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Library for Configuration Control (LCC)

S7-1200/1500, ET 200

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1 Introduction

1.1 General Information

Overview

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.

The library LCC (Library Configuration Control) for the TIA Portal contains blocks and PLC data types for the following functions:

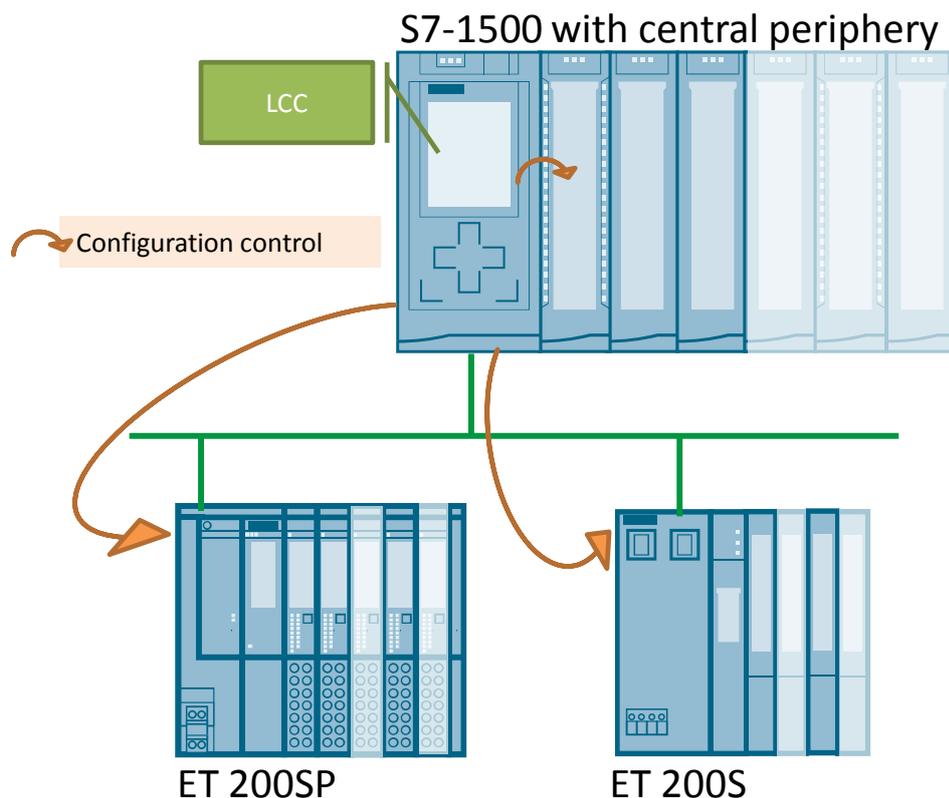
- Configuration control on a modular level
- Configuration control for IO systems

Configuration control on a modular level

The configuration control on a modular level enables flexible expansion stages for the decentralized and central periphery within a project to be delivered. A single TIA Portal project (maximum extension) can therefore be used for several extension stages of stations.

The following figure shows a possible scenario for configuration control on a modular level:

Figure 1-1: Configuration control on a modular level

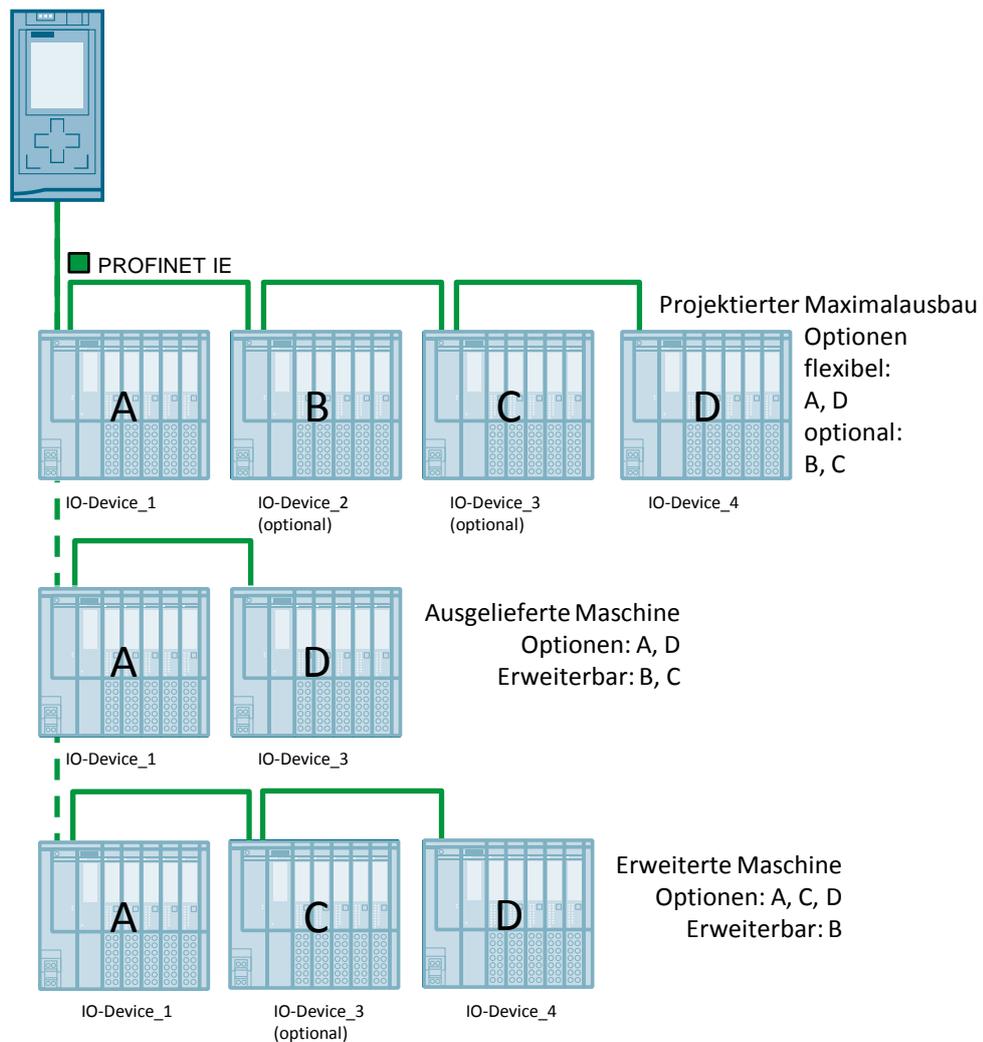


Configuration control for IO systems

The configuration control for IO systems enables flexible expansion stages and connections of stations within an IO system. A single TIA Portal project can therefore be used for several concrete IO systems, as long as they can be derived from the maximum configuration.

The following figure shows a possible scenario for configuration control for IO systems:

Figure 1-2: Configuration control for IO systems



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Delimitation

In the PROFIBUS variants of ET 200S and ET 200pro, the configuration control follows a different mechanism.

These library descriptions and blocks refer only to the PROFINET variants of the decentralized peripherals.

1.2 Components used

Requirements for this library

In order to be able to use the functionality of the library described here, the following hardware and software requirements must be met.

Hardware

- S7-1500 ab FW 1.5
- S7-1200 from FW 4.1
- ET 200SP CPU ab FW 1.6
- ET 200SP
- ET 200MP
- ET 200AL
- ET 200S
- ET 200pro

Software

- STEP 7 Basic from V14 SP1

Note

It is generally possible to open a library with STEP 7 Basic, although STEP 7 Professional elements (e.g. S7-1500 controller) are included. In this case you will be informed with a message when opening the library.

All elements (types and copy templates) can be used if they are supported by the hardware installed in the TIA Portal.

If you try to copy elements with STEP 7 Basic from the library that are not supported (e.g. S7-1500 controller), an error message is displayed.

2 Engineering

2.1 Components of the library

Function blocks

Table 2-1: Function blocks of the library

Name	Version	Description
LCC_ConfigDevice	2.0.0	This FB is used for configuration control on a modular level. The FB transfers a control data set to a CPU or an IO-Device to reconfigure this device.
LCC_ReconfigSys	1.0.0	This FB is used for configuration control for IO systems. The FB calls the system instruction "ReconfigIOSystem" successively in its three modes to reconfigure an IO system.

PLC data types

Table 2-2: PLC library data types

Name	Version	Description
LCC_typeCPU1200	2.0.0	Control data record for the configuration control of a S7-1200 CPU.
LCC_typeCPU1500	2.0.0	Control data record for the configuration control of a S7-1500 CPU.
LCC_typeCPUET200SP	2.0.0	Control data record for the configuration control of a ET 200SP CPU.
LCC_typeET200AL	2.0.0	Control data record for the configuration control of a ET 200AL.
LCC_typeET200MP	2.0.0	Control data record for the configuration control of a ET 200 MP.
LCC_typeET200pro	2.0.0	Control data record for the configuration control of a ET 200 pro.
LCC_typeET200S	2.0.0	Control data record for the configuration control of a ET 200S.
LCC_typeET200SP_HF	2.0.0	Control data record for the configuration control of a ET 200SP HF.
LCC_typeET200SP_HF_AL	2.0.0	Control data record for the configuration control of an ET 200SP HF with bus adapter BA-Send and subordinate ET 200AL modules.
LCC_typeET200SP_ST	2.0.0	Control data record for the configuration control of a ET 200SP ST.
LCC_typeHeader	2.0.0	Header for each control data record.
LCC_typeSlotET200AL	2.0.0	Slot description of a ET 200AL.
LCC_typeSlotET200SP	2.0.0	Slot description of a ET 200SP.

Data blocks

Table 2-3: Blocks of the library

Name	Description
LCC_CtrlRec	Contains structures for the control data record for LCC_ReconfigSys (see section 2.3.3).

2.2 LCC_ConfigDevice

2.2.1 Description

Overview

The "LCC_ConfigDevice" block is a parameterizable function block for configuration control on a modular level. The control data record to be used is transferred as input/output parameter at parameter "dataRec" when the block is called.

Principle of operation

The block "LCC_ConfigDevice" transfers the data set 196 required for configuration control to the component addressed by "hwID".

This can be a central or a decentral periphery.

The block uses the system instruction "WRREC" to write the control data record.

"WRREC" works asynchronously - the write process can run over several cycles. For this reason, the write process in the "LCC_ConfigDevice" is implemented in a program loop.

If the write process is successfully completed, the program loop is terminated and the block "LCC_ConfigDevice" is left.

The following figure schematically shows the function sequence using the ET 200SP as an example:

Figure 2-1: Configuration control sequence

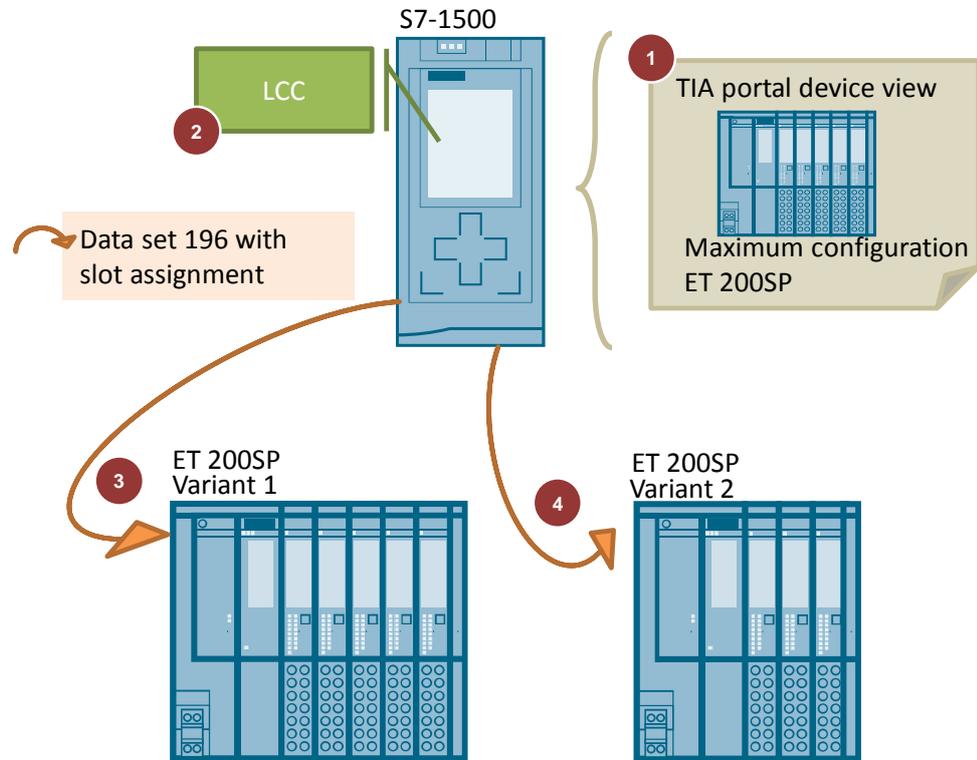


Table 2-4: Configuration control sequence

No.	Description
1.	The ET 200SP decentralized periphery is configured in the TIA portal in maximum configuration.
2.	The ET 200SP variants and the associated slot assignment are configured using the predefined data structures from the LCC library.
3.	The FB "LCC_ConfigDevice" writes the data set 196 with the corresponding slot assignment for variant 1 to the ET 200SP in one call.
4.	If a different module assignment is required, the FB is called again and the data set 196 with the corresponding slot assignment for variant 2 is written to the ET 200SP.

NOTE

The FB uses the system instruction "Serialize" internally. The version of this system function must be set to V2.0 or higher.

Calling the block

If you have activated the configuration control, the CPU or the interface module is not ready for operation without control data set.

The following regulation applies to the call location of the module:

- Centralized periphery: It is absolutely necessary to transfer a valid control data record already in the start-up OB (OB 100).
- Decentralized periphery: A call in the start-up OB is possible. A valid control data record can also be transferred in the cyclic user program.

Configuration control behavior

Initial commissioning:

If there is no valid control data record in the CPU or the interface module, the configuration control is not ready for operation.

In this case the CPU returns from the start to the STOP state.

With the decentralized periphery, all modules of the station have failed and the interface module is exchanging data.

Changes in the expansion:

When writing the control data record with modified expansion (modified configuration), the decentralized periphery fails (the cyclic data exchange is aborted) and then the station with the modified configuration is restarted.

When writing a control data set with changed configuration, the CPU reacts with an overall reset with subsequent start-up with this changed configuration.

2.2.2 Parameters

Figure 2-2: LCC_ConfigDevice

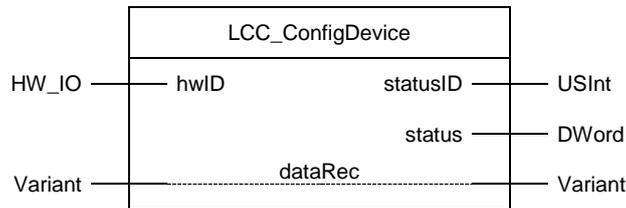


Table 2-5: Parameter of "LCC_ConfigDevice"

Name	P type	Data type	Comment
hwID	IN	HW_IO	Hardware identification of the device to be reconfigured. <ul style="list-style-type: none"> For CPU: 33 For decentralized periphery: Hardware identification of the interface module.
statusID	OUT	USInt	Specifies the source of the error.
status	OUT	DWord	Status/error code
dataRec	IN_OUT	Variant	Control data record transferred to the device

2.2.3 Control data record

The control data record informs the controller or the interface module which modules are missing in the actual configuration deviating from the configuration or which modules are located in a different slot deviating from the configuration.

The control data record is remanently stored in the CPU or in the interface module.

The tax record is split in two: it starts with a header area and then there are the controls.

In each element, the control elements describe which actual slot in the PROFINET device is assigned to the configured slot.

The header has the same structure for all control data records. The structure of the control elements, which - depending on the type of device - follow a fixed pattern, is different.

The library provides a PLC data type for each device type. Information concerning the data types is provided in section [2.4](#)

Note When parameterizing the control data set, observe the rules for configuration control (see section [3.1](#)).

2.2.4 Integration into the user project

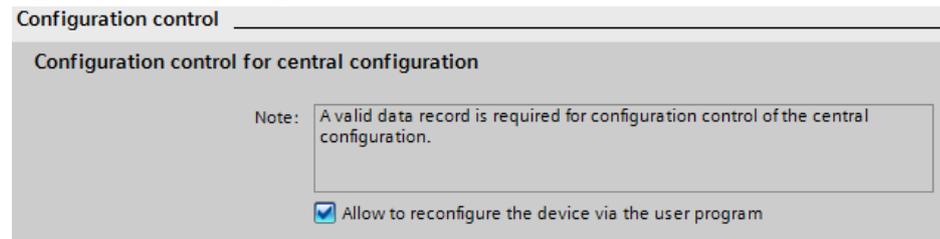
For general information on dealing with libraries in the TIA Portal, see section 3.1.

Requirement

The "Allow to reconfigure the device via the user program" property is enabled for each device.

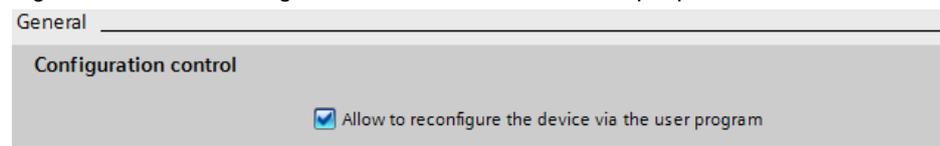
For CPUs the property can be found in the section "Configuration control":

Figure 2-3 Activate configuration control for CPU



For decentralized peripherals the property can be found in the area "Module parameters > General"

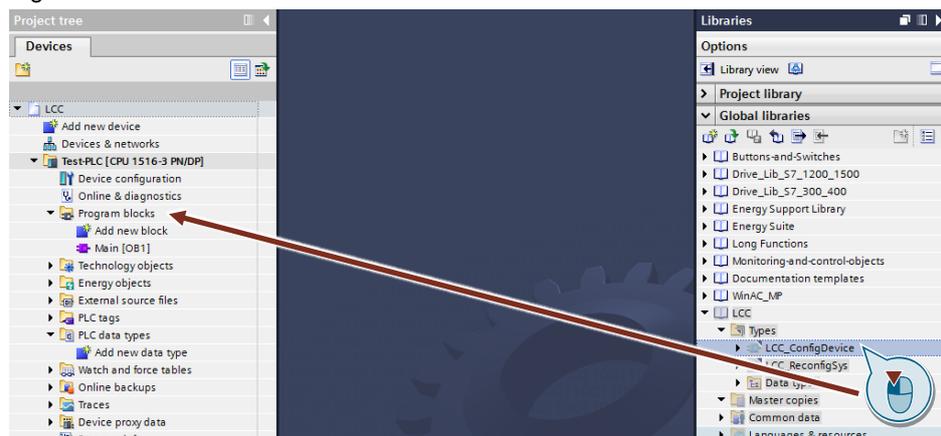
Figure 2-4: Activate configuration control for decentralized peripherals



Procedure

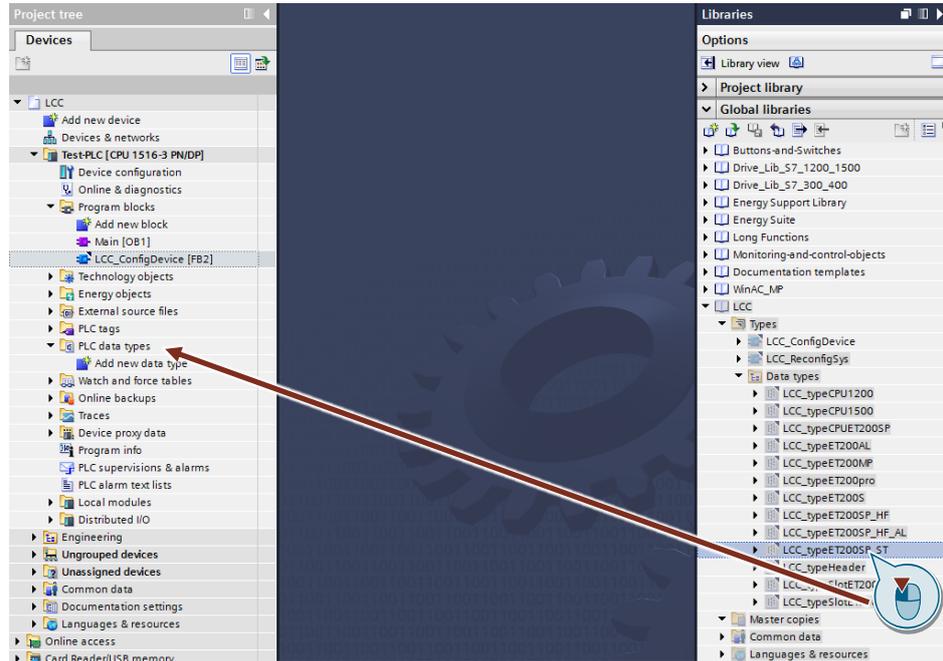
1. Open your existing TIA Portal project.
2. Open the library "LCC".
3. Drag and drop the FB "LCC_ConfigDevice" from the folder "Types" of the library into the folder "Program blocks" of your CPU.

Figure 2-5



4. Drag and drop the respective PLC data type for your device from the "Types" folder of the library into the "PLC data types" folder of your CPU.

Figure 2-6



5. Create a DB for the tax records and open it.
6. For each configuration, create a variable of the respective PLC data type for your device.

Figure 2-7

DataConfigCtrl		
	Name	Data type
1	Static	
2	recET200Max	*LCC_typeET200SP_ST
3	recET200Opt1	*LCC_typeET200SP_ST
4	recET200Opt2	*LCC_typeET200SP_ST

Alternatively, you can also create an array for the configurations:

Figure 2-8

DataConfigCtrl		
	Name	Data type
1	Static	
2	configurations	Array[0..2] of *LCC_typeE...
3	configurations[0]	*LCC_typeET200SP_ST
4	configurations[1]	*LCC_typeET200SP_ST
5	configurations[2]	*LCC_typeET200SP_ST

- Parameterize the slots according to your configurations. Leave the header area unchanged.

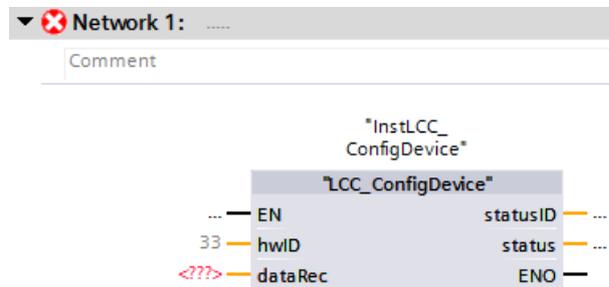
Figure 2-9

DataConfigCtrl			
	Name	Data type	Start value
1	Static		
2	recET200Max	*LCC_typeET200SP_ST*	
3	recET200Opt1	*LCC_typeET200SP_ST*	
4	recET200Opt2	*LCC_typeET200SP_ST*	
5	header	*LCC_typeHeader*	
6	slots	Array[1..33] of *LCC_type...	
7	slots[1]	*LCC_typeSlotET200SP*	
8	actSlotNum...	USInt	1
9	slotProperty	USInt	0
10	slots[2]	*LCC_typeSlotET200SP*	
11	actSlotNum...	USInt	0
12	slotProperty	USInt	0
13	slots[3]	*LCC_typeSlotET200SP*	
14	actSlotNum...	USInt	2
15	slotProperty	USInt	0
16	slots[4]	*LCC_typeSlotET200SP*	

In this configuration, the module configured in slot 2 is not present. In this configuration, the module configured in slot 2 is not present.

- Open the OB in which the configuration control is to be carried out (for central setup always OB 100, see section [2.2.1](#) and [3.2](#)).
- Drag and drop the FB "LCC_ConfigDevice" into an empty network and create an instance.

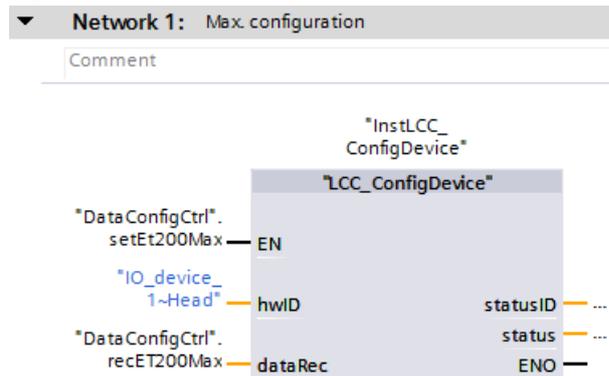
Figure 2-10



10. Connect the module:

- Create the condition for controlling the respective configuration at input "EN".
- Create the hardware identification of the device to be reconfigured at the "hwID" input (always 33 for CPU).
- Create the control data record of the respective configuration at the "dataRec" input.

Figure 2-11

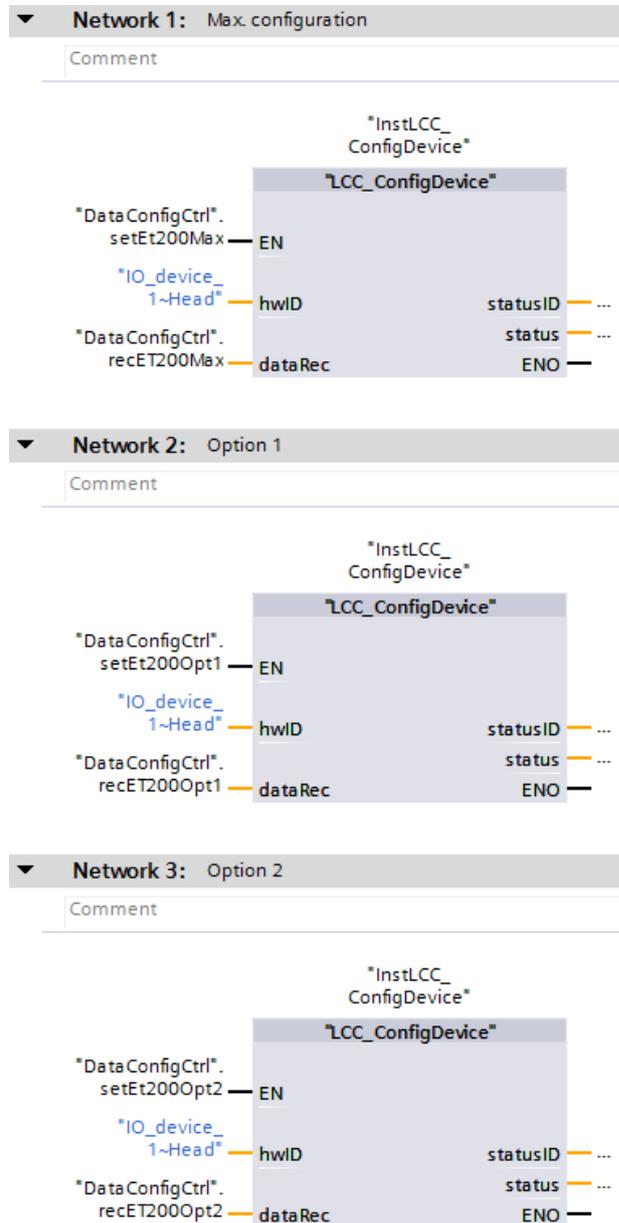


Note

If you call the FB in the cyclic program, make sure that the block is not executed cyclically, but only if the device is to be reconfigured.

- Repeat steps 10 to 11 for each additional configuration. You can use the same instance.

Figure 2-12



2.2.5 Error handling

The FB "LCC_ConfigDevice" outputs status and error codes at the output "status". The FB internally uses the system instruction "WRREC" and outputs the error codes of this instruction at the parameter "status" in the event of an error (error = true).

The source of the error is specified by the parameter "statusID" as follows:

- statusID = 0: Internal status code
- statusID = 1: System instruction error "WRREC"

Internal status code (statusID = 0)

Table 2-6: Status code internal error

Status	Meaning
16#0000_0000	Instruction was executed without errors.
16#0000_8001	Control data record at parameter "dataRec" is not known.

Error codes of the system instruction "WRREC" (statusID = 1)

The following table lists the most important error codes of the system instruction "WRREC":

Table 2-7: Error codes of the system instruction "WRREC"

Status	Meaning	Remedy / notes
16#Dx80_B1xx	Invalid length; The length specification in the control data record is incorrect.	The length and pattern of the area referenced by the parameter "dataRec" must match the data structure stored for the component referenced by "hwID".
16#Dx80_B5xx	Configuration control parameters not assigned.	Activate the configuration control: <ul style="list-style-type: none"> • All (except ET 200S): Parameter "Enable reconfiguration of the device via user program" (range "configuration control"). • ET 200S: Parameter "Options handling" (area "Assembly parameters").
16#Dx80_B6xx	DP slave or module denies access	The data structure referenced by the parameter "OPTION_STRUCT" and the component referenced by "ID" are not compliant. Use the data structure provided for the component.
16#Dx80_E2xx	Control data record was transferred in the wrong OB context. The control data record must be transferred in the start-up program.	For configuration control in the central setup, the control data record must be transferred in the start-up OB (OB 100).
16#Dx80_B8xx	Parameter error; module reports invalid parameters.	An error in the parameterization of the slot allocation was detected. Check them for errors.
All other status codes of the system instruction "WRREC" can be found in the TIA Portal Information System.		

2.3 LCC_ReconfigSys

2.3.1 Description

General Information

The FB "LCC_ReconfigSys" is a capsule FB for the S7-1500 which successively calls the system instruction "ReconfigIOSys" in its three modes:

- Mode 1: Deactivation of all IO-Devices in the IO-System.
- Mode 2: Transmission of the control data record "ctrlRec" to the IO-Controller.
- Mode 3: Activation of the IO devices in the IO system according to the transferred control data record.

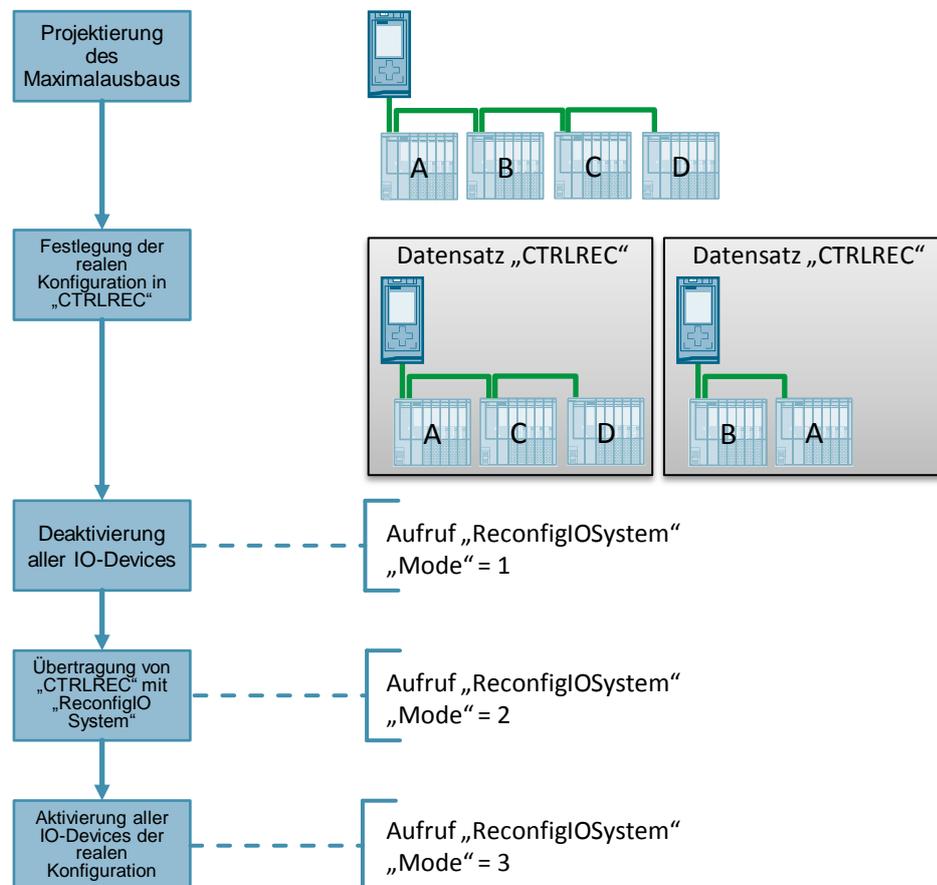
System instruction "ReconfigIOSystem"

The system instruction "ReconfigIOSystem" transmits a control data record to the PROFINET interface of the IO-Controller.

With the system instruction, the topology of the IO system can be adapted to the needs of the application by means of optional IO devices and specified port connections, even during operation, if necessary.

The following figure shows the principle of the system instruction "ReconfigIOSystem".

Figure 2-13: Principle of the system instruction "ReconfigIOSystem"



"ReconfigIOSystem" is an asynchronous system instruction. The complete processing of the order takes place via several calls in the different modes (parameter "MODE").

CAUTION Depending on the number of optional IO devices or port connections via the user program, reconfiguration can take a long time.

2.3.2 Parameters

Figure 2-14: LCC_ReconfigSys

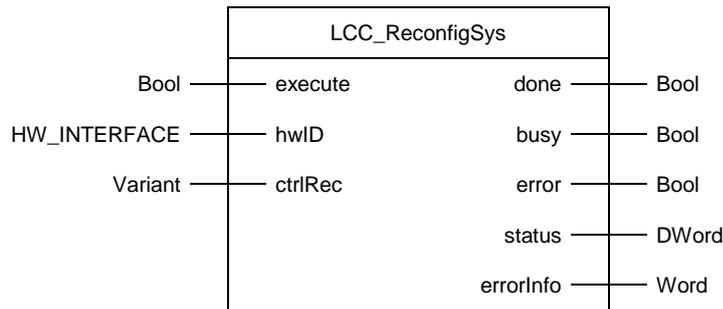


Table 2-8: Parameter of "LCC_ReconfigSys"

Name	P type	Data type	Comment
execute	IN	Bool	Request to reconfigure the IO System
hwID	IN	HW_INTERFACE	Hardware identification of the PROFINET interface of the IO-Controller
ctrlRec	IN	Variant	Control data record to reconfigure the IO system
done	OUT	Bool	Order completed
busy	OUT	Bool	Order is being executed
error	OUT	Bool	An error has occurred
status	OUT	DWord	Parameter "STATUS" of the system instruction "ReconfigIOSystem".
errorInfo	OUT	Word	Parameter "ERR_INFO" of the system instruction "ReconfigIOSystem". Contains the hardware ID of the IO device that caused the error.

2.3.3 Control data record

The system instruction "ReconfigIOSystem" expects the control data record in the form of an Array of Word or Array of UInt.

The library provides the DB "LCC_CtrlRec" with a prefabricated structure for easy creation of the control data record.

The FB "LCC_ReconfigSys" converts the control data record at the parameter "ctrlRec" into an array of UInt. You can therefore use an Array of Word/UInt or one of the prefabricated structures from the DB "LCC_CtrlRec" for the tax record at the parameter "ctrlRec".

The following table shows the structure of the control data record in the DB "LCC_CtrlRec".

Control data record setup

Table 2-9: Structure of the control data record

Name	Data type	Description
version	Word	Version of the control data record High Byte: 01 Low Byte: 00
numOptDevices	UInt	Number of optional IO devices used in the actual IO system. If no optional IO-Devices are available, "0" must be entered.
actOptDevices	Array[0..n] of HW_DEVICE	Hardware identifiers of the IO devices that are used in the actual IO system. IO devices that are not listed remain deactivated. Use the system constant of the IO-Device (data type "HW_Device").
numPortInterconnections	UInt	Number of port connections to be set. If no port connection is set, "0" must be entered.
portInterconnections	Array[0..m] of Struct	Port connections that are to be set. If no port connection is set, the array can be deleted.
portLocal	HW_INTERFACE	HW identifier of the local port. Use the system constant of the connected port (data type "HW_Interface").
portRemote	HW_INTERFACE	HW ID of the partner port. Use the system constant of the connected port (data type "HW_Interface").

Note Port connections that you have configured in the topology cannot be changed via the user program.
Port connections that have neither been configured in the topology nor set via the user program receive the declaration "Any partner" when the IO-Device is activated.

2.3.4 Integration into the user project

For general information on dealing with libraries in the TIA Portal, see section [3.1](#).

Requirements

- The affected IO-Devices were configured as optional IO-Devices in the hardware configuration.
- The port connections are configured in the topology or the partner ports are set to "Set partner by user program".

Procedure

1. Open your existing TIA Portal project.
2. Open the library "LCC".
3. Drag and drop the FB "LCC_ReconfigSys" from the folder "Types" of the library into the folder "Program blocks" of your CPU.

Figure 2-15



4. Drag and drop the DB "LCC_CtrlRec" from the folder "Master copies" of the library into the folder "Program blocks" of your CPU.
5. Open the DB "LCC_CtrlRec".
6. Enter as start value of the variable "numOptDevices" the number of IO-Devices which are to be activated in this configuration.
7. Adjust the size of the array "optDevices" to the number of IO-Devices to be activated in this configuration.

- Adjust the size of the array "optDevices" to the number of IO-Devices to be activated in this configuration. You can do this symbolically or absolutely.

Figure 2-16

LCC_CtrlRec			
	Name	Data type	Start value
1	Static		
2	ctrlRec	Struct	
3	version	Word	16#0100
4	numOptDevices	UInt	2
5	optDevices	Array[0..1] of HW_...	
6	optDevices[0]	HW_DEVICE	"IO_device_2-IODevice"
7	optDevices[1]	HW_DEVICE	266
8	numPortInterconn...	UInt	0
9	portInterconnectio...	Array[0..1] of Struct	

- If you have not configured a topology, enter the number of port connections to be set as the start value of the variable "numPortInterconnections".
- Adjust the size of the array "portInterconnections" to the number of port connections to be set.
- Specify the hardware identifiers of the ports that are interconnected in this configuration. You can do this symbolically or absolutely.

Figure 2-17

LCC_CtrlRec			
	Name	Data type	Start value
1	Static		
2	ctrlRec	Struct	
3	version	Word	16#0100
4	numOptDevices	UInt	2
5	optDevices	Array[0..1] of HW_...	
6	optDevices[0]	HW_DEVICE	"IO_device_2-IODevice"
7	optDevices[1]	HW_DEVICE	266
8	numPortInterconn...	UInt	2
9	portInterconnectio...	Array[0..1] of Struct	
10	portInterconne...	Struct	
11	portLocal	HW_INTERFACE	"Local~PROFINET_interface_1~Port_1"
12	portRemote	HW_INTERFACE	"IO_device_2~PROFINET_interface~Port_1"
13	portInterconne...	Struct	
14	portLocal	HW_INTERFACE	261
15	portRemote	HW_INTERFACE	271

If you have configured a topology and do not want to set port connections in the user program, you can delete the array.

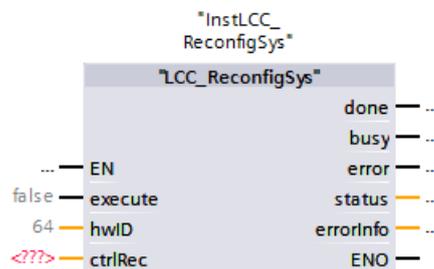
12. Copy the structure and adjust the start values for each further configuration.

Figure 2-18

LCC_CtrlRec		
	Name	Data type
1	Static	
2	ctrlRecMax	Struct
3	ctrlRecWithoutDrive	Struct
4	ctrlRecXYZ	Struct
5	<Add new>	

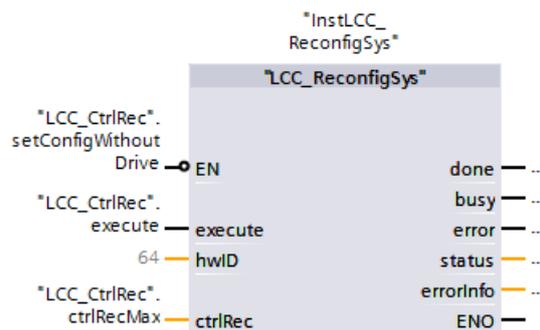
13. Open the block in which the reconfiguration of the IO system is to be carried out.
14. Drag and drop the FB "LCC_ReconfigSys" into an empty network and create an instance.

Figure 2-19



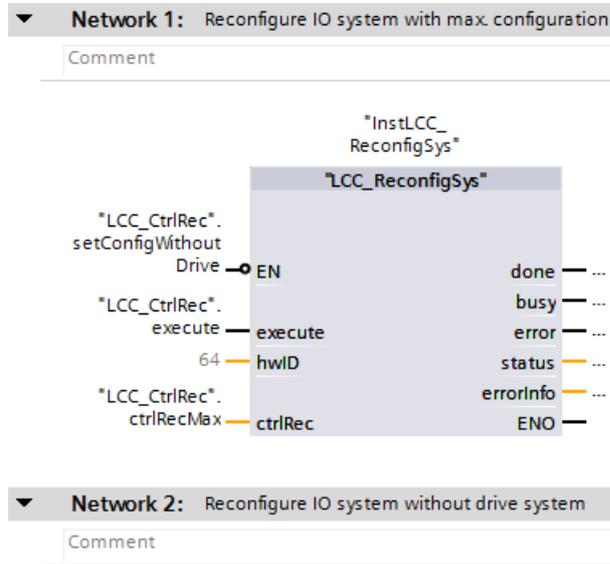
15. Connect the module:
 - Create the condition at input "EN" to control the respective configuration.
 - Create the condition at the "execute" input to execute the reconfiguration.
 - Create the hardware identification of the PROFINET interface of the IO-Controller at input "hwID".
 - Create the control data record of the respective configuration at input "ctrlRec".

Figure 2-20



- Repeat steps 14 to 15 for each additional configuration. You can use the same instance.

Figure 2-21



2.3.5 Error handling

The FB "LCC_ReconfigSys" outputs the status codes of the system instruction "ReconfigIOSystem" at the parameter "status".

The following table lists the most important status codes of the system instruction "ReconfigIOSystem":

Table 2-10: Error codes of the system instruction "ReconfigIOSystem"

Status	Meaning
16#0000_0000	Order completed without errors
16#0070_0000	No order active
16#0070_0100	First call of the instruction
16#0070_0200	Follow-up call of the instruction (instruction still running, "busy" = true)
16#0080_9100	The parameter "hwID" does not address a PROFINET interface (does not exist or has the wrong type, e.g. PROFIBUS interface). The PROFINET interface does not support configuration control of IO systems.
16#0080_Cx00	Temporary error, e.g. due to short-term lack of resources.
16#DF80_AAxx	Error in the structure of the control data record.
16#DF80_B6xx	Configuration control not possible because either no optional IO device was configured or no port was parameterized with "Partner set in user program". This configuration is a prerequisite for calling the instruction.
16#0080_9400	Pass-through error codes of the internally called instruction D_ACT_DP.
16#0080_A000	
16#0080_A700	
16#0080_AA00	
16#0080_AB00	
16#0080_AC00	

Note

For more information on the status codes of the "ReconfigIOSystem" system instruction, see the TIA Portal Information System.

2.4 PLC-Datentypes

2.4.1 LCC_typeHeader

"LCC_typeHeader" describes the predefined header area of tax record 196. This PLC data type is used in the device-specific PLC data types and preassigned with the corresponding start values for each device.

The header area consists of the following parameters:

Table 2-11: Parameters of the header area

Name	Data type	Description
blockLength	USInt	Length of the control data record: 4 bytes + (number of slots * number of bytes per slot)
blockID	USInt	Number of the control data record: 196
type	USInt	Identifier for the assembly
typeSub	USInt	Further identifier for the assembly

The coding of the parameters "type" and "typeSub" is shown in the following table:

Table 2-12: Coding of the parameters "type" and "typeSub".

Module	type	typeSub
ET 200S/ET 200pro	1	0
ET 200SP/ET 200SP CPU	2	0
ET 200AL	2	1
ET 200MP	3	0
S7-1500	4	0
S7-1200	5	0

2.4.2 LCC_typeCPU1200

"LCC_typeCPU1200" describes the control data record for the central structure of a S7-1200 CPU.

Control data record is structured as follows:

Table 2-13: Control data record "LCC_typeCPU1200"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots	Array[1..9] of USInt	Control elements for the signal board and the peripheral modules of the CPU (slot 1): <ul style="list-style-type: none"> • 0: Configured module is not available • 1-9: Actual position of the configured slot • 255: Device configuration contains no module at this slot
slotsComm	Array[101..103] of USInt	Control elements for the communication modules: <ul style="list-style-type: none"> • 101-103: Communication assembly is present (a position change is not supported for communication assemblies) • 255: Device configuration contains no module at this slot

Note

For more information on configuration control with the S7-1200, refer to the System Manual:

<https://support.industry.siemens.com/cs/ww/en/view/109759862/90255715723>

2.4.3 LCC_typeCPU1500

"LCC_typeCPU1500" describes the control data record for the central structure of a S7-1500 CPU.

Control data record is structured as follows:

Table 2-14: Control data record "LCC_typeCPU1500"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots	Array[0..31] of USInt	Control elements: <ul style="list-style-type: none"> 0 to maximum slot Actual position of the configured slot 255: Module is not available

Note The CPU is always plugged into slot 1 and is not an element of the configuration control, but controls it. "slots[1]" must always have the value "1".

Note For more information on configuration control with the S7-1500, refer to the System Manual:
<https://support.industry.siemens.com/cs/ww/en/view/59191792/105312769803>

2.4.4 LCC_typeCPUET200SP

"LCC_typeCPUET200SP" describes the control data record for the central structure of an ET 200SP CPU.

Control data record is structured as follows:

Table 2-15: Control data record "LCC_typeCPUET200SP"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots	Array[1..66] of LCC_typeSlotET200SP	slots[1]: Element for the CPU (slot 1): Always 1 slots[2..66]: Control elements for the peripheral modules

Note The CPU is always plugged into slot 1 and is not an element of the configuration control, but controls it. "slots[1]" must always have the value "1".

The control elements of the slots are defined in the PLC data type "LCC_typeSlotET200SP" and consist of the following parameters:

Table 2-16: Structure "LCC_typeSlotET200SP"

Name	Description
actSlotNumber	Assignment of configured slot to actual slot: <ul style="list-style-type: none"> 0: Configured module is not available 1 to maximum slot: Actual position of the configured slot 128 + slot: Empty slot with BU cover + actual position of the configured slot (see note)
slotProperty	Properties of the slot: <ul style="list-style-type: none"> 0: Acceptance of the configured parameters 1: Opening a new potential group (replacement of a BU...B by BU...D)

Note When encoding an empty space (value: 128) also the slot number of the empty slot. A combination of empty space and non-existent module is not permitted.

2.4.5 LCC_typeET200AL

"LCC_typeET200AL" describes the control data record for the decentralized periphery ET 200AL.

Control data record is structured as follows:

Table 2-17: Control data record "LCC_typeET200AL"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
connection1	Struct	Control elements for "ET_connection_1"
interface	LCC_typeSlotET200AL	Control elements for the topology module "ET_connection_1"
slots	Array[2..17] of LCC_typeSlotET200AL	Control elements for slots 2 to 17
connection2	Struct	Controls for ET_connection_2
interface	LCC_typeSlotET200AL	Controls for the topology module "ET_connection_2"
slots	Array[19..34] of LCC_typeSlotET200AL	Control elements for slots 19 to 34

Note

The slots for "ET_connection_1" and "ET_connection_2" are statically defined in the GSD file. "ET_connection_1" is always fixed at slot 1 and "ET_Connection_2" at slot 18.
 "connection1.actSlotNumber" must always have the value "1" and "connectio2.actSlotNumber" must always have the value "18".

The control elements of the slots are defined in the PLC data type "LCC_typeSlotET200AL" and consist of the following parameters:

Table 2-18: Setup "LCC_typeSlotET200AL"

Name	Description
actSlotNumber	Assignment of configured slot to actual slot: <ul style="list-style-type: none"> 0: Configured module is not available 2 to 17 or 19 to maximum slot: Actual position of the configured slot (1 and 18 are reserved for the topology modules)
reserved	Reserved

Note

Further information on configuration control with the ET 200AL can be found in the manual:

<https://support.industry.siemens.com/cs/ww/en/view/89254965/94009654923>

2.4.6 LCC_typeET200MP

"LCC_typeET200MP" describes the control data record for the decentralized periphery ET 200MP.

Control data record is structured as follows:

Table 2-19: Control data record "LCC_typeET200MP"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slot0	USInt	Control element for the power module (slot 0): <ul style="list-style-type: none"> 0: As configured 127: Configured module is not available
slots	Array[2..31] of USInt	Control elements for the peripheral modules: <ul style="list-style-type: none"> 2 to maximum slot: Actual position of the configured slot 127: Configured module is not available

Note The interface module (slot 1) is not an element of the configuration control, but controls it.

Note Further information on configuration control with the ET 200MP can be found in the system manual:

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

2.4.7 LCC_typeET200pro

"LCC_typeET200pro" describes the control data record for the decentralized periphery ET 200pro.

Control data record is structured as follows:

Table 2-20: Control data record "LCC_typeET200pro"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots[1]	Array[1..17] of USInt	Control element for the power module (slot 1): <ul style="list-style-type: none"> 0: Configured module is not available 1: Module is available
slots[2..17]		Control elements for the peripheral modules: <ul style="list-style-type: none"> 0: Configured module is not available 1 to maximum slot: Actual position of the configured slot 128 + slot: Reserve module permitted + actual Slot

Note The interface module (slot 1) is not an element of the configuration control, but controls it.

2.4.8 LCC_typeET200S

"LCC_typeET200S" describes the control data record for the ET 200S decentralized periphery.

Control data record is structured as follows:

Table 2-21: Control data record "LCC_typeET200MP"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots[1]	Array[1..63] of USInt	Control element for the power module (slot 1): Always 1.
slots[2..63]		Control elements for the peripheral modules: <ul style="list-style-type: none"> • 0: Configured module is not available • 2 to maximum slot: Actual position of the configured slot • 128 + slot: Reserve module permitted + actual Slot

Note The interface module (slot 1) is not an element of the configuration control, but controls it.

Note Further information on configuration control with the ET 200S can be found in the system manual:

<https://support.industry.siemens.com/cs/ww/en/view/30598131/23717484555>

2.4.9 LCC_typeET200SP_HF

"LCC_typeET200SP_HF" describes the control data record for the decentralized periphery ET 200SP HF.

Control data record is structured as follows:

Table 2-22: Control data record "LCC_typeET200SP_HF"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots	Array[1..65] of LCC_typeSlotET200SP	Control elements for slots 1 to 65

Note The interface module (slot 0) is not an element of the configuration control, but rather controls it.

The control elements of the slots are defined in the PLC data type "LCC_typeSlotET200SP" and consist of the following parameters:

Table 2-23: Structure "LCC_typeSlotET200SP"

Name	Description
actSlotNumber	Assignment of configured slot to actual slot: <ul style="list-style-type: none"> 0: Configured module is not available 1 to maximum slot: Actual position of the configured slot 128 + slot: Empty slot with BU cover + actual position of the configured slot (see note)
slotProperty	Properties of the slot: <ul style="list-style-type: none"> 0: Acceptance of the configured parameters 1: Opening a new potential group (replacement of a BU...B by BU...D)

Note When encoding an empty space (value: 128) also the slot number of the empty slot. A combination of empty space and non-existent module is not permitted.

Note Further information on configuration control with the ET 200SP can be found in the manual:

<https://support.industry.siemens.com/cs/ww/en/view/58649293/95505151243>

2.4.10 LCC_typeET200SP_HF_AL

"LCC_typeET200SP_HF_AL" describes the control data record for the ET 200SP HF decentralized periphery with ET 200AL extension.

Control data record is structured as follows:

Table 2-24: Control data record "LCC_typeET200SP_HF"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slotsET200SP	Array[1..65] of LCC_typeSlotET200SP	Control elements for the peripheral modules of the ET 200SP (see Table 2-23)
slotsET200AL	Array[66..81] of LCC_typeSlotET200AL	Control elements for the peripheral modules of the ET 200AL expansion (see Table 2-18)

Note The interface module (slot 0) is not an element of the configuration control, but rather controls it.

The control elements of the ET 200SP are described in [table 2-24](#).

The control elements of the ET 200AL extension are defined in the PLC data type "LCC_typeSlotET200AL" and consist of the following parameters:

Table 2-25: Setup "LCC_typeSlotET200AL"

Name	Description
actSlotNumber	Assignment of configured slot to actual slot: <ul style="list-style-type: none"> 0: Configured module is not available 66 to 81: Actual position of the configured slot
reserved	Reserved

Note Further information on configuration control with the ET 200SP can be found in the manual:

<https://support.industry.siemens.com/cs/ww/en/view/58649293/95505151243>

2.4.11 LCC_typeET200SP_ST

"LCC_typeET200SP_ST" describes the control data record for the decentralized periphery ET 200SP ST.

Control data record is structured as follows:

Table 2-26: Control data record "LCC_typeET200SP_HF"

Name	Data type	Description
header	LCC_typeHeader	Header area (see section 2.4.1)
slots	Array[1..33] of LCC_typeSlotET200SP	Control elements for the peripheral modules

Note The interface module (slot 0) is not an element of the configuration control, but rather controls it.

The control elements of the slots are defined in the PLC data type "LCC_typeSlotET200SP" and consist of the following parameters:

Table 2-27: Setup "LCC_typeSlotET200SP"

Name	Description
actSlotNumber	Assignment of configured slot to actual slot: <ul style="list-style-type: none"> 0: Configured module is not available 1 to maximum slot: Actual position of the configured slot 128 + slot: Empty slot with BU cover + actual position of the configured slot (see note)
slotProperty	Properties of the slot: <ul style="list-style-type: none"> 0: Acceptance of the configured parameters 1: Opening a new potential group (replacement of a BU...B by BU...D)

Note When encoding an empty space (value: 128) also the slot number of the empty slot. A combination of empty space and non-existent module is not permitted.

Note Further information on configuration control with the ET 200SP can be found in the manual:

<https://support.industry.siemens.com/cs/ww/en/view/58649293/95505151243>

3 Useful information

3.1 Library in the TIA Portal

Most of the blocks are stored as types in the library. Thus the modules are versioned and can use the following advantages:

- Central update function for library elements
- Versioning of library elements

Note

Information on the general handling of libraries can be found in the Programming Guide for S7-1200/1500 in the section "Libraries":

<https://support.industry.siemens.com/cs/ww/en/view/81318674>

Note

All blocks in the library were created according to the programming style guide:

<https://support.industry.siemens.com/cs/ww/en/view/81318674>

For more information on libraries, visit the TIA Portal:

- How do you open libraries in STEP 7 (TIA Portal)?
<https://support.industry.siemens.com/cs/ww/en/view/37364723>
- In less than 10 minutes, TIA Portal: Time Savers – Global libraries
<https://support.industry.siemens.com/cs/ww/en/view/78529894>
- Which elements from STEP 7 (TIA Portal) can be stored in a library as a type or as a copy template?
<https://support.industry.siemens.com/cs/ww/en/view/109476862>
- How can you automatically open a global library when starting TIA Portal V13 or higher and use it e.g. as a corporate library?
<https://support.industry.siemens.com/cs/ww/en/view/100451450>

3.2 Rules for configuration control

In this section you will find the rules for configuration control that must be observed when using the LCC library described here.

General rules

- Slot entries in the control data set outside the configured target configuration are ignored.
- The tax record can be shortened. The entries up to the last slot of the current nominal configuration must be contained.
- Each actual slot may only be present once in the control data record.
- An actual slot may only be assigned to one configured slot.
- The control data record is retentively stored in the CPU or the interface module.
- Diagnostic messages of the modules always refer to the maximum configuration according to the hardware configuration.

Rules for the S7-1500 with firmware 1.5 and 1.6

- No CP/CM may be plugged into the central configuration. If you have configured a module of this type and have activated the configuration control, you cannot load the configuration.
- If you have activated the configuration control, the CPU is not ready for operation without control data record.
The control data record must already be transferred in the start-up OB (OB 100).
- For addressing, use the hardware identification 33 (decimal) to write the control data record (see section [2.2.2](#)).
- The control data record is retentively stored in the CPU, so that with unchanged configuration no rewriting of the control data record 196 is necessary at restart.
Before commissioning an overall reset of the CPU is recommended in order to delete a possibly existing control data record.
- System power supply modules (PS) can also be reconfigured via the configuration controller.
For a system power supply module (PS) in slot 0, it is recommended not to reconfigure.

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, application examples and videos – all information is accessible with just a few mouse clicks:

<https://support.industry.siemens.com>

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:

www.siemens.com/industry/supportrequest

SITRAIN – Training for Industry

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

www.siemens.com/sitrain

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:

<https://support.industry.siemens.com/cs/sc>

Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:

<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 SIMATIC S7 S7-1200 Automation System https://support.industry.siemens.com/cs/ww/en/view/109759862
\4\	System Manual SIMATIC S7-1500, ET 200MP Automation System https://support.industry.siemens.com/cs/ww/en/view/59191792
\5\	System Manual SIMATIC ET 200SP Decentralized Peripheral System https://support.industry.siemens.com/cs/ww/en/view/58649293
\6\	Device Manual SIMATIC Decentral Periphery ET 200S Interface Module IM151-3 PN https://support.industry.siemens.com/cs/ww/en/view/30598131
\7\	System Manual SIMATIC ET 200AL Decentralized Peripheral System https://support.industry.siemens.com/cs/ww/en/view/89254965
\8\	PROFINET Function Manual with STEP 7 V15 https://support.industry.siemens.com/cs/ww/en/view/49948856

4.3 Change history

Table 4-2: Change history

Version	Date	Change
V1.0	09/2014	First version
V1.1	11/2015	PLC data types for ET 200SP ST, ET 200SP HF, ET 200SP HF + ET 200AL added
V1.2	03/2017	Upgraded to STEP 7 V14
V2.0	11/2018	Library renamed to "LCC" Library adapted according to programming styleguide for S7-1200/1500 Blocks and PLC data types versioned as types