Application example for using an RCCA-B-C-D without HMI

Contents

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Preconditions

To understand this example, the following components are required: RCCA of variant B, C or D with current firmware (V1.0.32 or newer) GSMDL file for the TST RCCA, Siemens S7-1200F PLC, Siemens TIA Portal development environment not older than version V15.
TST FUF2/FU3F with activated RCCA functionality and activated parameter P.804 = 1.
Fail-safe input devices. Variants used in the example: Two-channel emergency stop switch (ABB type C), two single-channel NC contacts, PILZ PSEN cs1.1.

To simplify the interaction between PG, PLC and RCCA, the use of an Ethernet switch is recommended. The address range of the adapter used in the PG is to be set to 192.168.0.xxx/24, single-channel NO contact to digital input 1 for error acknowledgement.

Hardware configuration

Create a new project and add your control unit to the project. A Siemens S7-1212FC DC/DC/DC is used in the example. In order to be able to use the safe inputs of the RCCA, a fail-safe control unit is required - an extended licence may be necessary for project planning.

If you have already integrated the GSDML into your project, select the hardware variant "TST-RCCA-X" from the hardware catalogue under "Other field devices" -> "PROFINET IO" -> "I/O" -> "FEIG ELECTRONIC GmbH" -> "Door control" and add it to your project. (X = B, C or D)

Establish the ProfiSafe connection between the control unit and RCCA under "Network view".

Operating parameters

As you are using one of the RCCA variants -B, -C or -D, the security parameters must be configured before communication is established.
The safe inputs are configured with the three possible signalling device configurations. The first available channel is to trigger an emergency stop of the control unit, the

second channel is assigned an OSSD (output signal switching device), the third channel is equipped with single-channel NC contacts.

Set the parameters of the input channels as follows (for a detailed description of the possible input configurations, please refer to chapter 8.8 of the installation instructions - version V2.0):

Channel 1 parameters:

Parameter description	Value
F-DIx discrepancy time (in ms)	10
F-DIx debounce filter (ms)	10
F-DIx mode	1oo2 mode
F-DIx device type (1oo2)	Passive
F-DIx.1 activation (1oo1)	Not relevant
F-DIx.2 activation (1oo1)	Not relevant
F-DIx short circuit test	Enabled
F-DIx short circuit off time	2ms
F-DIx short circuit restart time	2ms

Table 1: Parameter F-DI 0

Channel 2 parameters:

Parameter description	Value
F-DIx discrepancy time (in ms)	10
F-DIx debounce filter (ms)	10
F-DIx mode	1oo2 mode
F-DIx device type (1oo2)	Active
F-DIx.1 activation (1oo1)	Not relevant
F-DIx.2 activation (1oo1)	Not relevant
F-DIx short circuit test	Disabled
F-DIx short circuit off time	Not relevant
F-DIx short circuit restart time	Not relevant

Table 2: Parameter F-DI 2

Channel 3 parameters:

Parameter description	Value
F-DIx discrepancy time (in ms)	Not relevant
F-DIx debounce filter (ms)	10
F-DIx mode	1oo1 mode
F-DIx device type (1oo2)	Not relevant

F-DIx.1 activation (1oo1)	Enabled
F-DIx.2 activation (1oo1)	Enabled
F-DIx short circuit test	Enabled
F-DIx short circuit off time	2ms
F-DIx short circuit restart time	2ms

Table 3: Parameters F-DI 2.1 and 2.2

iPar-CRC

To calculate the checksum, switch to the device view of the corresponding RCCA hardware and open the "Feig-iPar-CRC" tool by right-clicking on the hardware and selecting "Start device tool". Confirm the parameter settings by ticking the "accepted" column and then generate the checksum by clicking on "Calculate CRC". Accept the value under hexadecimal and enter it in the "F-iPar_CRC" field in the PROFIsafe module settings.

Figure 1: iPar-CRC tool

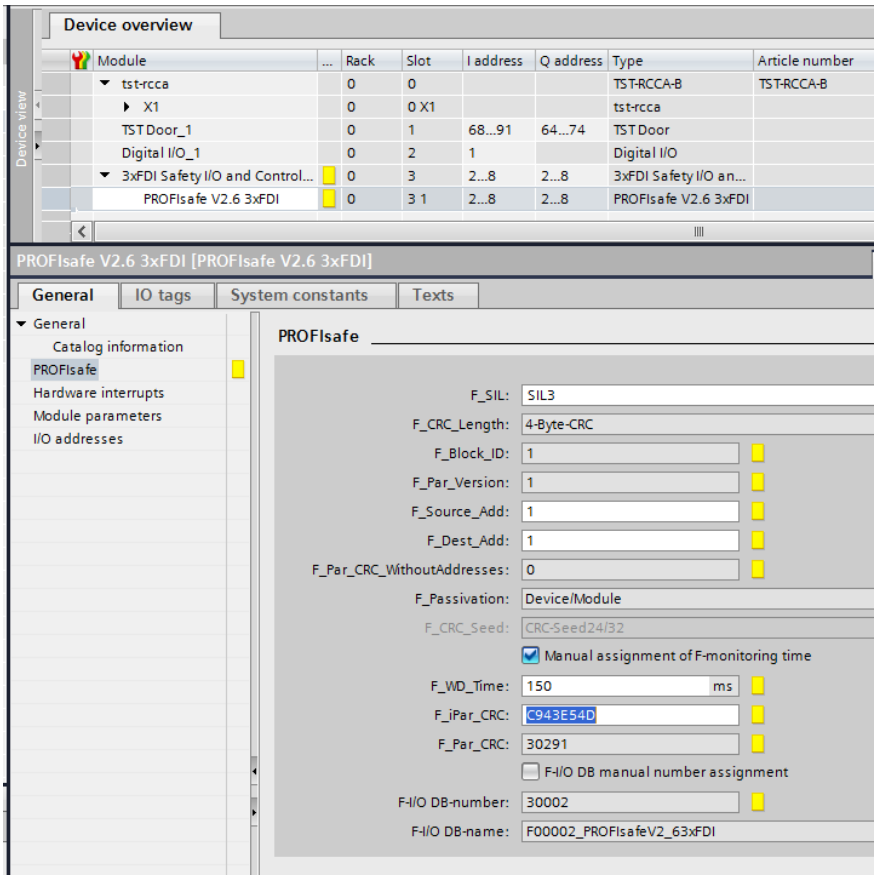


Figure 2: i Par-CRC - device view

Digital inputs

To acknowledge a triggered emergency stop, a digital input of the RCCA is used in the example programme. A simple NO contact is used here.

Debounce time of the digital inputs

The debounce time of the digital inputs can be set in the range from 0ms (debounce off) to 255ms. This setting can be found in the hardware view of the RCCA in the "Digital I/O_1" submodule.
Set the debounce time of the first digital input to a value greater than 0.

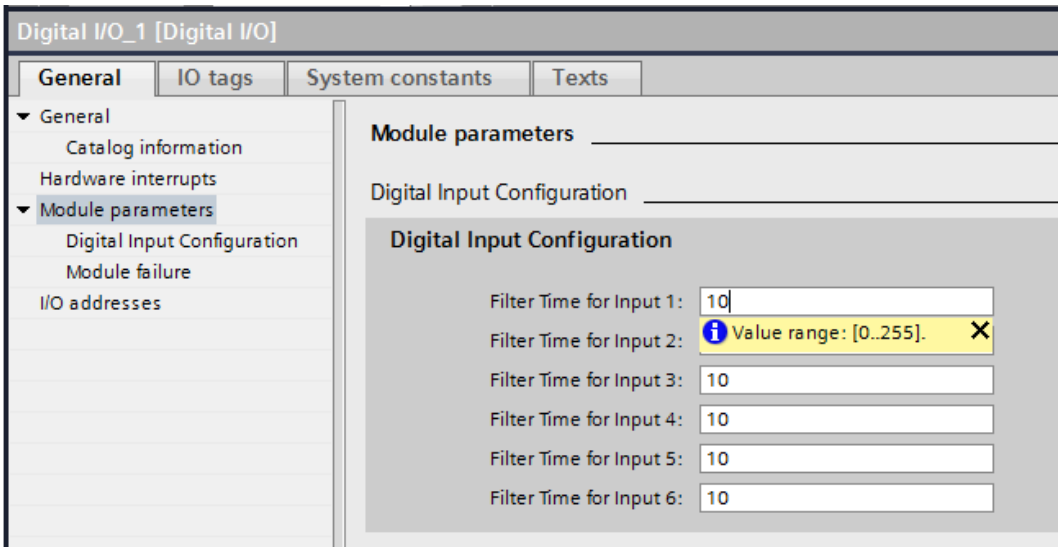


Figure 3: Debouncing

Program blocks

Tags

To simplify the subsequent wiring, create the following variable tables:

Safety

	Name	Data type	Address
1	Ack	Bool	%M0.0
2	Trigger_E-Stop	Bool	%M0.1
3	F-DI_0	Bool	%I2.0
4	F-DI_2	Bool	%I2.1
5	Q_E-Stop	Bool	%Q3.0
6	F-DI_2.1	Bool	%I2.2
7	F-DI_2.2	Bool	%I2.6

Figure 4: Variables for security program

The corresponding address assignment can be found in the document "Module list RCCA-B - D".

Digital_Input

	Name	Data type	Address
1	DI_1	Bool	%I1.0
2	DI_2	Bool	%I1.1
3	DI_3	Bool	%I1.2
4	DI_4	Bool	%I1.3
5	DI_5	Bool	%I1.4
6	DI_6	Bool	%I1.5

Figure 5: Digital input variables

The addresses of the digital inputs can be found under the hardware configuration of the RCCA module.

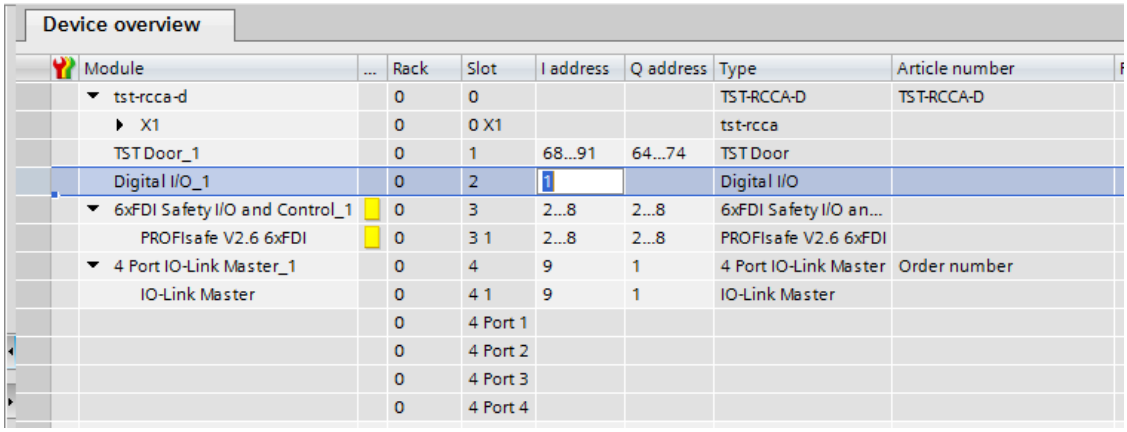


Figure 6: Digital inputs on EB1

Security program

The entire processing of this example program takes place in the safety FB of the control unit.
To edit it, open the automatically created module "Main_Safety_RTG1" and add the standard modules "ACK_GL" and "ESTOP1" to the safety program. As the movement function is not to be evaluated in this example, we will dispense with the necessary programme section at this point and only create the modules to edit the fail-safe inputs and to trigger the emergency stop of the door control unit.

Supply the inputs of the modules with the variables previously created in the "Safety" table.

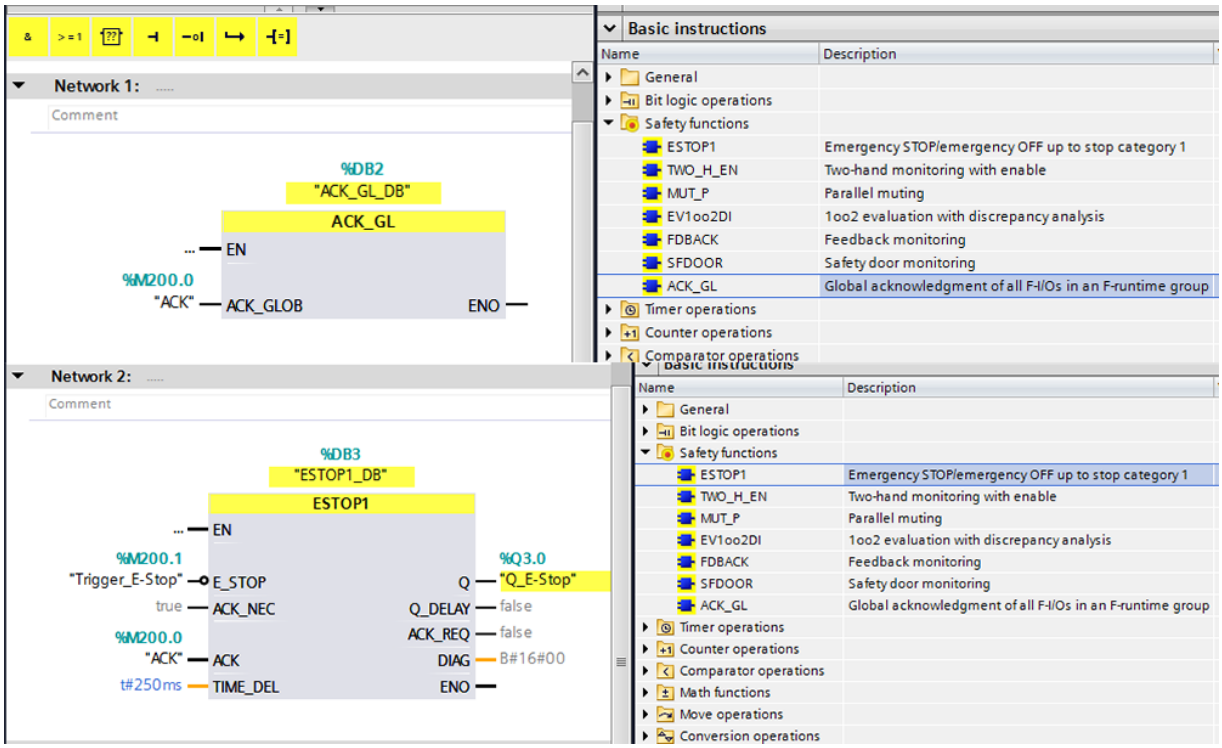


Figure 7: Security program

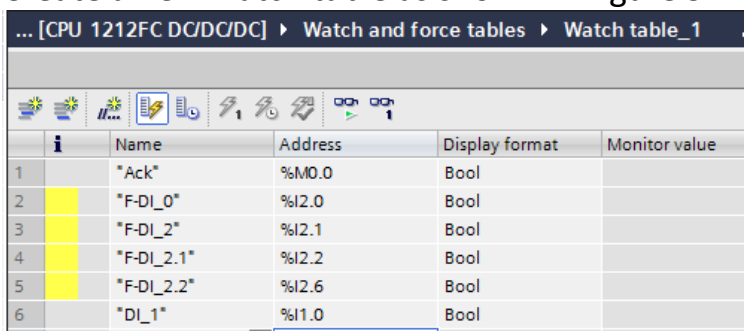
The wiring shown in network 1 enables acknowledgement of the control unit and release of the emergency stop status both via the digital input "DI_1" as a physical input and via "Ack" as a purely virtual signal.
In network 2, the redundantly analysed first channel of the RCCA is monitored by the "F-DI_0" signal provided at the "E_STOP" input.

Program sequence

The programme sequence in this example project is limited to evaluating the safe inputs and switching the safe output. No function is assigned to the two input channels F-DI2 and F-DI2.1/2.2. Only F-DI0 is used to trigger the emergency stop (see Fig. 8). However, it is possible still to process the unused inputs. They can be used in the entire program - standard or security programme. For example, signalling a safe end position via F-DI2 would be a possible application, or triggering movement commands via F-DI2.1 (open) and F-DI2.2 (close).

Watch and control

Create a new watch table as shown in Figure 9.



	Name	Address	Display format	Monitor value
1	"Ack"	%M0.0	Bool	
2	"F-DI_0"	%I2.0	Bool	
3	"F-DI_2"	%I2.1	Bool	
4	"F-DI_2.1"	%I2.2	Bool	
5	"F-DI_2.2"	%I2.6	Bool	
6	"DI_1"	%I1.0	Bool	

Figure 8: Force table

Now translate and transfer the hardware configuration and control program.
The emergency stop can now be released via the button on digital input 1. You can also achieve this by controlling the virtual signal "Ack". The states of the safe inputs can be monitored via the table.