Configuration control: Select configuration safely

SIMATIC, Safety Integrated

https://support.industry.siemens.com/cs/ww/en/view/29430270

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Table of contents

1 Introduction

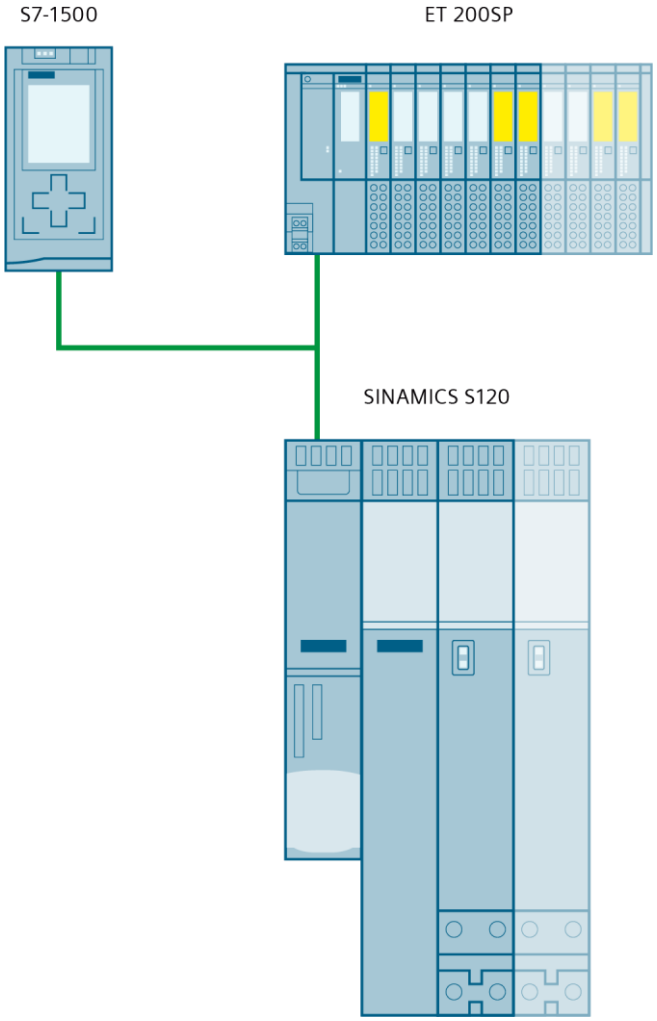
1.1 Overview

Introduction

The configuration control allows you to operate various configuration levels (configurations) of a series machine in a single project without changing the hardware configuration or the user program.

If the various configurations also consist of fail-safe modules and safety functions are added or deselected, it must be ensured that no dangerous states can arise as a result.

Figure 1-1: Overview



The actual configuration can, for example, be selected in a fail-safe data block. Since data cannot be remanently stored in error-proof data blocks, you must define the selection using start values and thus adapt the data block for different projects.

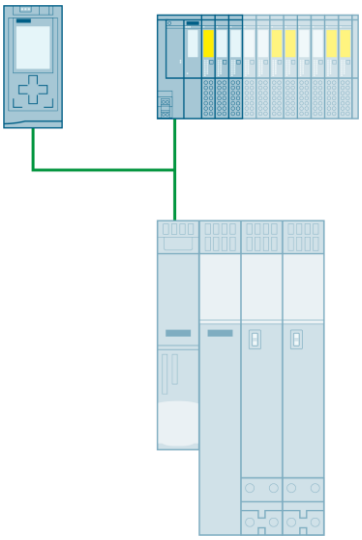
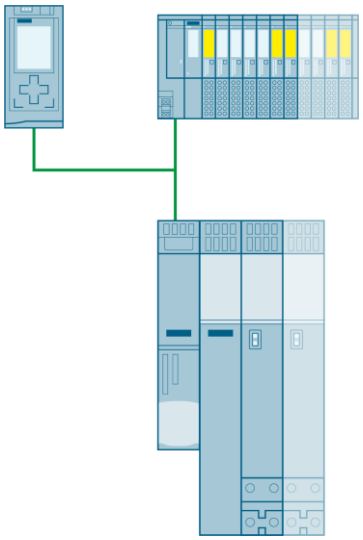
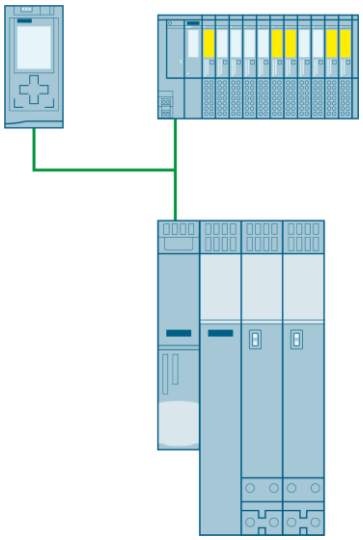
This application example shows you how you can select the actual configuration via the wiring of an F-DI module instead and thus do not have to adapt the user program and also do not require an engineering system during commissioning.

CAUTION	If you only select the actual configuration in the standard user program, the result is only available as a standard date that is not saved. Ensure that no dangerous conditions can occur as a result.

Configurations

In this application example, the application consists of an F-CPU, an ET 200SP station and a SINAMICS S120 drive system with up to two double motor modules (DMM). The design of the ET 200SP station and the drive system varies.

Table 1-1: Configurations

Minimum configuration	1 machine module	2 machine modules
		

Scope of the application example

- Select configuration safely
- Deactivate F peripherals not available in the selected configuration.
- Configuration control of IO systems (activating/deactivating the drive system)
- Configuration control on modular level (structure of the ET 200SP station)
- Activating or deactivating drive objects

Required knowledge

- STEP 7 programming (incl. STEP 7 Safety)
- Configuration control in a standard application

1.2 Principle of operation

Select configuration safely

The actual configuration is selected via the wiring of an F-DI module in the ET 200SP station. For example, up to four configurations can be selected with two inputs.

In this application, the selection is defined as follows:

Table 1-2: Input bits of the F-DI module

Configuration	Input bits of the F-DI module	
	.1	.0
Minimum configuration without machine modules	0	0
1 machine module	0	1
2 machine modules	1	0

The wiring of the F-DI module is evaluated in the safety program in the FB "DetectConfig" and the fail-safe modules not present in the selected configuration are deactivated there.

Figure 1-2: Selection of the configuration "1 machine module"

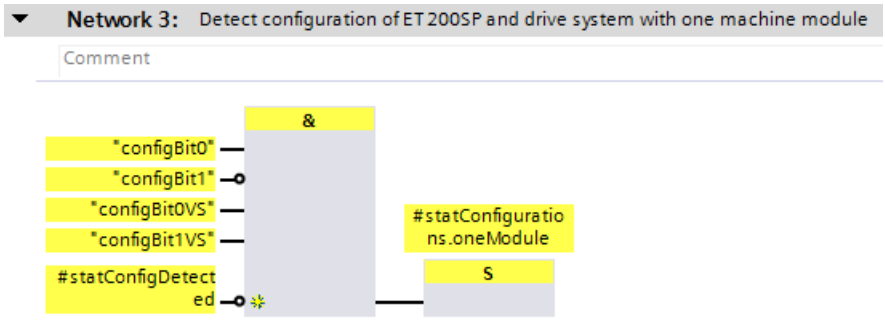
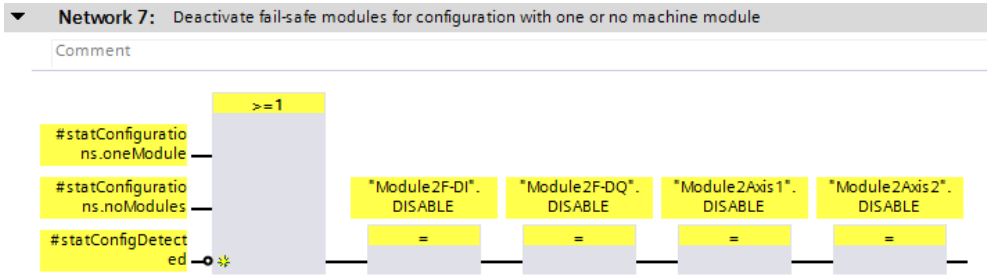


Figure 1-3: Deactivate unused modules



Configuration control sequence

Before the actual configuration can be selected in the safety program, the ET 200SP station requires a control data record with a valid configuration. This does not have to correspond to the actual configuration, but does include the F-DI module for selecting the configuration.

The configuration control itself takes place as usual in the standard user program and is implemented in the FB "SetConfig".

The following figure shows the simplified configuration control procedure in the FB "SetConfig":

Figure 1-4: Sequence "SetConfig"

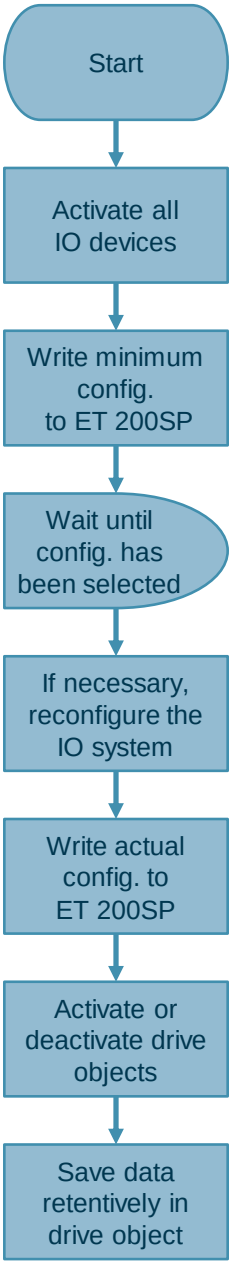


Table 1-3: Configuration control sequence

	Description
1.	**Activate all IO-Devices** Since there is no drive system in the minimum configuration, the drive system is configured as an optional IO device. As soon as an IO-Device is configured as optional, the IO-Controller deactivates all IO-Devices during start-up. So that the ET 200SP can receive the data set with a configuration, in the first step all IO-Devices are activated with the FB "LCC_ReconfigSys". Since the configurations containing a drive system are more common, the drive system is also activated, even if it is missing from the actual configuration.
2.	**Write minimum configuration to ET 200SP** After the ET 200SP station has been activated, the minimum configuration in which the F-DI module for selecting the configuration is contained is transferred to the interface module in the form of a data set. The FB "LCC_ConfigDevice" is used for this.
3.	**Selecting actual configuration** This step takes place in the security program in the FB "DetectConfig". As long as no configuration has been selected, the FB automatically integrates the F-DI module again and then evaluates its inputs incl. value status. As soon as the inputs provide valid signals, the respective configuration is selected and reported to the standard user program.
4.	**If necessary, reconfigure the IO system** In the first step all IO-Devices were activated. If the actual configuration of the IO system differs from the maximum configuration (e.g. no drive system available), "LCC_ReconfigSys" is called again and only the actually available IO devices (e.g. only ET 200SP station) are activated.
5.	**Write actual configuration to ET 200SP** The data set associated with the actual configuration is transferred to the interface module with the FB "LCC_ConfigDevice“.
6.	**Activate or deactivate drive objects** Depending on the selected configuration, the drive objects of the second DMM are activated or deactivated with the FB "LAcycCom_ActDeactDrive".
7.	**Save data retentively in drive object** In order that the drive objects of the second DMM do not have to be reactivated or deactivated after a power failure at the drive system, the data of the drive objects are retentively saved with the FB "LAcycCom_DriveRamToRom".

1.3 Components used

This application example was created using these hardware and software components:

Table 1-4: Components used

Components	Quantity	Article number	Note
F-CPU	1	6ES7516-3FN01-0AB0	
SIMATIC Memory Card	1	6ES7954-8LF02-0AA0	
ET 200SP interface module	1	6ES7155-6AA00-0BN0	
ET 200SP DI	1	6ES7131-6BF00-0BA0	
ET 200SP DQ	1	6ES7132-6BF00-0CA0	
ET 200SP F-DI	3	6ES7136-6BA00-0CA0	
ET 200SP F-DQ	2	6ES7136-6DB00-0CA0	
BaseUnit disconnected	3	6ES7193-6BP00-0DA0	
BaseUnit bridged	8	6ES7193-6BP00-0BA0	
SINAMICS S120 Control Unit	1	6SL3040-1MA01-0AA0	
SINAMICS S120 Smart Line Module	1	6SL3130-6AE15-0AB1	
SINAMICS S120 Double Motor Module	2	6SL3120-2TE13-0AA3	
SINAMICS S120 CF card	1	6SL3054-0FB01-1BA0	
Emergency-stop command device	2	3SU1851-0NB00-2AA2	2 openers
Pushbutton	1	3SU1	1 closer
STEP 7 Professional V15	1	6ES7822-1AE05-0YA5	
STEP 7 Safety Advanced V15	1	6ES7833-1FA15-0YH5	
Block library "LCC"			\2\
Block library "LAcycCom"			\5\
Block library "LDrvSafe"			\6\

This application example consists of the following components:

Table 1-5: Components of the application example

Components	File name	Note
Documentation	29430270_Config-Control-Safety_DOC_V10_de.pdf	This document
TIA Portal project	29430270_Config-Control-Safety_PROJ_V10.zip	Sample project for TIA Portal V15

2 Engineering

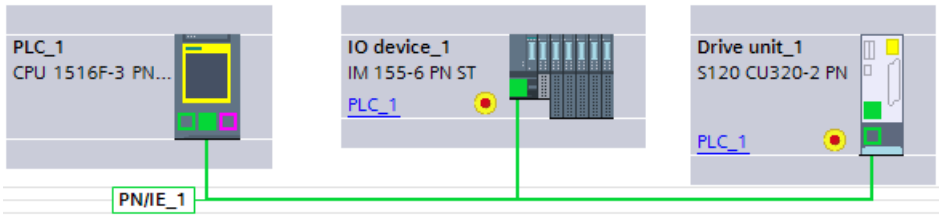
2.1 Configuration

2.1.1 Configuring the hardware

General Information

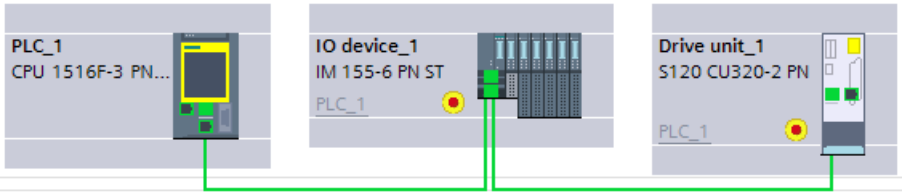
1. Open TIA Portal and create a new project.
2. Create the devices that are included in the maximum configuration.

   Figure 2-1



3. Create the topology so that the IO-Controller can assign PROFINET device names and IP addresses to the IO-Devices during commissioning.

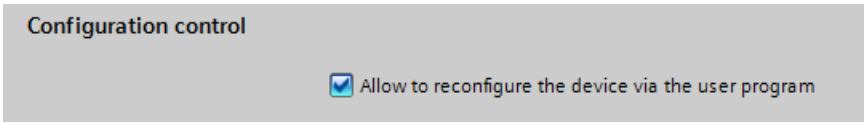
   Figure 2-2



Project planning an ET 200SP station

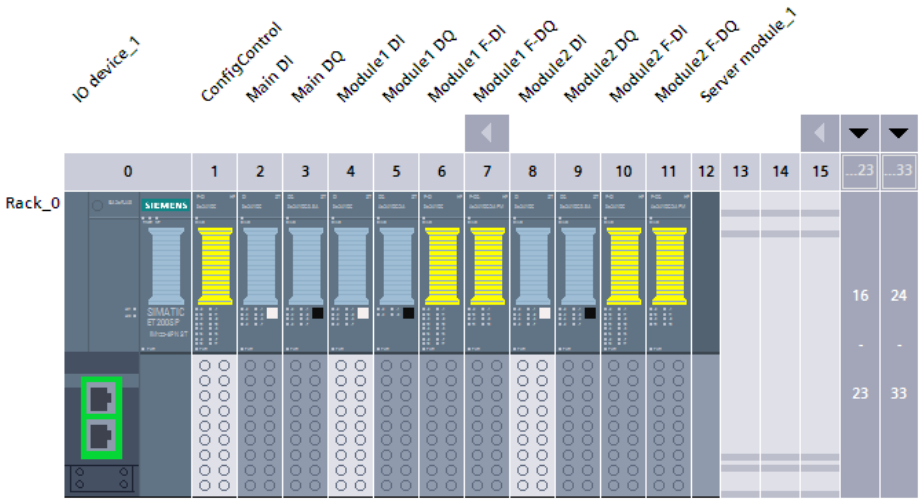
1. Open the properties of the ET 200SP interface module and go to "Module parameters > General"
2. Select the control box "Allow to reconifgure the device via the user program"

   Figure 2-3



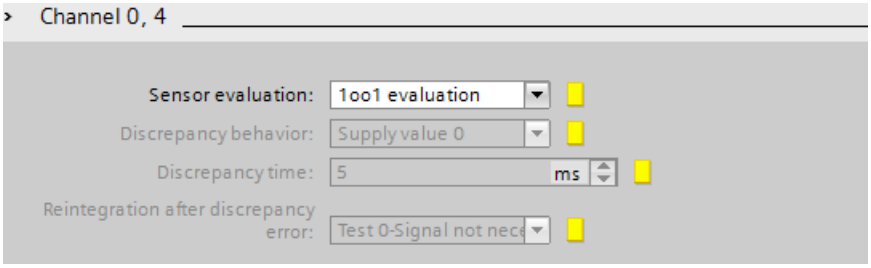
3. Configure the maximum configuration of the ET 200SP station and assign unique names to the modules.

Figure 2-4



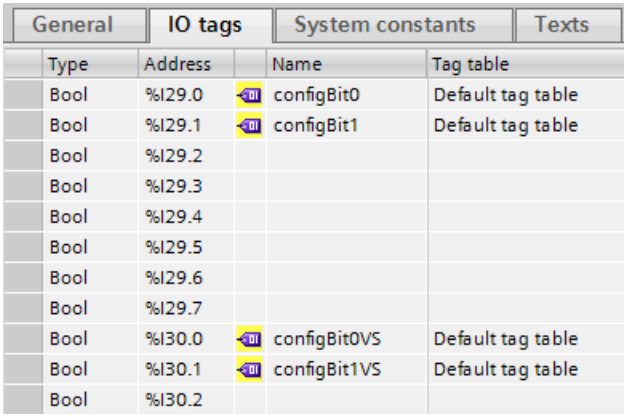
4. Open the properties of the F-DI module that is used to select the configuration and go to "DI parameters > Channel parameters"
5. Set the "1oo1 (1v1)-evaluation" for the channels you use to select the configuration

Figure 2-5



6. In the Inspector window, open the "IO tags" tab and assign unique names to the inputs used and the associated value statuses.

Figure 2-6



Type	Address	Name	Tag table
Bool	%I29.0	configBit0	Default tag table
Bool	%I29.1	configBit1	Default tag table
Bool	%I29.2		
Bool	%I29.3		
Bool	%I29.4		
Bool	%I29.5		
Bool	%I29.6		
Bool	%I29.7		
Bool	%I30.0	configBit0VS	Default tag table
Bool	%I30.1	configBit1VS	Default tag table
Bool	%I30.2		

7. Parameterize the remaining modules according to your application.

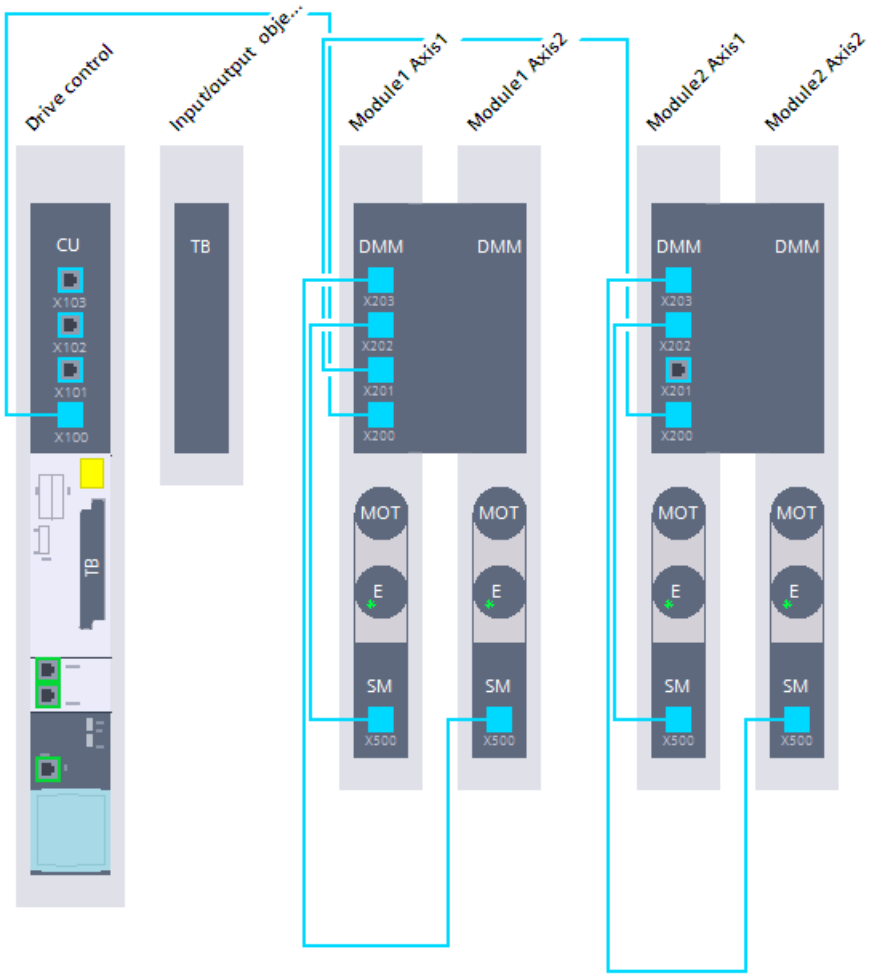
Project planning the drive system

1. Open the properties of the drive system's control unit and go to "PROFINET Interface [X150] > Extended Options > Interface Options.
2. Select the "Optional IO-Device" control box for the "No machine modules" configuration.

   Figure 2-7

3. Project the maximum configuration of the drive system and assign unique names to the modules.

   Figure 2-8



4. Parameterize your drive system according to your application.

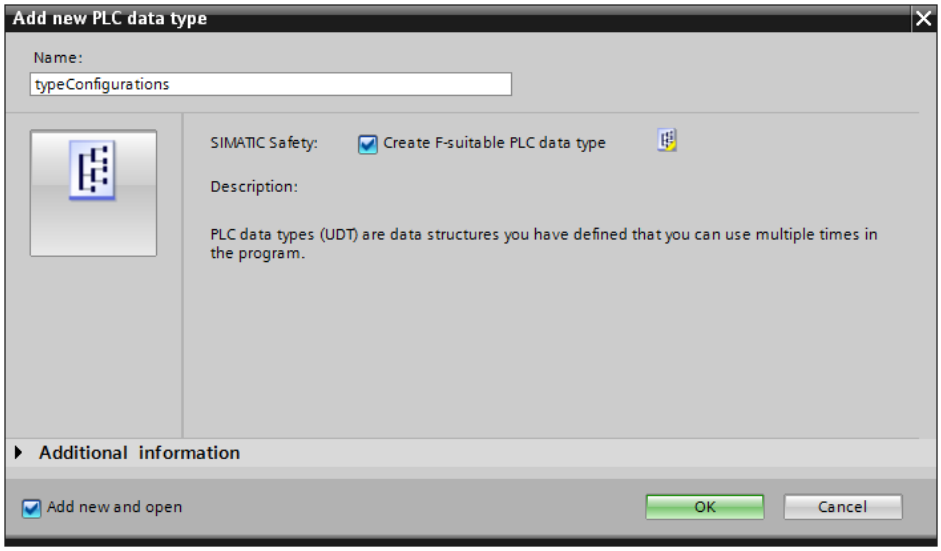
Note A detailed description of how to project plan your drive system with Startdrive in the TIA Portal can be found in the Siemens Industry Online Support:

https://support.industry.siemens.com/cs/ww/en/view/109743270

2.1.2 Programming the configuration selection

1. Create an F suitable PLC data type for the selection of the configuration and open it.

   Figure 2-9



2. Create a variable of the data type BOOL for each configuration.

   Figure 2-10

typeConfigurations

	Name	Data type	Default value
1	noModules	Bool	false
2	oneModule	Bool	false
3	twoModules	Bool	false

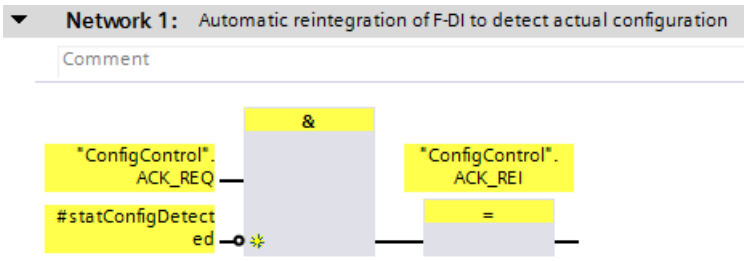
3. Create an F-FB for the selection of the configuration and open it.
4. Create two outputs and corresponding static variables:
   - "configDetected" of the data type BOOL
   - "configurations" of the previously created PLC data type

   Figure 2-11

Output		
configDetected	Bool	false
configurations	"typeConfigurations"	
InOut		
Static		
statConfigDetected	Bool	false
statConfigurations	"typeConfigurations"	

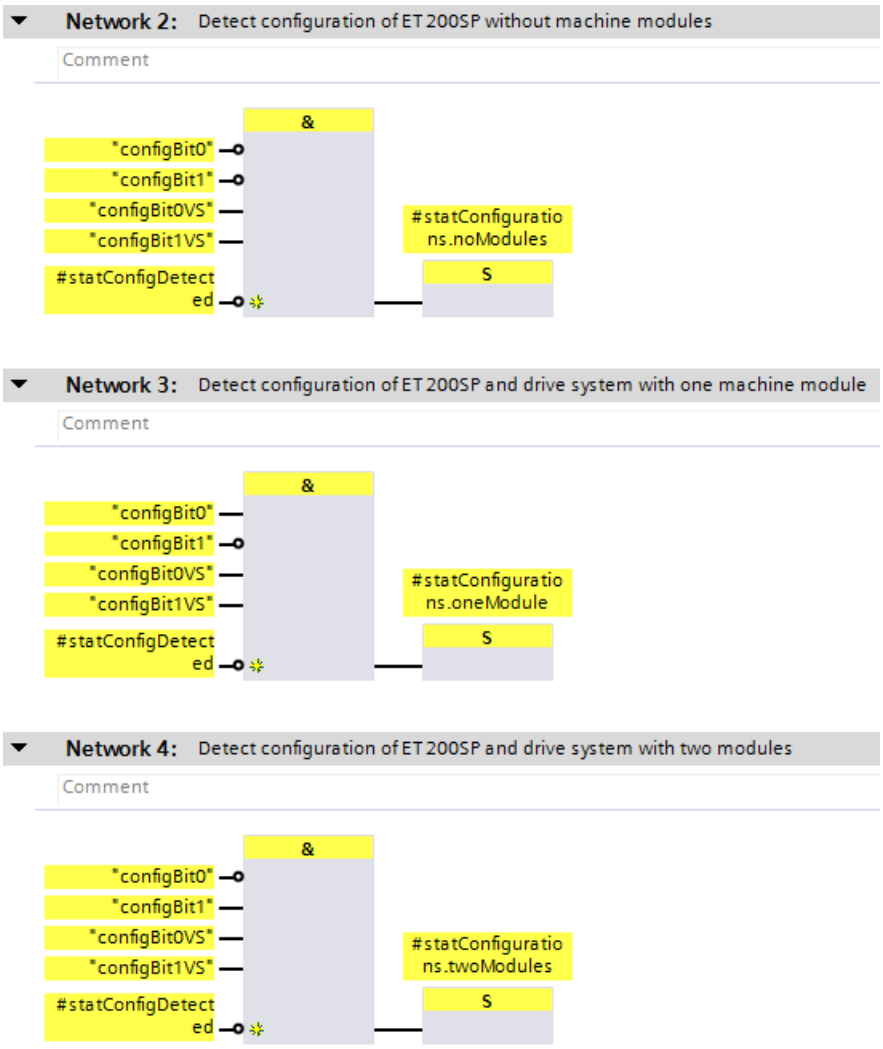
5. Program an automatic reintegration of the F-DI module used to select the configuration as long as none has been selected ("statConfigDetected" = FALSE). Use the variables of the respective F peripheral DB for this purpose.

Figure 2-12



6. Program the selection of configurations. To ensure that the selection is selected only once after the CPU is started and does not change even if the wiring is changed during operation, evaluate the static variable "statConfigDetected".

Figure 2-13



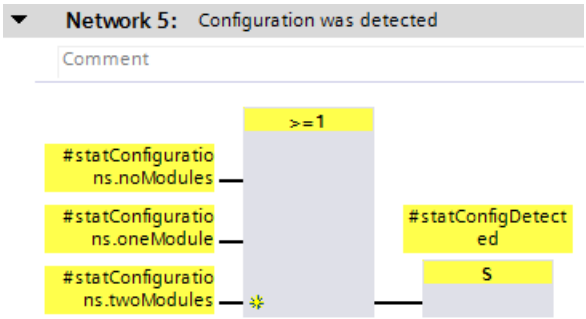
Note

When selecting the configuration, note that substitute values are used for the inputs of the F peripherals in certain situations, e.g. when starting the F system or in the event of F periphery/channel errors.

In these situations, the actual configuration cannot be detected. Therefore, additionally evaluate the value status of the inputs and accept the selection of the configuration only once after starting the F system.

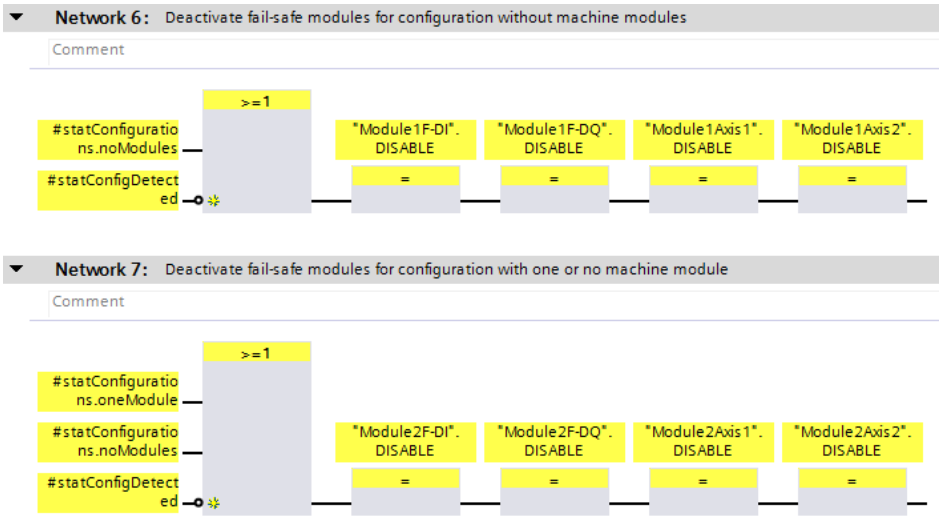
7. Once a configuration has been selected, set the static variable "statConfigDetected".

Figure 2-14



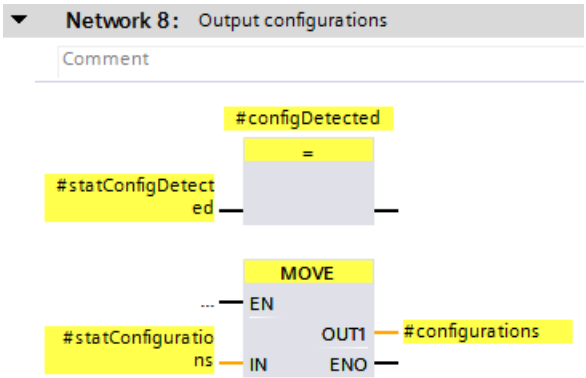
8. Deactivate F peripheral modules that are not present in the selected configuration by setting the variable "DISABLE" in the respective F peripheral DB to TRUE. This prevents the flashing of the error LED of the F-CPU and suppresses the associated diagnostic entries.

Figure 2-15



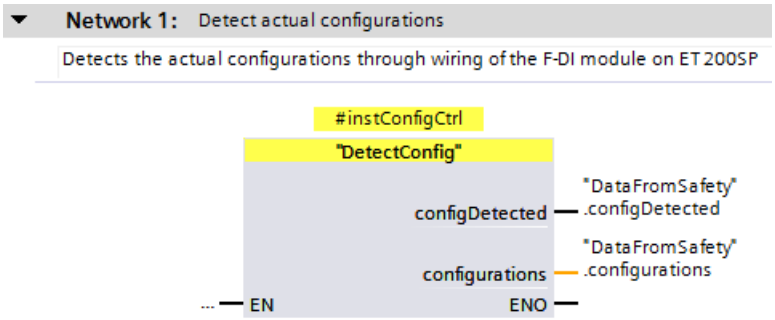
9. Display the selection.

Figure 2-16



10. Open the FB "Main_Safety" and call the newly created FB in it. Connect the outputs with a standard DB to transfer the configuration selection to the standard user program.

Figure 2-17



2.1.3 Programming the configuration control

For configuration control with F peripherals, proceed as for standard peripherals. As this is already described in detail in other documents, only a superficial description of the project planning is given here.

Detailed descriptions for the configuration of configuration control can be found on the contribution page of this document:

https://support.industry.siemens.com/cs/ww/en/view/29430270

Preparation

The block library "LCC" is used for the configuration of the IO system and the ET 200SP station. The drive objects are activated or deactivated via acyclic communication using the block library "LAcycCom".

Download the block libraries and open them in the TIA Portal:

- LCC: https://support.industry.siemens.com/cs/ww/en/view/29430270
- LAcycCom: https://support.industry.siemens.com/cs/ww/en/view/109479553

Configuring the resource manager for acyclic communication

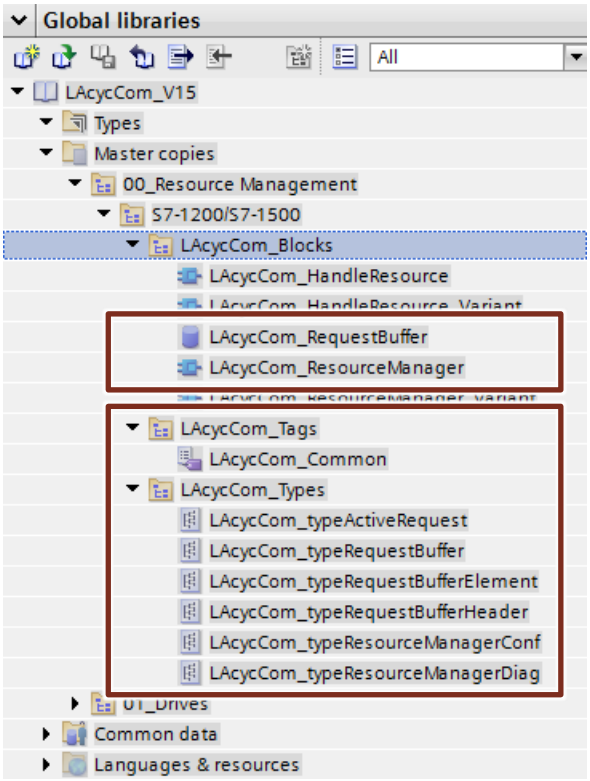
The blocks of the library "LAcycCom" store their communication orders in a global buffer. The resource manager contained in the library manages the communication jobs and processes them one after the other. The resource manager is therefore necessary to use the remaining blocks of the library.

The use of the resource manager is explained in detail in the corresponding documentation and is therefore only dealt with superficially here.

Proceed as follows to integrate the resource manager into your project:

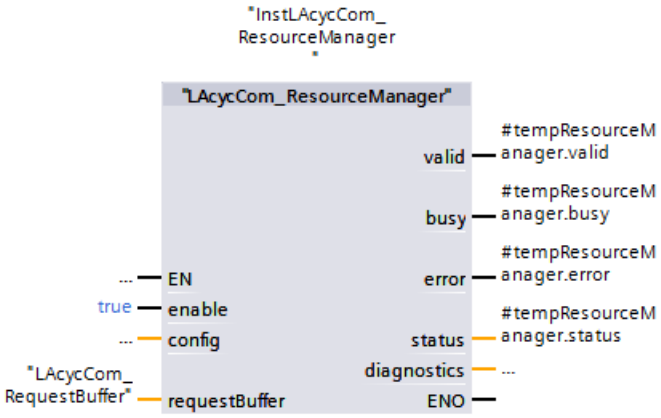
1. Drag the following elements from the block library "LAcycCom" into the respective folders of your CPU:
   - FB "LAcycCom_ResourceManager"
   - DB "LAcycCom_RequestBuffer"
   - PLC variables "LAcycCom_Common"
   - Folders with PLC data types"LAcycCom_Types"

Figure 2-18



2. Open the OB "Main".
3. Drag the FB "ResourceManager" into an empty network, create an instance and connect the FB as follows:

Figure 2-19



The default configuration is sufficient for this application. The input "config" is therefore not connected.

Creating the control data records

1. Drag the DB "LCC_CtrlRec" from the folder "Master copies" of the global library "LCC" to the folder "Program blocks" of your PLC and open it.
2. Copy the prepared structure and adapt them for each configuration of your IO system. There are two configurations in this application example:
   - "recWithDrive": IO system with drive system
   - "recWithoutDrive": IO system without drive system

Figure 2-20

LCC_CtrlRec

	Name	Data type	Start value
1	Static		
2	recWithDrive	Struct	
3	version	Word	16#0100
4	numOptDevices	UInt	1
5	optDevices	HW_DEVICE	"Drive_unit_1~PROFINET_interface...
6	numPortInterconn...	UInt	0
7	recWithoutDrive	Struct	
8	version	Word	16#0100
9	numOptDevices	UInt	0
10	numPortInterconn...	UInt	0

3. Drag the PLC data type "LCC_typeET200SP_ST" from the global library into your CPU.

4. Create a control data record of this PLC data type for each configuration of your ET 200SP station. There are three configurations in this application example:
   - "etDefault": Minimum configuration
   - "et1Module": Configuration with 1 machine module
   - "et2Modules": Configuration with 2 machine modules

   Figure 2-21

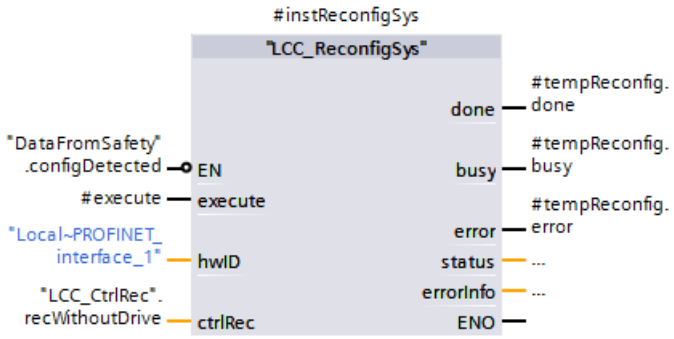
LCC_CtrlRec

	Name	Data type
1	Static	
2	recWithDrive	Struct
3	recWithoutDrive	Struct
4	etDefault	"LCC_typeET200SP_ST"
5	et1Module	"LCC_typeET200SP_ST"
6	et2Modules	"LCC_typeET200SP_ST"

Programming the configuration control of the IO system and the ET 200SP station

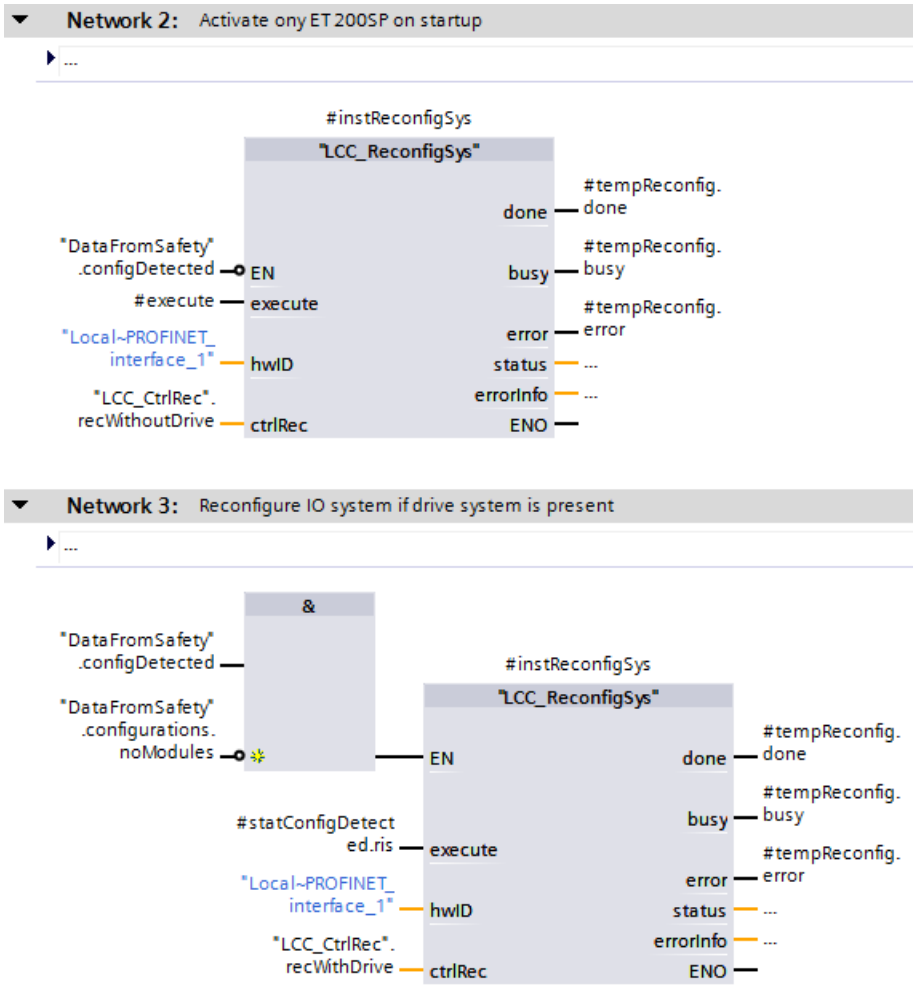
1. Create a FB for the conversion of the configuration control and open it. In the example project, the FB was created in FBD so that it can easily be extended by further configurations.
2. Drag the FB "LCC_ReconfigSys" to reconfigure the IO system from the folder "Types" of the global library "LCC" to the next network and create an instance.
3. Interconnect the block in a manner that it reconfigures the IO system with the minimum configuration at startup.

   Figure 2-22



4. Call the FB "LCC_ReconfigureSys" in the next network again and interconnect it in a manner that it reconfigures the IO system if a configuration with the drive system was selected. You may use the same instance for this but must ensure that only one call is processed per cycle.

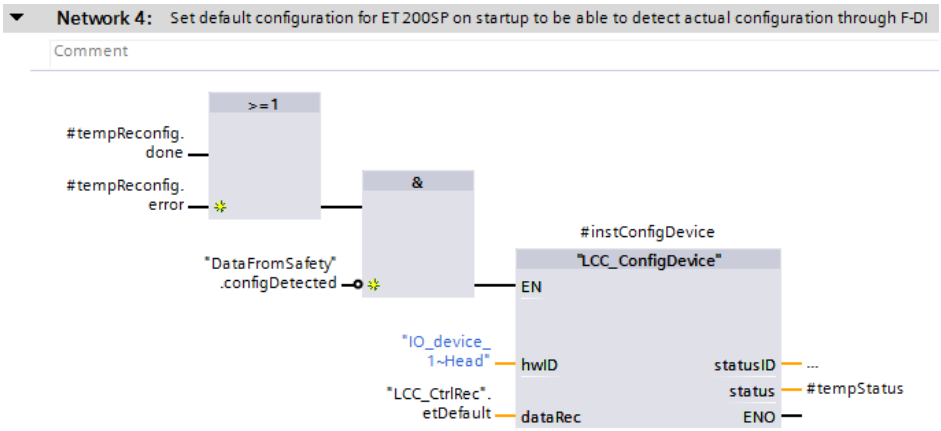
   Figure 2-23



5. Drag the block "LCC_ConfigDevice" for the configuration control of the ET 200SP station from the global library into the next network and create an instance.

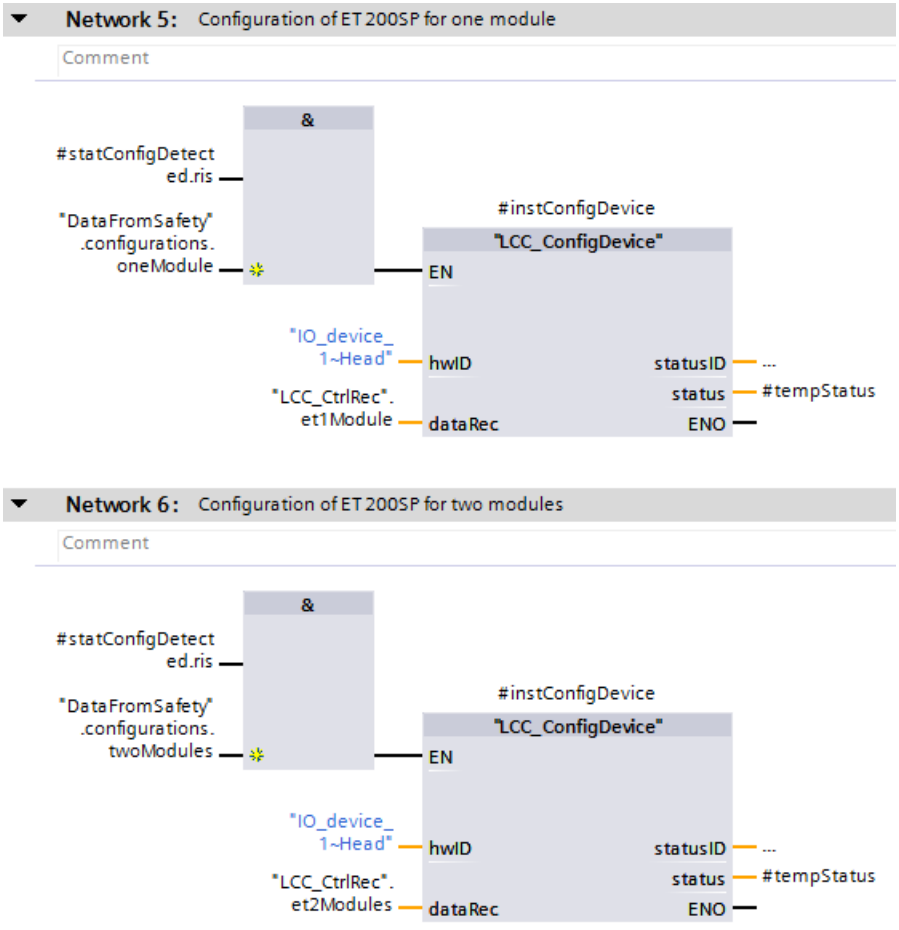
6. Program the configuration control of the minimum configuration that contains the F-DI module to select the actual configuration.
   Make sure that the block is only called for one cycle.

   Figure 2-24



7. Program the configuration control of the remaining configurations of the ET 200SP station. You may use the same instance but must ensure that a maximum of one call is processed per cycle.

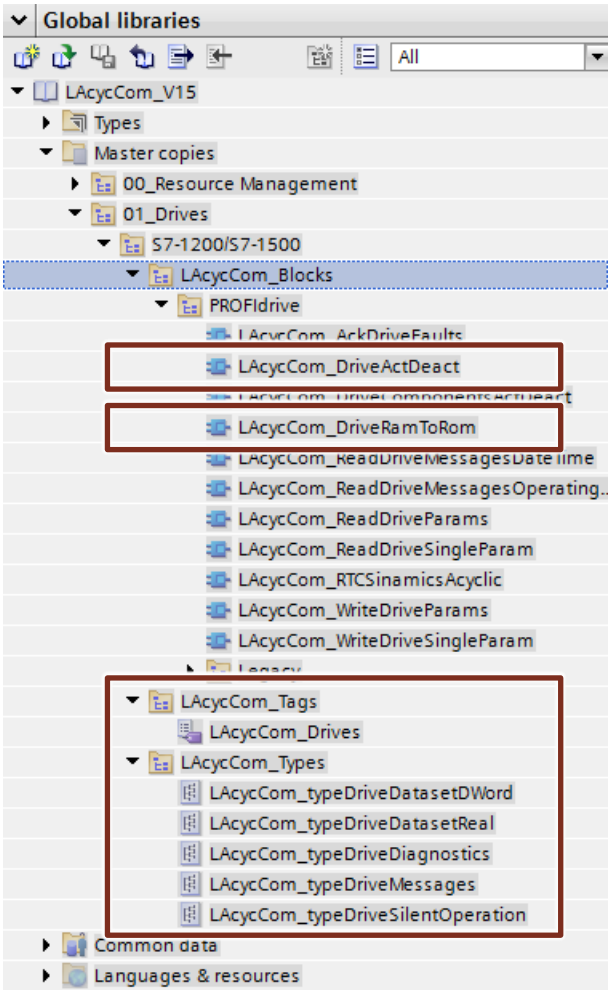
   Figure 2-25



Programming the configuration control of the drive system

1. Drag the following elements from the block library "LAcycCom" into the respective folders of your CPU:
   - FB "LAcycCom_DriveActDeact"
   - FB "LAcycCom_DriveRamToRom"
   - PLC variables "LAcycCom_Drives"
   - PLC data types of the folder "LAcycCom_Types"

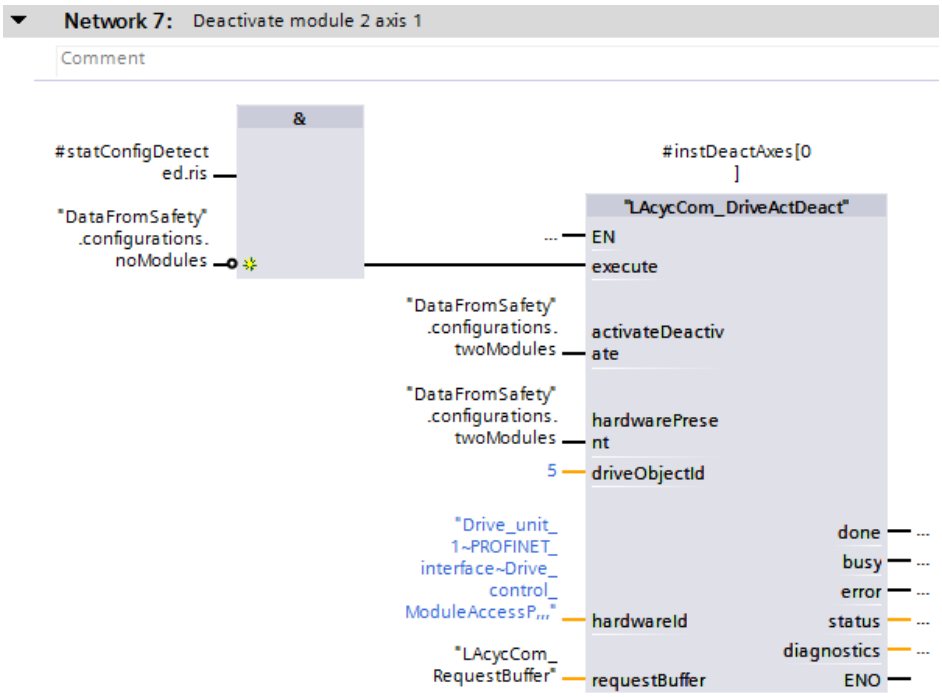
   Figure 2-26



2. Drag the FB "LAcycCom_DriveActDeact" to activate or deactivate a drive object in the next network and create an instance.

3. Connect the "execute" input so that the FB is only executed if the drive system exists in the actual configuration.

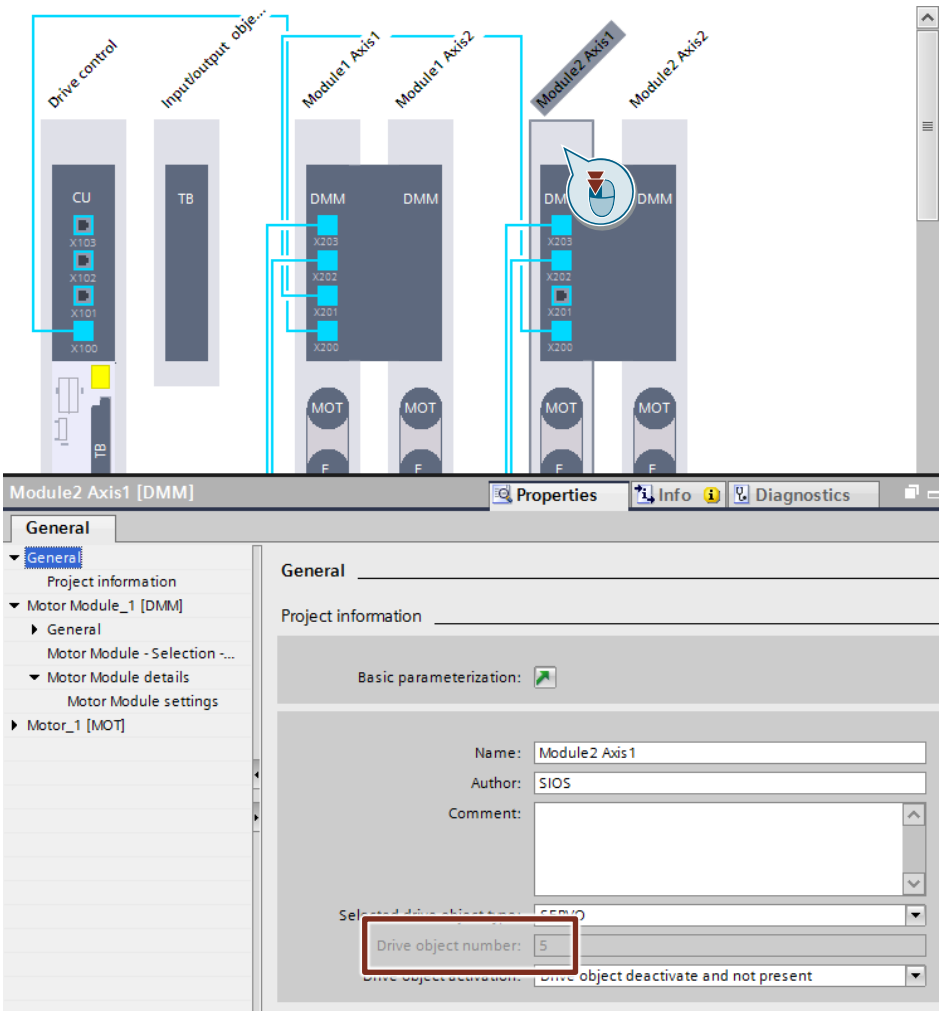
Figure 2-27



4. To activate or deactivate the motor module depending on the actual configuration, create the variable of the configuration in which the motor module exists at the inputs "activateDeactivate" and "hardwarePresent".

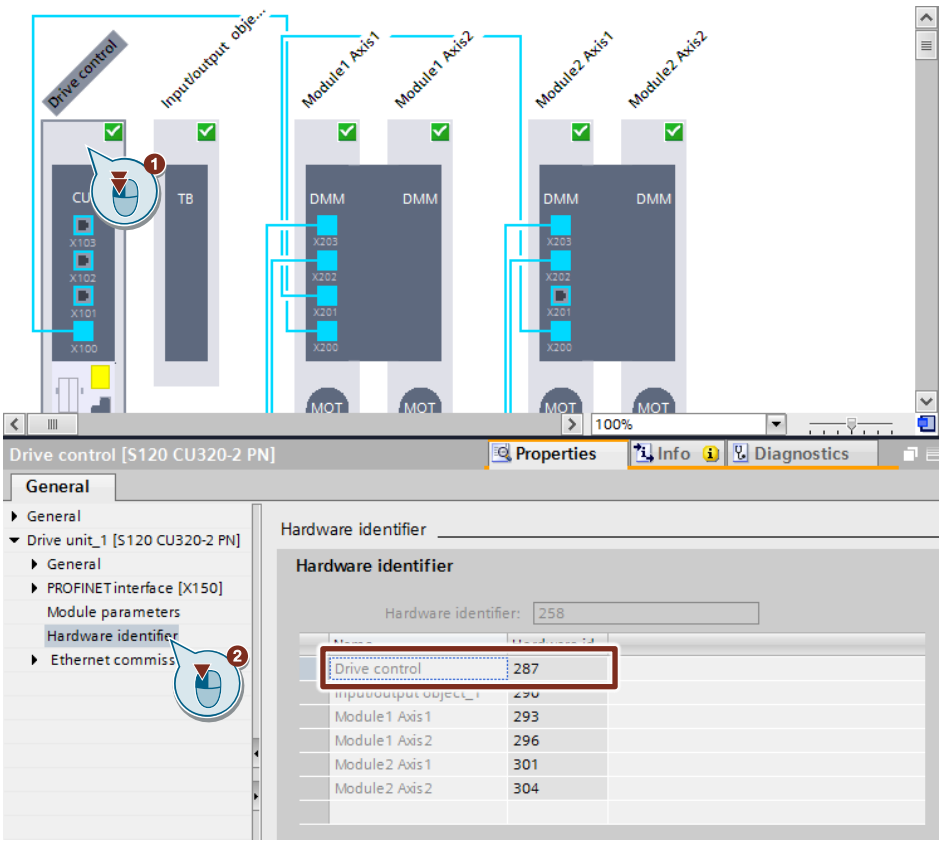
5. Create the number of the drive object at the "driveObjectId" input. These can be found in the properties of the respective motor module.

Figure 2-28



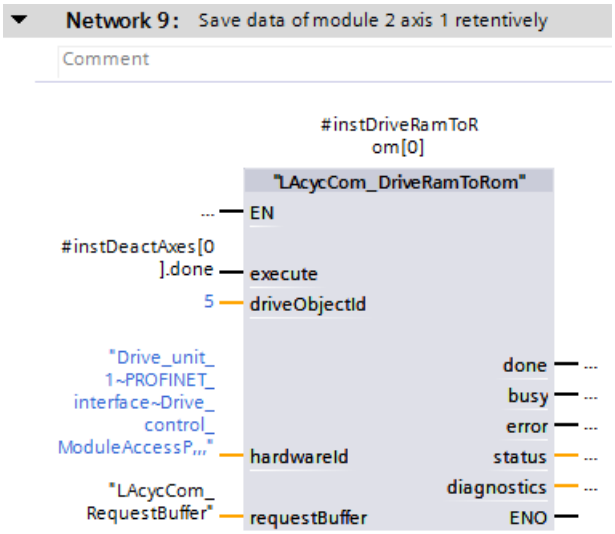
6. Apply the HW identification of the Control Unit to the "hardwareId" input. These can be found in the properties of the control unit or in the system constants.

   Figure 2-29



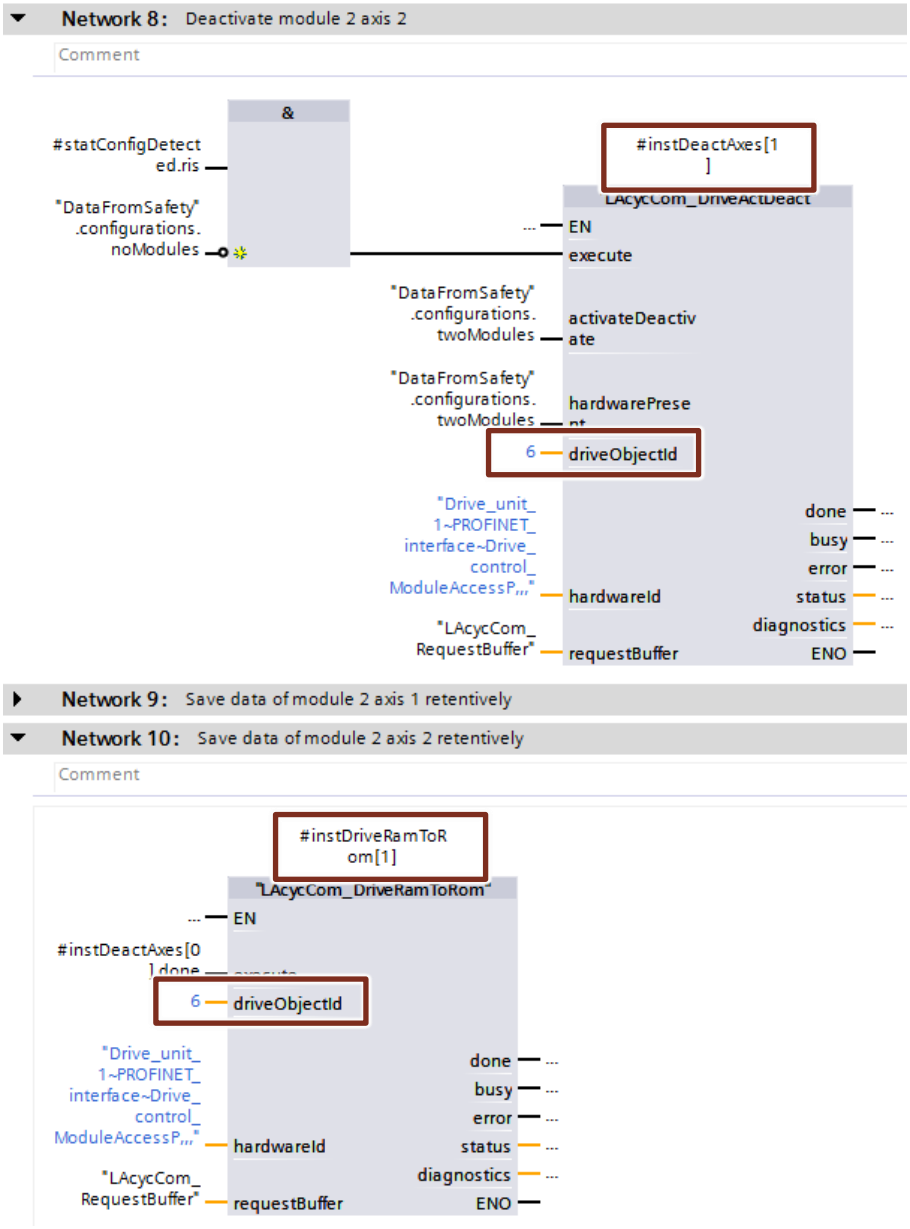
7. Create the DB "LAcycCom_RequestBuffer" at the input "requestBuffer".
8. To save the parameters remanently in the drive object, drag the FB "LAcycCom_DriveRamToRom" into the next network, create an instance and connect the FB as follows:

   Figure 2-30



9. Repeat steps 2 to 8 for each additional optional motor module. Use a separate instance for each.

Figure 2-31



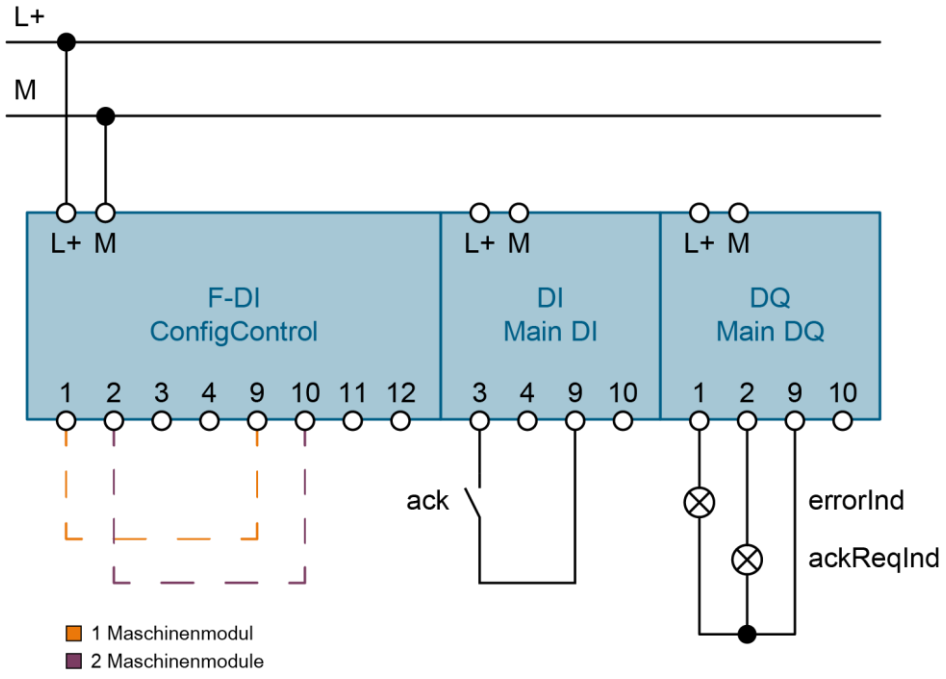
Note In a DMM, both motor modules must be activated or deactivated separately.

2.2 Hardware setup

This section describes the most important steps to set up the hardware:

1. Set up the devices according to the respective configuration.
2. Set up the devices according to the respective configuration.
3. Wire the F-DI module according to the configuration to be selected. (see also Table 1-2).

Figure 2-32: Wiring ET 200SP station with minimum configuration



4. Wire a pushbutton to reintegrate fail-safe I/O modules and acknowledge safety functions and faults.

Note To avoid possible wiring errors, the internal encoder supply with activated short-circuit test of the F-DI module is used. The module thus detects external voltages or the sensor supply of another channel at the inputs.

2.3 Commissioning

The aim of this application example is to enable the commissioning of a series machine without an engineering system and adaptation of the user program.

Requirement

The following prerequisites apply for commissioning:

- The SIMATIC Memory Card (SMC) contains the project planning of the CPU.
- The CF card contains the project planning of the drive system.
- The PROFIsafe addresses are assigned or are assigned during commissioning via the user program.

Procedure

Proceed as follows to put the system into operation:

1. Plug the SMC into the CPU.
2. Insert the CF card into the control unit of the drive system.
3. Switch on the power supply and set the CPU to RUN.
   The CPU now starts, assigns the PROFINET device names and IP addresses to the IO-Devices and controls the configuration. This can take several seconds.
4. After the configuration has been controlled (output "ackReqInd" flashes), integrate fail-safe I/O modules and acknowledge possible errors in the drive system by pressing the acknowledge button (input "ack").
5. Acknowledge the safety functions by pressing the acknowledge button (input "ack").

Assigning a PROFIsafe address

You have the following options for assigning the PROFIsafe addresses:

- Before commissioning with the engineering system
- When commissioning via the user program

How to assign PROFIsafe addresses via the user program can be found in Siemens Industry Online Support:

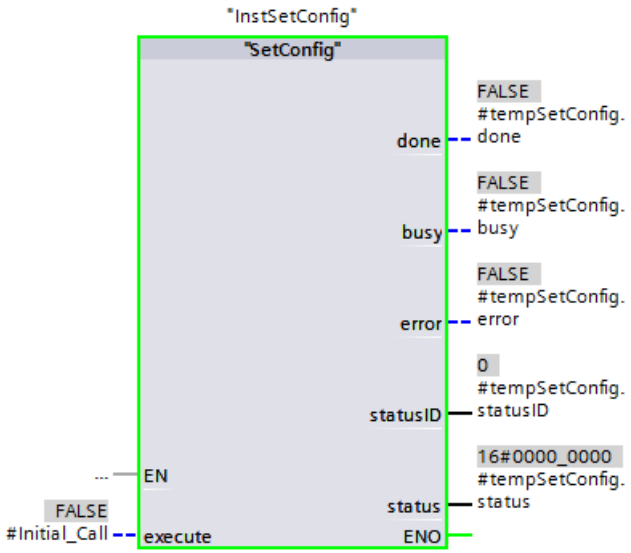
https://support.industry.siemens.com/cs/ww/en/view/109748466

Note The PROFIsafe addresses can only be assigned to fail-safe modules at the configured slots.

2.4 Error handling

The FB "SetConfig", in which the configuration control is implemented, has outputs for error output.

Figure 2-33: Calling a "SetConfig" FB



In the event of an error, the status codes of the called blocks are output at output "status" and the source of the error is specified at output "statusID".

Table 2-1: "statusID" meaning

statusID	Meaning
0	FB "LCC_ReconfigSys" has an error.
1	FB "LCC_ConfigDevice" has an error.
2	The FB instance "LAcycCom_DriveActDeact" for module 2 axis 1 has an error.
3	The FB instance "LAcycCom_DriveActDeact" for module 2 axis 2 has an error.
4	The FB instance "LAcycCom_DriveRamToRom" for module 2 axis 1 has an error.
5	The FB instance "LAcycCom_DriveRamToRom" for module 2 axis 2 has an error.

If an error occurs, you can look up the status code of the called modules in the TIA Portal Information System or in the relevant documentation.

3 Useful information

3.1 Basics

3.1.1 Configuration control on a modular level

Introduction

With the configuration control (option handling) you can operate various expansion stages of a series machine in a single project without changing the hardware−configuration or the user program.

Configuration control operating principle

The configuration control allows you to operate different expansion stages of a series machine with a single configuration of the S7−1500 automation system.

- A station master is configured in a project (maximum configuration). The station master comprises all modules needed for all possible plant parts of a modular standard machine.
- In the project's user program, various station options are provided for various expansion stages of the series machine as well as the selection of a station option. A station option, for example, only uses a part of the modules of the station master and these modules are not plugged in in the configured sequence.
- The series machine manufacturer selects a station option for an expansion stage of the series machine. He does not have to change the project or load a changed configuration.
- You inform the CPU/interface module by means of a control data set programmed by you which modules are missing in a station option other than the station master or are located in another slot. The configuration control does not have an impact on the parameter assignment of the modules.

The configuration control allows you to flexibly vary the centralized/decentralized structure. A requirement is that the station option can be derived from the station master.

For more information on configuration control at the modular level, refer to the "S7-1500, ET 200MP Automation System" system manual:

https://support.industry.siemens.com/cs/ww/en/view/59191792/105312769803

3.1.2 Configuration control for IO systems

Through the configuration control of IO systems, it is possible to generate several concrete characteristics of a series machine from a series machine project.

The principle of configuration control is already known at device level for the flexible use of modules ("option handling"). Various configurations can be derived from one project planning for both centralized and decentralized peripherals.

With S7-1500 CPUs from firmware version V1.7 this principle is also applicable on the level of IO systems. You have the option of omitting or adding stations (IO devices) of a PROFINET IO system in a specific system or varying the sequence of the stations.

Configuration control for devices and configuration control for IO systems can be combined; the functions are independent of each other.

Different variants can be operated from a configured maximum configuration of an IO system. In a series machine project, you can prepare a modular system of IO devices, which you can then adapt flexibly for various expansion stages using the configuration control.

The following variation options are available:

- Variation of the number of IO devices involved

  Optional IO devices for configuration control are included in the configuration by transferring a corresponding data set with the desired configuration in the user program.

- Variation of the sequence of participating IO devices

  You adapt the port switching of the IO devices to the topology used by transferring a corresponding data record with the desired topology in the user program.

Further information on configuration control for IO systems can be found in the "PROFINET with STEP 7 V15" function manual:

https://support.industry.siemens.com/cs/ww/en/view/59191792/105312769803

3.2 Details on functionality

3.2.1 Program structure

The following figures show the program structure:

Figure 3-1: Structure of standard user program

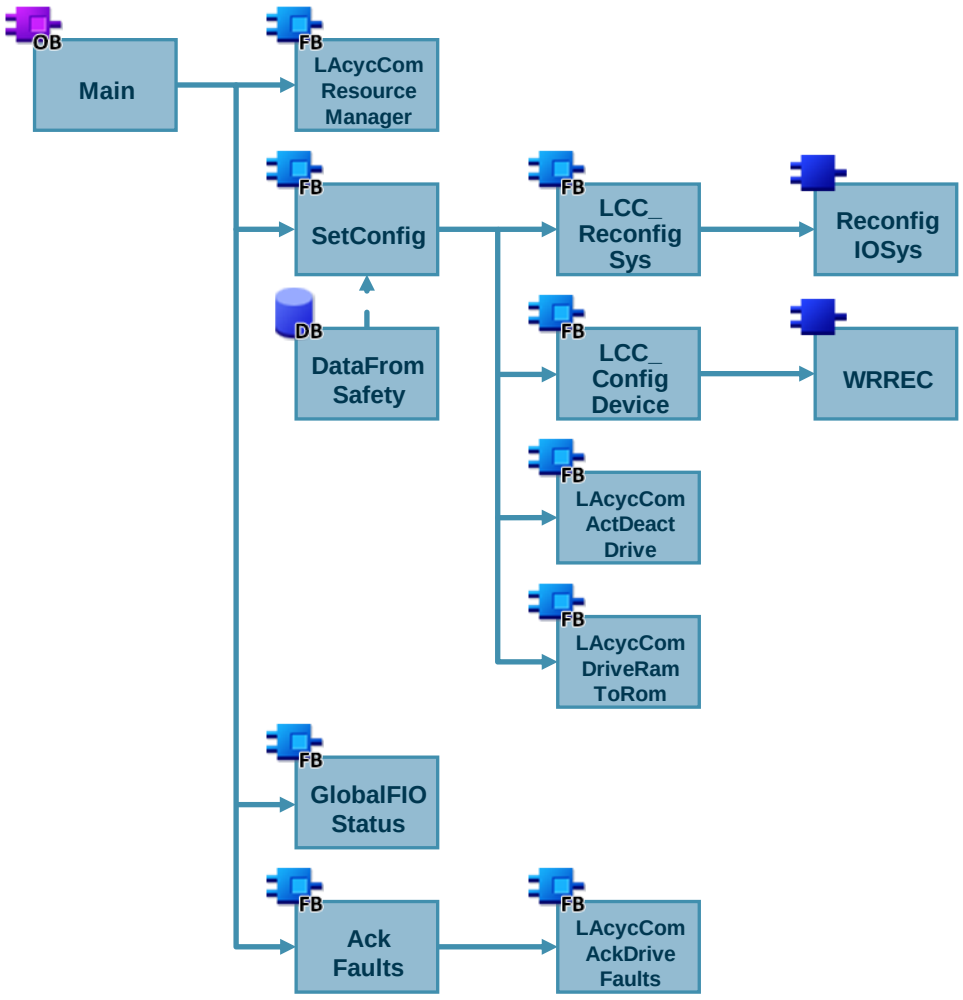
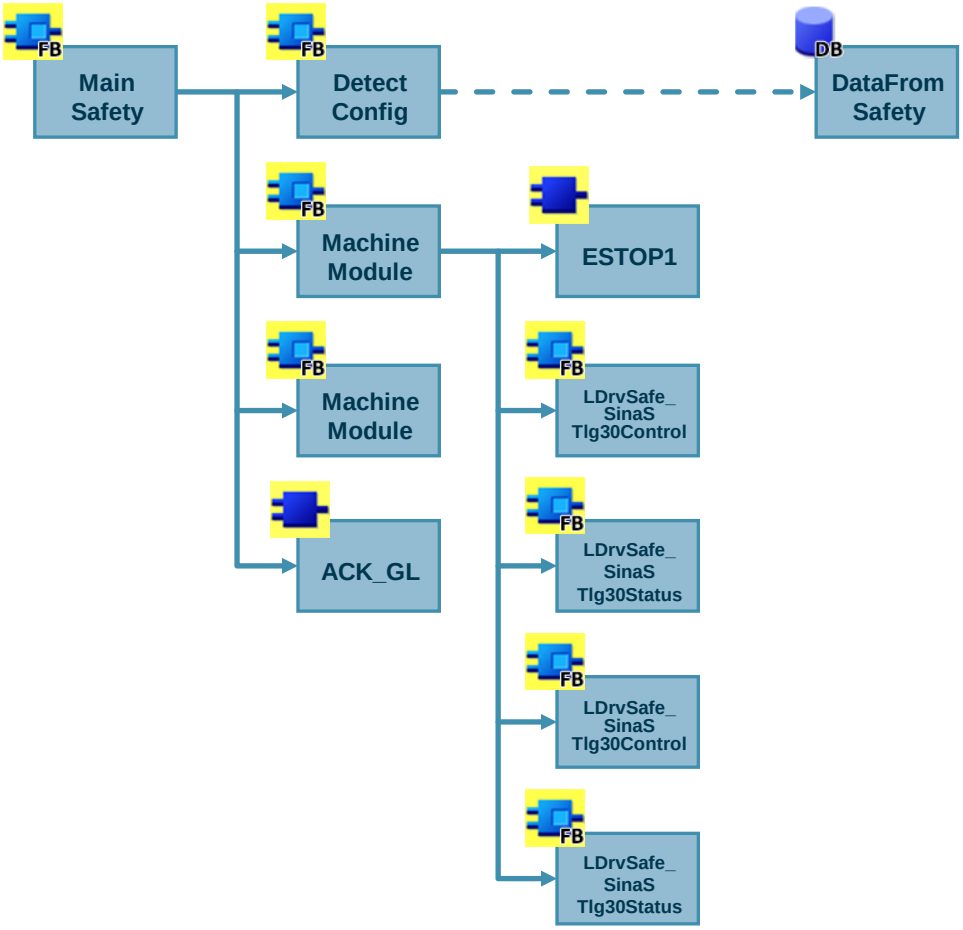


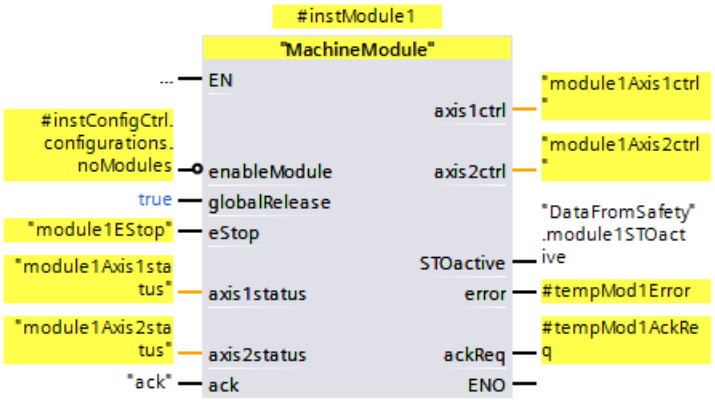
Figure 3-2: Structure of the safety program



3.2.2 FB "MachineModule"

The safety functions of a machine module are implemented in the "MachineModule" FB. In this application example, the safety functions of both machine modules are identical.

Figure 3-3: Calling the FB "MachineModule" for machine module 1



In the FB, an emergency stop command device is evaluated as an example and the safety functions in the drive are controlled using the "LDrvSafe" block library.

You can download the block library "LDrvSafe" from the Siemens Industry Online Support:

https://support.industry.siemens.com/cs/ww/en/view/109485794

If the machine module does not exist in the selected configuration, the execution of the respective instance of the FB is deactivated with the parameter "enableModule".

3.3 Alternative solutions

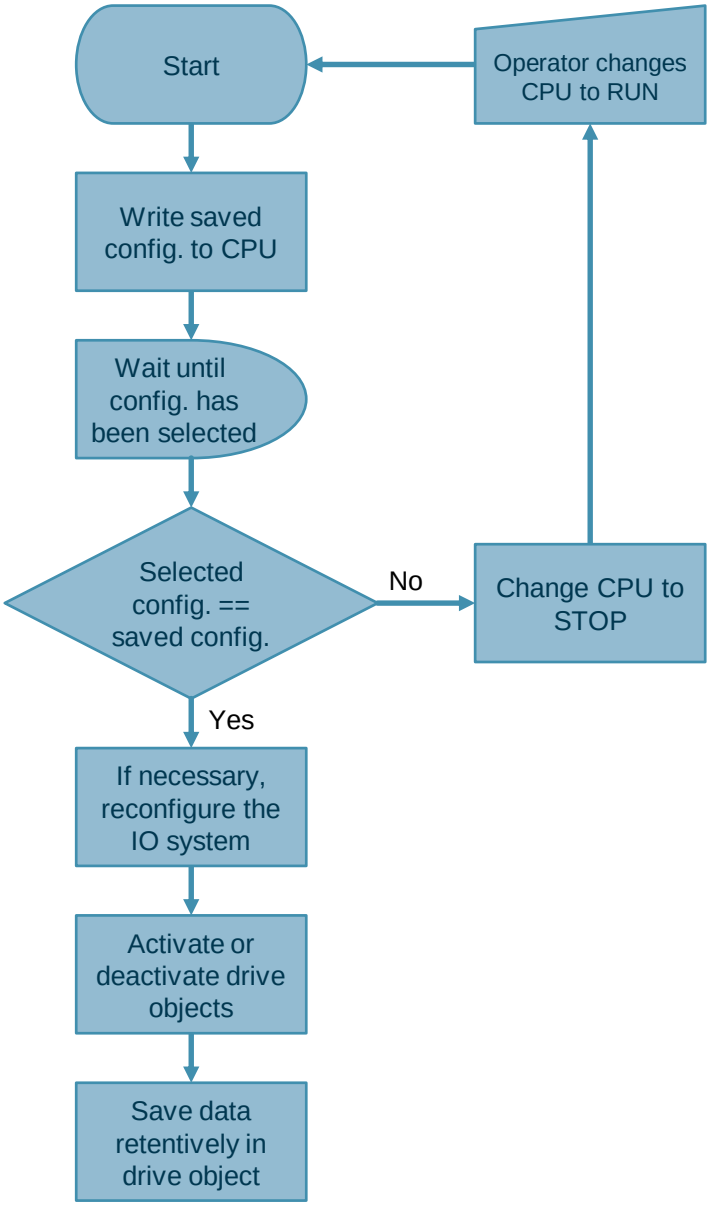
Special Features of Configuration Control in the Central Structure

The CPU is not ready for operation without control data record. If no valid control data record is transferred in the start-up OB (e.g. OB 100), the CPU returns from start-up to the STOP state.

One possibility would be to transfer a minimum configuration, which contains the F-DI module for the selection of the configuration, to the CPU at the first start-up, to save the selected configuration remanently and to restart the CPU.

The program flow could look like this:

Figure 3-4: Possible sequence for configuration control in central structure



3.4 Measures against possible errors

Overview

This section describes an FMEA (Failure Mode and Effect Analysis) for the application example described here. The following possible errors are considered:

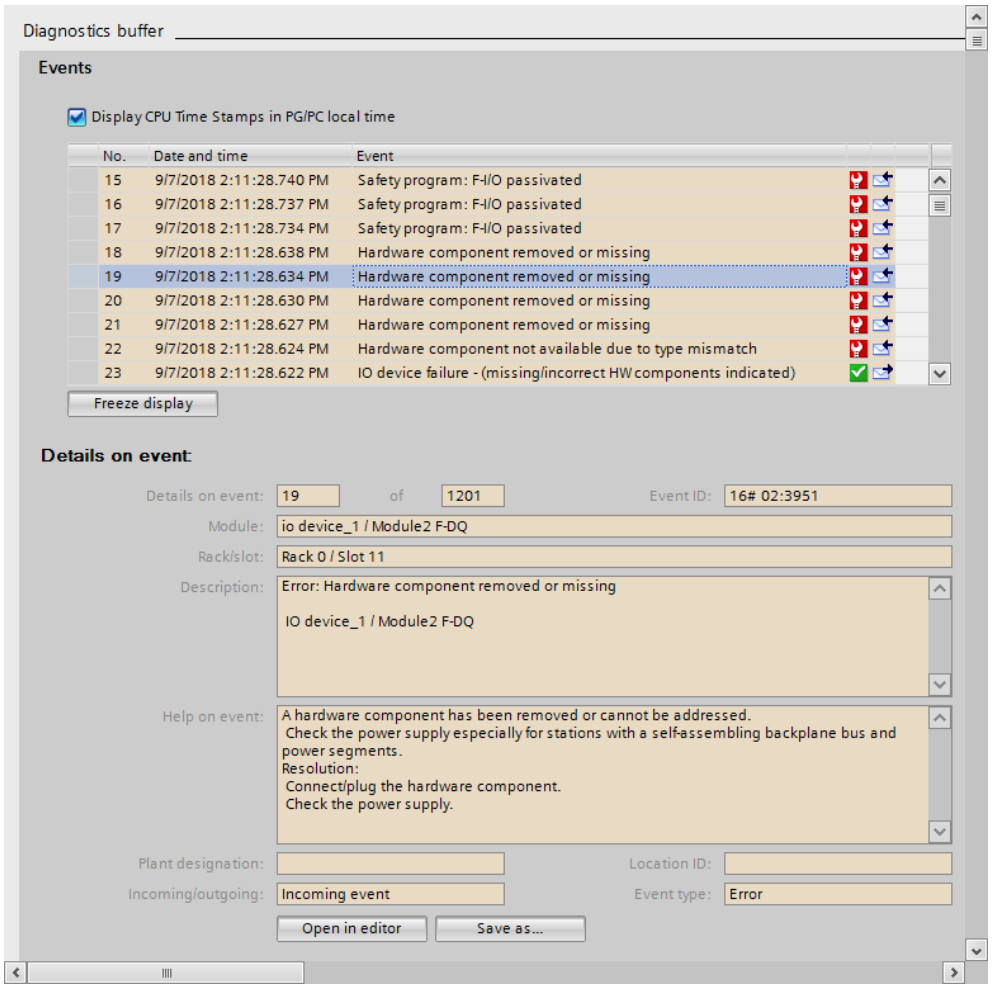
- Commissioning engineer incorrectly wired the F-DI module to select the configuration
- Wire fracture at the F-DI module to select the configuration
- F-DI module short-circuit for configuration selection
- Error when executing the configuration control in the standard user program.

Each of these errors causes the wrong configuration to be controlled and the actual setup to differ from the target setup. The error detection and error reaction are therefore identical for these errors.

Error detection

Errors are detected in the devices themselves, which compare the actual configuration with the target configuration and inform the user about differences via LEDs and messages in the display of the CPU or the engineering system.

Figure 3-5: Example for diagnostic messages for missing modules



Error response

If the actual structure differs from the target structure, all fail-safe modules are passivated and the channels output substitute values. This triggers all programmed safety functions and the system goes into a safe state.

The following figure shows the status of the F peripheral DBs and the value status of the fail-safe channels if the actual structure differs from the target structure.

Figure 3-6: Status in case of differences between actual and target structure

// Machine module 1				
	"Module1F-DI".PASS_OUT		Bool	TRUE
	"Module1F-DI".QBAD		Bool	TRUE
	"Module1F-DQ".PASS_OUT		Bool	TRUE
	"Module1F-DQ".QBAD		Bool	TRUE
	"Module1Axis1".PASS_OUT		Bool	TRUE
	"Module1Axis1".QBAD		Bool	TRUE
	"Module1Axis2".PASS_OUT		Bool	TRUE
	"Module1Axis2".QBAD		Bool	TRUE
	"module1EStop"	%I18.0	Bool	FALSE
	"module1EStopVS"	%I19.0	Bool	FALSE
// Machine module 2				
	"Module2F-DI".PASS_OUT		Bool	TRUE
	"Module2F-DI".QBAD		Bool	TRUE
	"Module2F-DQ".PASS_OUT		Bool	TRUE
	"Module2F-DQ".QBAD		Bool	TRUE
	"Module2Axis1".PASS_OUT		Bool	TRUE
	"Module2Axis1".QBAD		Bool	TRUE
	"Module2Axis2".PASS_OUT		Bool	TRUE
	"Module2Axis2".QBAD		Bool	TRUE
	"module2EStop"	%I35.0	Bool	FALSE
	"module2EStopVS"	%I36.0	Bool	FALSE

It does not matter whether the selected configuration contains more or less modules than are actually present in the actual structure.

Note A short-circuit on one channel of the F-DI module is detected by the activated short-circuit detection of the module. The affected channel is made passive and therefore no configuration is selected. The previously controlled minimum configuration is still active and differs from the actual configuration.

4 Appendix

4.1 Service and Support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs and application examples – all information is accessible with just a few mouse clicks at:
https://support.industry.siemens.com

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https://support.industry.siemens.com/cs/ww/en/sc/2067

4.2 Links and literature

Table 4-1: Links and literature

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to the article page of the application example https://support.industry.siemens.com/cs/ww/en/view/29430270
\3\	System Manual "S7-1500, ET 200MP Automation System" https://support.industry.siemens.com/cs/ww/en/view/59191792
\4\	Function manual "PROFINET with STEP 7 V15" https://support.industry.siemens.com/cs/ww/en/view/49948856
\5\	Block library LAcycCom for SIMATIC S7-1200/S7-1500 https://support.industry.siemens.com/cs/ww/en/view/109479553
\6\	LDrvSafe block library for controlling Safety Integrated Functions of the SINAMICS drive family https://support.industry.siemens.com/cs/ww/en/view/109485794
\7\	Application example "Configuration of a SINAMICS S120 with Startdrive" https://support.industry.siemens.com/cs/ww/en/view/109743270
\8\	Application example "Controlling the Safety Integrated Functions of SINAMICS S120 with SIMATIC S7-1500F via PROFIsafe". https://support.industry.siemens.com/cs/ww/en/view/109749224
\9\	FAQ "How can you assign PROFIsafe addresses to the F modules of the ET 200SP without additional engineering?" https://support.industry.siemens.com/cs/ww/en/view/109748466

4.3 Change documentation

Table 4-2: Change documentation

Version	Date	Change
V1.0	11/2018	First version