Control with the Function keys

Every SIPROTEC 4 device has 4 function keys located on the front. These function keys are freely programmable. The function keys are typically used to switch device functions on and off.

Application description
Control a circuit breaker (CB) using 2-pole CLOSE and 1-pole TRIP commands
by means of the function keys.

F1 ==> CLOSE

F2 ==> TRIP

Indicate the circuit breaker command, OPEN or CLOSE on LEDs.

Picture 1 : The function keys

Initially settings in the input/output matrix must be applied. Only one type of user defined annunciation can be allocated to the function keys: the internal single-point annunciation (IntSP). This type of annunciation registers the state change when the function key is pressed, so that the function key operation can be processed properly by the CFC logic.

For the sake of clarity, a new, user defined group is created in the input/output matrix (e.g. F-key-switching). Function key F1 will be assigned for closing and function key F2 for opening (trip). These annunciations must be routed to CFC, where a CFC logic will generate the new command (*Q0 F key*; information type : command without feedback, 2 pole on, 1 pole off). This command is routed to the output contacts 1, 2 and 3 which are used to control the circuit breaker (shown in picture 2).

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		Information			Source			Destination							
	No.	Display text:	L	Type	BI	F	C	BO	LED	Buf	S	C	B	CM	
F-Key-switching		Q0 Fkey		C_D12			X	X1				X			
		F1 Close		IntSP		1						X			
		F2 Open		IntSP		2						X			
		LED On		OUT			X		L13						
		LED Off		OUT			X		L14						

Picture 2: extract of matrix with user defined annunciations

In the CFC chart the BOOL_TO_CO gate creates the command signal. When the function key 1 or 2 is pressed, the BO TRIG input on the BOOL_TO_CO gate is operated via the OR gate. This triggers the BOOL_TO_CO gate to check the status of the W VAL input. The W VAL input is generated with the BUILD_DI gate, which reflects the status of the F1 and F2 operation.

The BUILD_DI gate takes the two BOOLEAN inputs BO VAL_OFF and BO VAL_ON and generates a double point annunciation on its output Y W. The advantage of the BUILD_DI gate is that it generates a double point annunciation with all four possible states, 0 and 0, as well as 1 and 1 represent intermediate or illegal states which can be interpreted accordingly by the recipient of the information.
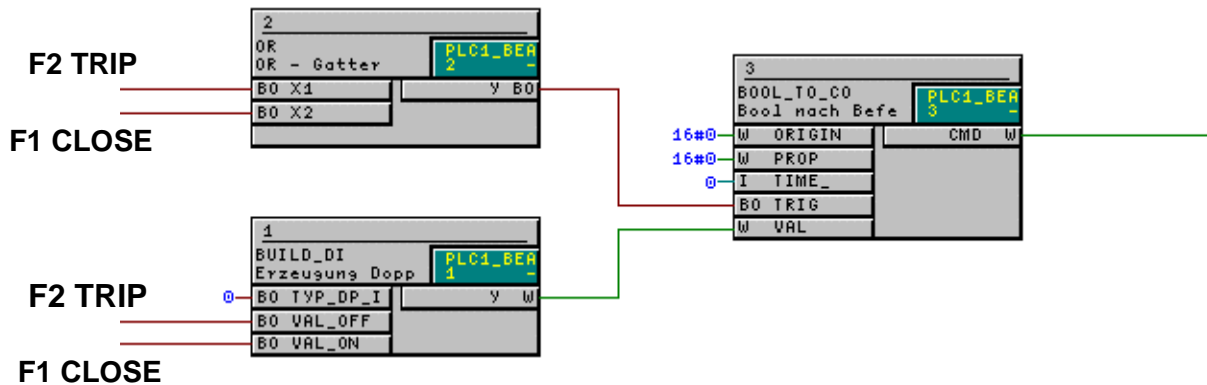
Picture 3: implementation in CFC

Furthermore the OPEN and CLOSE command status must be indicated with LEDs. The following assignment is made:

- LED 13 OPEN command

- LED 14 CLOSE command.

Two additional annunciations for the LEDs must be inserted in the input/output matrix (see picture 2). The signals will be generated inside the CFC chart, so their source is CFC .

For the implementation in CFC see picture 4. The command signal generated by the BOOL_TO_CO gate provides the information for OPEN and CLOSE. Thereby the appropriate contact(s) for control e.g. when F1 is pressed the CLOSE (contact 2 and 3), and when F2 is pressed OPEN (contact 1), will be operated.

In the CFC logic, this command output information must be separated into two Boolean signals representing the OPEN and CLOSE command information. For this purpose, two DI_TO_BOOL gates are used. These gates decode the selected one of the 4 possible states of the command output (double point information). Ehen the command matches the state on the inputs BO_OFF and BO_ON, the DI_TO_BOOL gate will indicate a logic 1 at its output Y BO.
To e.g. obtain the indication that the OPEN command is active, the DI_TO_BOOL inputs must be assigned as follows:
BO OFF : **1**
BO ON   : **0**.

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Picture 4 : Additional DI_TO_BOOL gates for indication of the command information

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