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6 Transformer



Figure 1. Transformer and transformer measurement symbols

6.1 Description

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

- Operation
- Status information

The status indication of the transformer is shown by different colors. In addition to the color coding, the abnormal status is indicated in an information message in dialogs.

The transformer has the following subfunctionality:

- Alarm state/acknowledgement
- Blocking/deblocking of update, control, alarm, event, printout and reprocessing within the database.
- Operation counting
- Object messages
- Access to the relay configuration tool (optional)

6.2 Features/Options

- Selectable size of the standard function (2x2, 3x3, 4x4 or 5x5)
- Free choice of the symbol sets for presentation of the transformer
- Picture function presented with or without a push button
- Versatile configuration
- A large amount of predefined information messages
- Help in all dialogs

6.3 Process Commands

6.3.1 SPOC 1xx/RTU-200

- Auto/manual/raise/lower

6.3.2 SPAU 341

- Auto/manual/raise/lower/single/parallel/reference voltage

6.4 Transformer Dialogs

This chapter describes the dialogs of the MV Process transformer. These dialogs are found in the directory LIB4/FMOD/MVPROCESS/USE and they are opened by clicking the transformer picture function or the More... menu in the transformer main control dialog.

6.4.1 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.

6.4.2 Main Control Dialog for SPAU 341

The transformer main control dialog is aimed for monitoring and controlling the transformer.

Functionality

Operations can be made, if the authorization level of the operator is Control (1) or higher and the transformer state allows controls. Only the buttons for allowed operations are available to the user. Before the operation is carried out, the user has to verify the operation in a confirmation dialog.

The main control dialog shows messages of the transformer status on the information bar. Only the most important message is shown. However, all active messages can be seen in the dialog Object messages which can be found by 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.

The tap position is viewed in the field at the bottom right side of the dialog box. In the same dialog it is also possible to find information about the lowest possible tap position, the highest possible position and the current tap position.

The single/parallel setting is selected on the left side of the dialog box. If the regulators are hard-wired together, the master-slave principle is used and either the master or the slave mode can be selected from the drop-down list box.

If the connection is not hard-wired, the drop-down list box will only indicate, whether negative reactance- or minimizing circulating current principle is used (NRP/MCC).

If the single mode is used, manual or automatic control can be selected in the drop-down list box. The raise and lower 'arrow keys' are available if the regulator is in the manual mode.

The voltage value of the regulator is presented in the field. If the warning limit is exceeded, the value is shown in yellow, and if the alarm limit is exceeded, the value is shown in red.

The reference voltage field can be used for setting the reference voltage of the regulator. A new value can be entered if the parallel mode or the automatic control is selected first. The reference voltage is accepted only if it is between $0.85 \cdot 1.15 \cdot \text{Nominal voltage}$, otherwise an information message of an illegal reference voltage value is shown on the dialog information bar and the old value is returned into the field.

If the transformer object is not connected to the process, the dialog simulates actual operations within the MicroSCADA database.

Access to other supported features is made available by the More... button. Help for each subdialog is found by clicking the Help button in the subdialog.

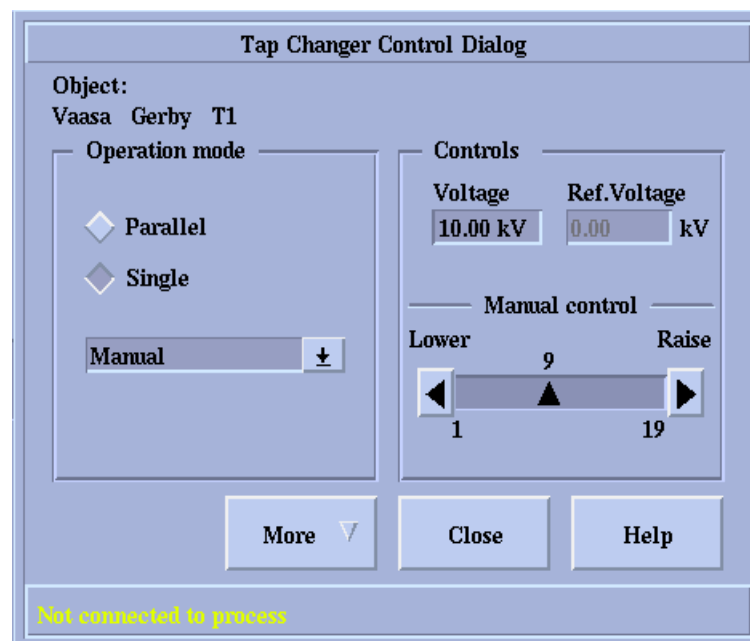


Figure 2. The main control dialog for the transformer controlled by SPAU 341 (FPU_TRA.PIC)

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

Table 1 The dialog buttons have the following functionality:

Button	Functionality
Parallel	This button displays the control action acknowledgement dialog shown later on in Figure 4. If the transformer is connected to a real process, the parallel command is sent to the control unit, (SPAU 341). If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
Single	This button displays the control action acknowledgement dialog shown later on in Figure 4. If the transformer is connected to a real process, the single command is sent to the control unit, (SPAU 341). If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
Raise	This button displays the control action acknowledgement dialog shown later on in Figure 4. If the transformer is connected to a real process, the raise command is sent to the control unit, (SPAU 341). If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
Lower	This button displays the control action acknowledgement dialog shown later on in Figure 4. If the transformer is connected to a real process, the lower command is sent to the control unit, (SPAU 341). If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
More	Opens selection list of the transformer subfunctionality.
Cancel	Closes the dialog and its subdialogs.
Help	Opens the general LIB 500 help dialog with the help text file FPU_SPAU.HLP.

Table 2 The drop-down list box has the following functionality:

Drop-down list box	Functionality
	<p>The drop-down list box has three different functionalities depending on the state of the regulator.</p> <ol style="list-style-type: none"> 1. Single <ul style="list-style-type: none"> -selections for manual and automatic 2. Parallel <ul style="list-style-type: none"> -Indication whether NRP or MCC is used 3. Parallel (master/slave) <ul style="list-style-type: none"> -selections for master and slave <p>If the transformer is connected to a real process, the selected command is sent to the control unit (SPAU 341). If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.</p>

6.4.3

Main Control Dialog for SPOC 1xx and RTU 200

The general functionality follows the same guidelines as the control dialog for SPAU 341, there are only less operations available for SPOC 1xx and RTU 200. The setting of automatic/manual mode is done by the option buttons. Raising and lowering the tap position is possible when the tap changer is in the automatic mode. Parallel operation is indicated in the field appearing on the left side of the control dialog box.

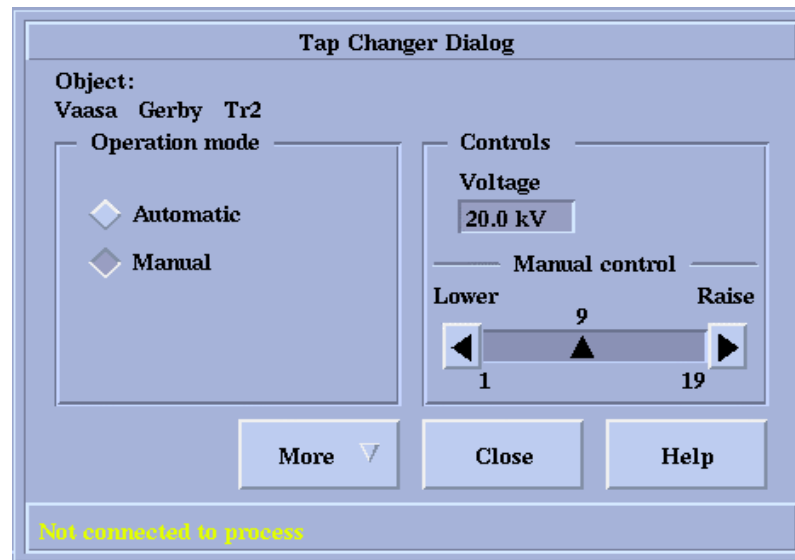


Figure 3. The main control dialog for the transformer controlled by SPOC 1xx/RTU-200 (FPU_TRB.PIC)

Table 3 The dialog buttons have the following functionality:

Button	Functionality
Automatic	This button displays the control action acknowledgement dialog which is shown in Figure 4. If the transformer is connected to a real process, the automatic command is sent to the control unit. If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
Manual	This button displays the control action acknowledgement dialog which is shown in Figure 4. If the transformer is connected to a real process, the manual command is sent to the control unit. If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
Raise	This button displays the control action acknowledgement dialog which is shown in Figure 4. If the transformer is connected to a real process, the raise command is sent to the control unit. If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
Lower	This button displays the control action acknowledgement dialog which is shown in Figure 4. If the transformer is connected to a real process, the lower command is sent to the control unit. If there is no connection to a real process, the dialog box simulates the operation within the MSCADA database.
More	Opens selection list of the transformer subfunctionality.
Cancel	Closes the dialog and its subdialogs.
Help	Opens the general LIB 500 help dialog with the help text file FPU_SPOC.HLP.

6.4.4 Control Confirmation Dialog

Figure 4 presents the control confirmation dialog which is opened in the main control dialog of the transformer. The function of this dialog is to confirm the selected action before executing it. The text in the dialog depends on the action to be performed.

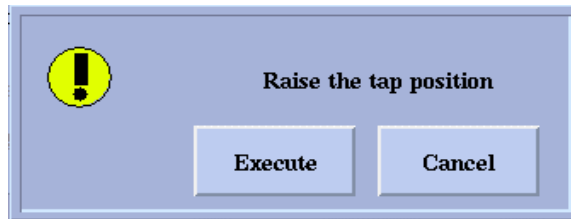


Figure 4. Transformer control confirmation dialog (FPU_TRC.PIC)

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

Table 4 The dialog buttons have the following functionality:

Button	Functionality
Execute	Executes the selected command. In case of a simulated process, the change in the database are simulated.
Cancel	Closes the dialog.

6.4.5 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 (transformer) 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.

6.4.6 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 transformer blockings dialog is for making blockings within the selected transformer 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.

6.4.7 Operation Countings Dialog

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

The number of tap position state changes is tracked with the help of the operation countings. The counter is increased with one every time the tap position changes. When the counter limit is exceeded, an alarm is activated.

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

6.4.8 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 transformer 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
SELECTED ON ANOTHER MONITOR	The same object has been selected and the control dialog is open on another monitor.
STATION L/R SWITCH MISSING	The database object for the station local/remote- switch does not exist (or there is a configuration error).
BAY L/R SWITCH MISSING	The database object for the bay local/remote-switch does not exist (or there is a configuration error).
NOT AUTHORIZED TO CONTROL	The personal authority level of the user is View (0) only.
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 the dialog named Control Authority of Control Centers, which pops up after selecting the option Station Authority in the Stations menu.
STATION LOCAL/REMOTE-SWITCH INHIBITS CONTROLS	Station local/remote-switch state does not allow controls on the station.
BAY IN LOCAL USE ONLY	The local/remote- switch in the control unit is in local state.
STATION LOCAL/REMOTE-SWITCH NOT UPDATED	The station local/remote-switch is not updated from the process.

BAY LOCAL/REMOTE-SWITCH NOT UPDATED	The bay local/remote-switch is not updated from the control unit.
VALUES SUBSTITUTED BY CONTROL DEVICE	The control device has substituted actual information from process with another values i.e. it is in the simulation mode.
NOT CONNECTED TO PROCESS	The transformer has no connection to the actual process. The dialog is made to simulate the actual operation process.
TAP POSITION VALUE OVERFLOW	There is an overflow in tap position value and it is unreliable.
TAP POSITION OBJECT NOT SAMPLED	The indication has not been updated from the process.
TAP POSITION VALUE OBSOLETE	The tap position object has an obsolete value.
TAP POSITION VALUE INVALID	The tap position value is invalid i.e. it unreliable due to the malfunction of the control device.
AUTO/MANUAL OBJECT NOT SAMPLED	The indication has not been updated from the process.
AUTO/MANUAL VALUE INVALID	The auto/manual value is invalid i.e. it is unreliable due to the malfunction of the control device.
AUTO/MANUAL VALUE OBSOLETE	The auto/manual object has an obsolete value.
AUTO/MANUAL OBJECT IN FAULTY POSITION	The auto/manual object is in faulty (11) position.
AUTO/MANUAL OBJECT IN MIDDLE POSITION	The auto/manual object is in middle (00) position.
VOLTAGE VALUE OVERFLOW	There is an overflow in voltage value and therefore it is unreliable.
VOLTAGE OBJECT NOT SAMPLED	The indication has not been updated from the process.
VOLTAGE VALUE INVALID	The voltage value is invalid i.e. it is unreliable due to the malfunction of the control device.
VOLTAGE VALUE OBSOLETE	The voltage object has an obsolete value.
BLOCKED	The operations are blocked by the device.
CONTROL BLOCKED	The control of the transformer is blocked (UB=1). The blockings can be set with the Blockings dialog.
SIGNALS BLOCKED BY CONTROL DEVICE	The control device has blocked its signals.
UPDATE BLOCKED	The indication of the transformer is blocked (UB=1). The blockings can be set with the Blockings dialog.
ALARM BLOCKED	The alarms of the transformer is blocked (AB=1). The blockings can be set with the Blockings dialog.
HISTORY BLOCKED	The events of the transformer is blocked (HB=1). The blockings can be set with the Blockings dialog.
PRINTOUT BLOCKED	The printouts of the transformer is blocked (PB=1). The blockings can be set with the Blockings dialog.
REPROCESSING BLOCKED	The event activation (reprocessing) of the transformer 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 Countings dialog for further information.
SINGLE PARALLEL OBJECT NOT SAMPLED	The indication has not been updated from the process.
PARALLEL OPERATION FAILED	Regulator is tried to set to parallel operation, but for some reason the operation is failed.
ISSUING THE PARALLEL OPERATION	Regulator is trying to reach the parallel mode

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