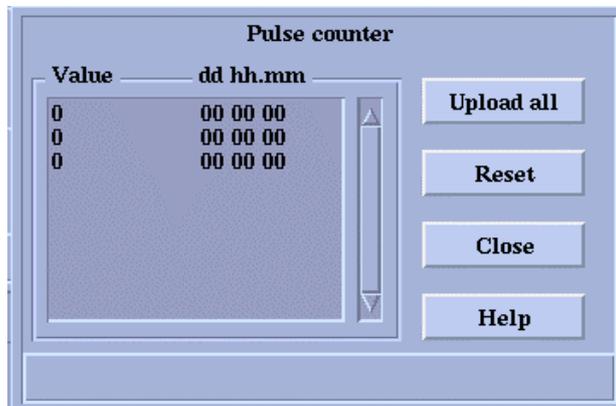
**10.5.10 Pulse Counter Dialog**

The pulse counter dialog can be opened by selecting Accessories/Counters/Pulse counter ... which can be found by clicking the More button in the main control dialog.

The three last recorded period counter values are read in when the pulse counter dialog is opened. The values are presented in the list with the corresponding time stamp. The format of time stamp is day hours.minutes.

**Functionality**

Operations can be made, if the authorization level of the operator is Control (1) or higher. The counter can be reset by the Reset button. All recorded pulse counter values can be uploaded by the Upload all button. Operations are confirmed or cancelled in the opening information dialog.



*Figure 8. REC 501 pulse counter dialog (FPU\_C501L.PIC)*

**Table 5 The dialog buttons have the following functionality:**

Button	Functionality
Upload all	Uploads all registered pulse counter values.
Reset	Resets pulse counter values of selected object.
Close	Closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C501L.HLP.

**10.5.11****Object Messages Dialog**

The object messages dialog can be opened by selecting Object messages ... which can be found by clicking the More button in the main control dialog.

An overall picture of the REC 501 object state can be seen in the dialog. The dialog shows information messages active at the moment the dialog is opened. The most important active message is also shown on the information bar of the main dialog.

**Functionality**

A new "snapshot" can be shown by pressing Refresh. The dialog can be closed by pressing Close. If messages do not fit into one view, they can be viewed with the scrollbar. For details, please refer to the General chapter in this MV Process Operator's Manual, which contains more detailed information about the Object messages dialog.

**Information Messages**

Message	Explanation
NOT AUTHORIZED CONTROL CENTER	The control center is not included in the list of authorized control centers for the station. The currently authorized centers can be seen in a dialog which can be found in the picture header menus.
NOT AUTHORIZED TO CONTROL	The personal authority level of the user is View (0) only.
OCCUPIED	The control unit is already under command.
DISCREPANCY IN THE COMMAND OBJECTS	Command process objects are not all in the same switch state.
NOT CONNECTED TO PROCESS	The REC 501 has no connection to the actual process. The dialog is made to simulate the actual operation process.
OBJECT NOT CONTROLLABLE	The REC 501 state indication has a connection to the process, but the commands have not.
INDICATION NOT CONNECTED TO PROCESS	The REC 501 commands have a connection to the process, but the indication does not.
STATION LOCAL/REMOTE-SWITCH INHIBITS CONTROLS	Stations local/remote-switch state does not allow controls on the station.
STATION LOCAL/REMOTE-SWITCH NOT UPDATED	The station local/remote-switch is not updated from the process.
BAY IN LOCAL USE	The local/remote- switch in the control unit is in local state.
BAY LOCAL/REMOTE-SWITCH NOT UPDATED	The bay local/remote-switch is not updated from the control unit.
CONTROL BLOCKED	The control of the REC 501 is blocked (UB=1). The blockings can be set with the Blockings dialog.
CLOSE DISABLED BY CONTROL DEVICE	Closing of the switching device is disabled by the control unit.

INTERLOCKING OBJECTS NOT UPDATED	One or more of the REC 501 interlocking process objects has not been updated from the process.
INTERLOCKED BY CONTROL APPLICATION	The REC 501 operations are disabled by the interlocking code made in the REC 501 picture function (in U_INTERLOCKING program).
CLOSE DISABLED BY CONTROL APPLICATION	Closing the object is disabled by the interlocking code made in the REC 501 picture function (in U_INTERLOCKING program).
OPEN DISABLED BY CONTROL APPLICATION	Opening the object is disabled by the interlocking code made in the REC 501 picture function (in U_INTERLOCKING program).
SELECTED ON ANOTHER MONITOR	The same REC 501 object has been selected and the control dialog is open on another monitor.
CONTROL APPLICATION INTERLOCKING OUT OF USE	The interlocking checking code of the REC 501 picture function (in U_INTERLOCKING program) is out of use.
REC 501 INDICATION(S) NOT UPDATED	The indication(s) of the REC 501 has not been updated from the process.
UPDATE BLOCKED	The indication of the REC 501 is blocked (UB=1). The blockings can be set with the Blockings dialog.
ALARM BLOCKED	The alarms of the REC 501 is blocked (AB=1). The blockings can be set with the Blockings dialog.
EVENT BLOCKED	The events of the REC 501 is blocked (HB=1). The blockings can be set with the Blockings dialog.
PRINTOUT BLOCKED	The printouts of the REC 501 is blocked (PB=1). The blockings can be set with the Blockings dialog.
REPROCESSING BLOCKED	The event activation (reprocessing) of the REC 501 is blocked (XB=1). The blockings can be set with the Blockings dialog.
OPERATION COUNTER LIMIT EXCEEDED	Operation counter limit has been exceeded. See the Operation Counter dialog for further information.

## 10.5.12

### Position Simulation Dialog

The position simulation dialog can be opened by selecting Simulation... which can be found by clicking the More button in the main control dialog.

During some communication problems or field device failure, the position of the switching device is not automatically known by the system. This dialog has been designed for operators to maintain the consistency of the database in case of an abnormal situation .

For details, please refer to the General chapter in this MV Process Operator's Manual Position simulation dialog which contains more detailed information.

### 10.5.13 Data Dialog

The data dialog can be opened by selecting Accessories/Data... which can be found by clicking the More button in the main control dialog.

Some general settings can be done via data dialog such as setting the heating limit and resetting minimum battery voltage. It is also possible to start the battery test. The dialog indicates the current state of battery voltage, minimum battery voltage, auxiliary supply, heating and temperature.

#### Functionality

Operations can be made, if the authorization level of the operator is Control (1) or higher.

Heating limit is set by clicking the heating limit field and entering the new value between -25 - +15 degrees of Celsius. The minimum battery voltage is reset by the Reset U(min) button.

By pressing the Battery test button, the battery condition monitoring test is started. If battery voltage drops under 22 V during the test, a notification is shown on the data dialogs information bar and an alarm is activated (only if the state of the process object monitoring the battery voltage at testing changes). The battery test will take a couple of seconds. Each operation is confirmed or cancelled in the opening information dialog.

The screenshot shows a software interface titled "Data Dialog" with a light blue background. It is organized into three main sections: "Batteries", "Heating", and "Settings".

- Batteries section:** Contains three input fields: "Aux. supply" with a dropdown menu set to "ON", "U" with a numeric input field set to "28.0" and a "V" unit label, and "U(Min)" with a numeric input field set to "24.0". To the right of these fields are three buttons: "Close", "Reset U(min)", and "Battery test".
- Heating section:** Contains two input fields: "Heating" with a dropdown menu set to "OFF", and "Temperature" with a numeric input field set to "24.0" and a "°C" unit label. To the right of these fields is a "Help" button.
- Settings section:** Contains one input field: "Heating limit" with a numeric input field set to "10" and a "°C" unit label.

At the bottom of the dialog, there is a wide, empty rectangular box.

Figure 9. Data dialog (FPU\_C5011.PIC)

**Table 6 The dialog buttons have the following functionality:**

Button	Functionality
Reset U(min)	Resets the minimum battery voltage
Battery test	Starts battery test
Close	Closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C5011.HLP.

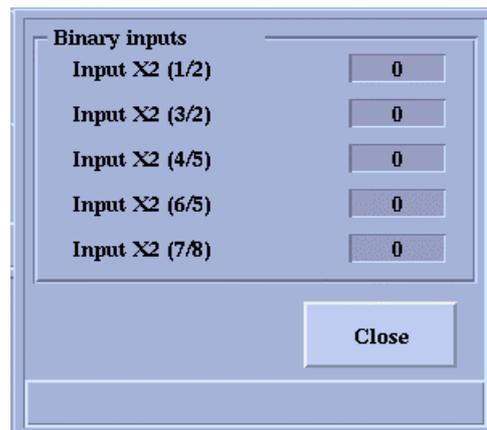
**10.5.14**

**Binary Inputs Dialog**

The Binary inputs dialog can be opened by selecting Accessories/Binary inputs... which can be by clicking the More button in the main control dialog.

The state of the free configurable binary inputs are presented in the binary inputs dialog. The identification text for each binary input is configurable. Defining the texts is explained in more detail in paragraph 8.5.4. If there is no field text defined, the default texts are taken in use. The default texts are:

Input X2 (1/2), X2 (3/2), X2 (4/5), X2 (6/5), X2 (7/8).



*Figure 10. Binary inputs dialog (FPU\_C501J.PIC)*

**Table 7 The dialog buttons have the following functionality:**

Button	Functionality
Close	Closes the dialog.

**10.5.15**

**Clock Synchronization Dialog**

The clock synchronization dialog can be opened by selecting Accessories/Clock sync ... which can be found by clicking the More button in the main control dialog .

A common dialog for clock synchronization of the REC 501 units. The station number of the selected object is represented in parentheses.

Execution time is the point of time when the synchronization procedure is executed. Synchronization is made in a cycle defined by the time interval drop-down list box. Time interval notifies how often the synchronization is done, i.e. if the interval is 24 hours, the operation is done once a day.

The list of stations belonging to the time synchronization is written into the file 'apl/pict/fpu\_c501s.txt.

Execution time and time interval are the same for all stations included in time synchronization by this dialog!

## Functionality

Operations can be made, if the authorization level of the operator is Control (1) or higher.

The selected REC 501 station is included in (or removed from) the time synchronization with the toggle button at the upper left corner of the dialog. Execution time is entered in the field in the format hh:mm. If the format is not correct, the old value is returned and an information message of a non-valid time appears to the information bar of the dialog.

Time interval is selected from the combo-box. 12 and 24 hour intervals are available. Operations are applied by the OK button. By pressing the Cancel button the dialog is closed without making any changes.

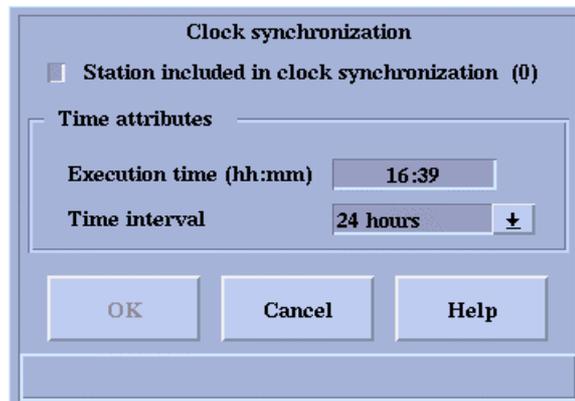


Figure 11. Clock synchronization dialog (FPU\_C501N.PIC)

**Table 8 The dialog buttons have the following functionality:**

Button	Functionality
Toggle button	Adds or removes station to/from clock synchronization
OK	Applies changes and closes dialog
Cancel	Discards changes, if any have been made, and closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C501N.HLP.

**Table 9** The dialog field has the following functionality:

Field	Functionality
Execution time (hh:mm)	Defines the starting point of cyclical clock synchronization

**Table 10** The dialog combo-box has the following functionality:

Drop-down list box	Functionality
Time interval	Defines the time interval of the clock synchronization

### 10.5.16

#### Program Versions Dialog

The program versions dialog can be opened by selecting Accessories/Program versions ... which can be found by clicking the More button in the main control dialog.

Program versions dialog is for viewing the current program versions of the power supply and charger unit (PSC3) and the modem module (MOD). The version identification is read from REC 501 and represented in the fields.

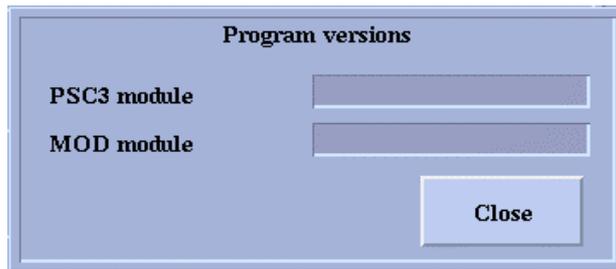


Figure 12. Program versions dialog (FPU\_C501T.PIC)

**Table 11** The dialog button have the following functionality:

Button	Functionality
Close	Closes the dialog.

### 10.5.17

#### Station Authority Dialog

The Station authority dialog can be opened by selecting Accessories/Station authority ... which can be found by clicking the More button in the main control dialog.

The dialog is for defining the control centers having the control authority for the REC 501 station. Access to this dialog depends on the configuration of the picture function. If the REC 501 picture function is configured to work as a stand-alone (station), this dialog can be entered. By default, authorized control center is the one where the picture function was installed.

**Functionality**

Operations can be made, if the authorization level of the operator is Control (1) or higher and the command source (=application name) is included in the authorized centers list. If the operator is logged in as the system manager, the command source does not have to be an authorized center.

The command sources found in the system are shown on the list of Control centers. The currently authorized centers are shown on the list of Authorized centers. Command sources can be added into the list of Control centers by writing them to the field New center. This can be needed in case of control applications, where there are multiple base systems.

**NOTE!** The inserting of New centers is case sensitive.

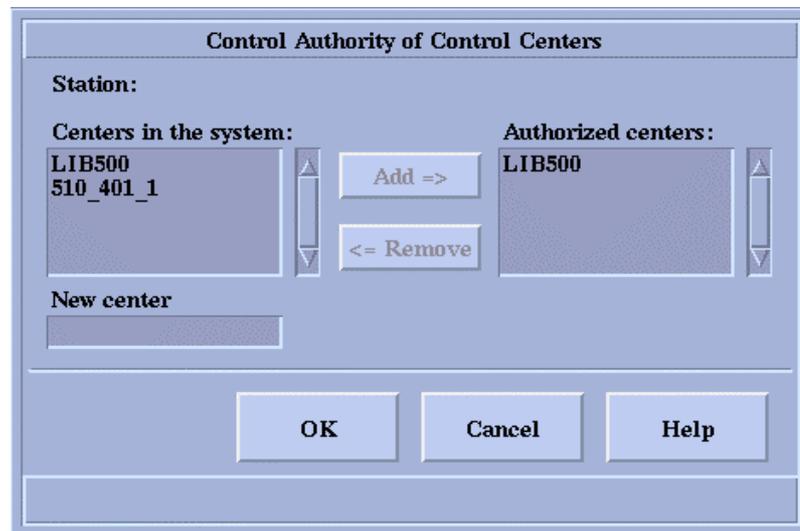


Figure 13. Station authority dialog (FPU\_C501U.PIC)

**Table 12** The dialog buttons have the following functionality:

Button	Functionality
Add =>	Adds center to the list of authorized centers
<= Remove	Removes center from the list of authorized centers
OK	Applies changes and closes the dialog.
Cancel	Discards changes, if any changes have been made, and closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C501U.HLP.

**Table 13** The dialog field have the following functionality:

Field	Functionality
New center	Adds center to the list Centers in system.

## 10.5.18 Relay Tool Dialog

The Relay tool dialog can be opened by selecting Accessories/Relay tool ... which can be found by clicking the More button in the main control dialog.

The showing of relay tool option is related to the configuration made in the relay picture function, namely the PF-PF connection part. More detailed instructions on how this is done are provided in the LIB 510 4.0.3 Operator's Manual (1MRS751281-MUM), SPA Relay Tool Operator's Manual.

Access to the relay setting tool is provided by this dialog. The selection list shows the picture function name as it has been given during the application engineering as well as the type designation of the relay (REC 501).

### Functionality

To open the Relay Setting tool for a certain relay, click the field on the list and press OK or just double-click the field.

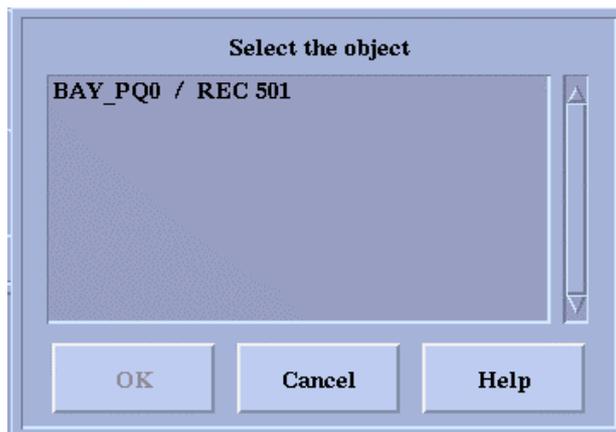


Figure 14. Relay tool dialog (FPU\_C501S.PIC)

**Table 14** The dialog buttons have the following functionality:

Button	Functionality
OK	Opens the Relay Setting Tool to selected relay.
Cancel	Closes the dialog.
Help	Opens the general LIB 500 help dialog with the help text file FPU_C501S.HLP.

**Table 15** The dialog list has the following functionality:

List	Functionality
	1. Selects a relay 2. Opens Relay Setting Tool by double-clicking the relay

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