

# Learn-/Training Document

Siemens Automation Cooperates with Education (SCE) | From Version V14 SP1

**TIA Portal Module 031-410** Basics of Diagnostics with SIMATIC S7-1200

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#### Matching SCE Trainer Packages for these Learn-/Training Document

- SIMATIC S7-1200 AC/DC/RELAY (set of 6) "TIA Portal" Order no.: 6ES7214-1BE30-4AB3
- SIMATIC S7-1200 DC/DC/DC (set of 6) "TIA Portal" Order no.: 6ES7214-1AE30-4AB3
- Upgrade SIMATIC STEP 7 BASIC V14 SP1 (for S7-1200) (set of 6) "TIA Portal" Order no.: 6ES7822-0AA04-4YE5

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We wish to thank the TU Dresden, particularly Prof. Dr.-Ing. Leon Urbas and the Michael Dziallas Engineering Corporation and all other involved persons for their support during the preparation of this Learn-/Training Document.

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# **Basics of Diagnostic Functions**

# 1 Goal

In this module, the reader will become acquainted with the tools that support troubleshooting.

This module will present diagnostic functions that, for example, you can test with the TIA project from the SCE\_EN\_031-100\_FC-Programming with SIMATIC S7-1200 module.

The SIMATIC S7 controllers listed in Chapter 3 can be used.

# 2 Prerequisite

This chapter builds on the hardware configuration of SIMATIC S7 CPU1214C. However, other hardware configurations that have digital input and output boards can be used. For this chapter, you can use the following project, for example:

SCE\_EN\_031\_100\_FC-Programming\_S7-1200\_R1504.zap14

## 3 Required hardware and software

- 1 Engineering station: requirements include hardware and operating system (for additional information, see Readme on the TIA Portal Installation DVDs)
- 2 SIMATIC STEP 7 Basic software in TIA Portal as of V14 SP1
- 3 SIMATIC S7-1200 controller, e.g. CPU 1214C DC/DC/DC with ANALOG OUTPUT SB1232 signal board, 1 AO Firmware as of V4.2.1

Note: The digital inputs should be fed out to a control panel.

4 Ethernet connection between engineering station and controller



# 4 Theory

## 4.1 Fault diagnostics and hardware faults

Faults can be caused by a variety of things.

For faults that occur after a changeover to RUN, there are two error patterns.

1. The CPU goes to or stays in the STOP operating state. The yellow STOP LED lights up and other indicator LEDs light up on the CPU, power supply unit, IO modules or bus modules.

A CPU fault is present in this case. For example, a module in the automation system might be defective or have an incorrect parameter assignment or a bus system fault might be present.

An interruption analysis will be performed in this case by evaluating the hardware diagnostics and by reading the module information from the diagnostic buffer of the CPU.

2. The CPU is in a faulty RUN operating state. The green RUN LED lights up and other indicator LEDs light up or flash on the CPU, power supply unit, IO modules or bus modules.

In this case, a fault may be present in the IO devices or power supply.

A visual check will be performed initially to narrow down the fault area. The indicator LEDs on the CPU and IO devices will be evaluated. The diagnostic data of the faulty IO and bus modules will be read from the hardware diagnostics. In addition, a fault analysis can be performed using a watch table on the programming device.

## 4.2 Hardware diagnostics

The device view in online mode of the TIA Portal gives you a quick overview of the configuration and system status of the automation system.



Figure 1: Online view of device configuration

## 4.3 Diagnostics for program blocks

The project tree window of the TIA Portal in online mode gives you an overview of the programmed blocks of the user program. A comparison of the program blocks used offline and online is displayed with the help of diagnostic symbols.



Figure 2: Online view of the Main [OB1] block

# 5 Task

The following diagnostic functions will be shown and tested in this chapter:

- Diagnostic symbols in the online view of the TIA Portal
- Device diagnostics with module information
- Offline/online comparison
- Monitoring and modifying tags
- Forcing tags

# 6 Planning

The diagnostic functions will be performed using a finished project as an example.

A project in the TIA Portal that was previously downloaded to the controller should be open for this.

In our case, once you have opened the TIA Portal, you will retrieve a previously created project that was archived and download it to the associated controller.

You can then start implementing the diagnostic functions in the TIA Portal.

## 6.1 Online interface

Online diagnostics can only be performed when the correct communication connection to the CPU has been established. We connect via Ethernet/PROFINET in this case.

When going online, you must therefore set the appropriate interfaces for your automation system.

Extended download to	device		_				>
	Configured access no	odes of "CPU_1214C"					
	Device	Device type	Slot	Туре	Address	Subnet	
	CPU_1214C	CPU 1214C DC/D	1 X1	PN/IE	192.168.0.1	PN/IE_1	
		Type of the PG/PC inter	face:	PN/IE		•	
		PG/PC inter	face:	Intel(R)	Ethernet Connection (4) I2	219-LM 🔻	
	Cor	nnection to interface/su	bnet:	PN/IE_1			) 🕐
		1st gate	eway:			v	
	Select target device:				Show all compatib	le devices	×
	Device	Device type	Interf	ace type	Address	Target devic	e
	CPU_1214C	CPU 1214C DC/D	PN/IE		192.168.0.1	CPU_12140	
	-	-	PN/IE		Access address	-	
Flash LED							
Online status information:					Display only erro	<u>S</u> tart : or messages	search
🚽 Connection establish	ed to the device with a	address 192.168.0.1.					^
Scan completed. 1 co	ompatible devices of 1	accessible devices fou	nd.				=
Scan and information	rmation						
	retire for compreteo.						
					Lo	ad <u>C</u> a	ncel

Figure 3: Connecting online

## 7 Structured step-by-step instructions

You will find instructions on how to carry out planning below. If you already have a good understanding of everything, it will be sufficient to focus on the numbered steps. Otherwise, simply follow the detailed steps in the instructions.

### 7.1 Retrieve an existing project

Before we can start the diagnostic functions, we need a project with programming and a hardware configuration (e.g., SCE\_EN\_031-100\_FC-Programming\_S7-1200....zap14). To retrieve an existing project that has been archived, you must select the relevant archive with 
 Project 
 Retrieve in the project view. Confirm your selection with "Open".



(® Project ® Retrieve ® Select a .zap archive ® Open)

® The next step is to select the target directory where the retrieved project will be stored. Confirm your selection with "OK". (® Target directory ® OK)

## 7.2 Download the program



® Select the correct interfaces and click "Start search". (® "PN/IE" ® Selection of the network adapter of the PG/PC ® Direct at slot '1 X1'® "Start search")

	Device	Device type	Slot	Туре	Address	Subnet
	CPU_1214C	CPU 1214C DC/D	1 X1	PN/IE	192.168.0.1	PN/IE_1
		Type of the PG/PC inte PG/PC inte	rface: rface:	PN/IE	Ethernet Connection (4) 12	219-LM
		Connection to interface/su	bnet:	PN/IE_1		-
		1st gat	eway:			-
····	CPU_1214C	CPU 1214C DC/D	. PN/IE	ace type	192.168.0.1	CPU_1214C
	-	-	PN/IE		Access address	-
Flach LED						
The still be b						
					Display only erro	<u>Start se</u>
e status informa	tion.				C Dispiss only end	
ne status informa Connection estal	tion: Ilished to the device wi	th address 192.168.0.1.				
ne status informa Connection estal Scan completed.	tion: blished to the device with 1 compatible devices of	th address 192.168.0.1. of 1 accessible devices fou	ind.			
ne status informa Connection estal Scan completed. Retrieving device	tion: Jished to the device wi 1 compatible devices c information	th address 192.168.0.1. of 1 accessible devices fou	ınd.			

Once "Scan and information retrieval completed" appears, click "Load". (® "Load")

Before downloading can be started, other actions may have to be set (pink marking). Then click "Load" again. (® "Load").

tatus	1	Target	Message	Action
+0	0	▼ CPU_1214C	Ready for loading.	
	0	<ul> <li>Stop modules</li> </ul>	The modules are stopped for downloading to device.	Stop all
	0	<ul> <li>Software</li> </ul>	Download software to device	Consistent download
	0	<ul> <li>Additional inform</li> </ul>	There are differences between the settings for the project and	l the 🗹 Overwrite all
	0	Text libraries	Download all alarm texts and text list texts	Consistent download
			III	

tatus	1	Target	Message	Action
~	40	Cr0_1214C	Downloading to device completed without error.	
	*	Start modules	Start modules after downloading to device.	Start all
			m	

## 7.3 Connect online

® To get started with the diagnostic functions, we will select our controller ("CPU\_1214C") and click "Go online". (® CPU\_1214C ® Go online)



 $\ensuremath{{\ensuremath{\mathbb S}}}$  Once the online connection to the "PLC\_1" controller is established, the CPU can be started

or stopped with the following buttons **II**. Diagnostic information in the form of symbols will already be available in the project tree and in the diagnostics window.



#### Symbols for the comparison status in the project tree

 The diagnostic symbols in the project tree show a comparison status representing the online/offline comparison of the project structure.

Symbol	Meaning	
•	Folder contains objects with online and offline versions that different (only in the project tree)	
Online and offline versions of the object are different		
0	Object only exists online	
0	Object only exists offline	
	Online and offline versions of the object are the same	

- ® Double-click the "Device configuration".
- (® Device configuration)



#### **Operating state symbols for CPUs and CPs**

® The graphical representation and device information window show the various operating states of the CPU or communication processors (CPs).

Symbol	Operating state
	RUN
	STOP
	STARTUP
<b>1</b> 10	HOLD
X	DEFECT
	Unknown operating state
10	The configured module does not support display of the operating state.

#### Diagnostic symbols for modules and devices in the device overview

 The graphical representation and Device overview window show the operating states of the various modules, CPU or communication processors (CPs) using the following symbols.

Symbol	Meaning
<b>*</b> 7	The connection to a CPU is currently being established.
6 <sup>5</sup>	The CPU is not accessible at the configured address.
<b>_</b>	The type of CPU configured and type of CPU actually present are incompatible.
9 <b>2</b>	On establishment of the online connection to a protected CPU, the password dialog was terminated without entry of the correct password.
$\checkmark$	No fault
2	Maintenance required
	Maintenance demanded
Ŷ	Fault
0	The module or device is deactivated.
L <sub>a</sub>	The module or device cannot be accessed from the CPU (valid for modules and devices below a CPU).
<b>D</b> !	Diagnostic data is not available because the current online configuration data differs from the offline configuration data.
1	The configured module or device and the module or device actually present are incompatible (valid for modules or devices below a CPU).
<b>!</b> ?	The configured module does not support display of the diagnostic status (valid for modules below a CPU).
?	The connection has been established, but the state of the module is currently still being determined.
0	The configured module does not support display of the diagnostic status.
0	Error in lower-level component: A fault is present in at least one lower-level hardware component.

#### Color coding of ports and Ethernet cables

- The status of ports and Ethernet cables can be diagnosed in the network view and topology view.
- ® The following table shows the possible colors and their respective meaning.

Color	Meaning
	No fault or maintenance required
	Maintenance demanded
	Communication error

## 7.4 Online & diagnostics for SIMATIC S7 controller

- ® Double-click "Online & diagnostics" in project tree. (® Online&Diagnostics)
- A CPU operating panel, the cycle time and the memory utilization are displayed in the online tools at the right. Switch the CPU to RUN here. (
   RUN)

	031-100_FC_Programming			_ • • ×	Online tools		1 11
Devices					Options		_
O31-100_FC_Programming     Add new device     Devices & networks     Ceu_1214C [CPU 214C OCDODD]     Oevices & networks     Online & diagnostics     Online & diagnostics     Sep Program blocks     Sep External source files     ArC tags     Online backing     Watch and force tables     Watch and force tables	Online access Diagnostics General Diagnostic status Diagnostic stuffer Cycle time Memory FROFINET interface [X1] Frunctions	General Module Article number: Hardware: Firmware: Version of the TIA Portal project: Rack: Slot:	CPU 1214C DC/DC/DC           6E57 214-1AG40-0X80           2           V4.2.1           V14 SP1           0           1		CPU operato     CPU_1214C [CPU     RUN / STOP     ERROR     MAINT     Cycle time	r panel 1 1214C DC/DC/DC) RUN STOP MRES III	]
Traces     Traces		Module information Module name: Plant designation: Location ID: Installation date:	CPU_1214C		Shortest: Current/last: Longest:	1.000 ms 3.000 ms 3.000 ms	
Card Reader/USB memory		Additional information: Manufacturer information			Load memory	Free:99.71 %	
		Manufacturer description:	SIEMENS AG		Work memory	Free:99.89 %	

® The working area window contains general information about the CPU. (® General)

Online access	General	
Diagnostics	Madula	
General	wodule	
Diagnostic status	Short designation:	CPU 1214C DC/DC/DC
Diagnostics buffer	Article sumbers	CEC7 214 14C40 0VP0
Cycle time	Arucie number:	0ES7 214-1AG40-0X80
Memory	Hardware:	2
PROFINET interface [X1]	Firmware:	V 4.2.1
Functions	Version of the TIA Portal project:	V14 SP1
	Slot: Module information	
	•	
	Module name:	CF0_1214C
	Plant designation:	
	Location ID:	
	Installation date:	Monday , July 03 , 2017 12 : 41
	Additional information:	
	Manufacturer information	
	Manufacturer description:	SIEMENS AG
	Serial number:	S C-F3SH7589
	Profile :	16#0000

If diagnostic information is available, it is displayed in Diagnostic status. (
 Diagnostic status)
 Status
 Status

031_100_FC-Programming	▶ CPU_1214C [CPU 1214C DC/DC/DC]	_ 🖬 🖬 🗙
Online access		
<ul> <li>Diagnostics</li> </ul>	Diagnostic status	
General		
Diagnostic status	Module exists	
Diagnostics buffer	ОК	
Cycle time		
Memory		
<ul> <li>PROFINET interface [X1]</li> </ul>		
Functions		

Betailed Information on the individual events is displayed in Diagnostics buffer.
 (Information Diagnostics buffer)

Online access		
Diagnostics	Diagnostics buffer	
General	Events	
Diagnostic status		
Diagnostics buffer	🗹 Display CPU Time Stamps in PG/PC local time	
Cycle time	No. Data and time. Event	
Memory	1 1/3/2012 8:27:35 621 PM New startup information - Current CPU operation mode: STOP	~
PROFINET Interface [X1]	2 1/3/2012 8:27:35 521 PM Communication initiated request: STOP - CPU changes from RUN to STO	
unctions	3 1/3/2012 8:25:16.968 PM Follow-on operating mode change - CPU changes from STARTUP to RUN T	
	4 1/3/2012 8:25:16.864 PM Communication initiated request: WARM RESTART - CPU changes from S 🗹 🚹	
	5 1/3/2012 8:25:16.864 PM New startup information - Current CPU operating mode: STOP	
	6 1/3/2012 8:25:06.164 PM New startup information - Current CPU operating mode: STOP 🗹 🚺	
	7 1/3/2012 8:25:04.656 PM New startup information - Current CPU operating mode: STOP 🗹 🕄	
	8 1/3/2012 8:25:01.949 PM New startup information - Current CPU operating mode: STOP 🗹 🚺	
•	9 1/3/2012 8:25:00.945 PM 🛛 Follow-on operating mode change - CPU changes from STOP to STOP m 🗹 🚺	~
	Freeze display       Details on event:       Details on event:       1       of       50       Event ID:       16# 02:4000	
	Freeze display           Details on event:           Details on event:           1         of           50         Event ID:           Module:         CPU_1214C	
	Preeze display           Details on event:           Details on event:           1         of           Module:         CPU_1214C           Rack/slot:         Rack 0 / Slot 1	
	Freeze display         Details on event:         Details on event:         1       of         Module:         CPU_1214C         Rack/slot:         Rack/slot:         Rack/slot:         Persing in:         CPU info:: New startup information	
-	Freeze display         Details on event:         Details on event:         1       of         50       Event ID:         16# 02:4000         Module:       CPU_1214C         Rackslot:       Rack 0 / Slot 1         Description:       CPU info: New startup information Pending startup information Pending startup information	
	Freeze display         Details on event:         Details on event:         1       of         50       Event ID:         16# 02:4000         Module:       CPU_1214C         RackSlot:       Rack 0 / Slot 1         Description:       CPU info: New startup information         Pending startup inhibit(5):       -Manual restart required         Current CPU operating mode: STOP	
	Freeze display         Details on event:         Details on event:         1       of         50       Event ID:         16# 02:4000         Module:       CPU_1214C         Rack/slot:       Rack 0 / Slot 1         Description:       CPU info: New startup information         Pending startup inhibit(5):       - Manual restart required         Current CPU operating mode: STOP       CURATION STOP	
	Freeze display         Details on event:         Details on event:         1       of         Module:       CPU_1214C         Rack/slot:       Rack 0 / Slot 1         Description:       CPU info: New startup information         Pending startup inhibit(s):       - Manual restart required         Current CPU operating mode: STOP       CPU_1214C (CPU_1214C	
	Freeze display         Details on event:         Details on event:         I       of         Module:       CPU_1214C         Rack/of / Slot 1         Description:       CPU info: New startup information         Pending startup inhibit(;):         - Ne nual restart required         CFU_1214C (CPU_1214C         Help on event:         The startup inhibit conditions for an operating mode transition to RUN have changed, for example, because blocks or a hardware configuration have been loaded.         The current startup information is available in the detailed information for the event.	
	Freeze display         Details on event:         Details on event:         Image: Details on event:         Image: Details on event:         Image: Details on event:         Image: Details on event:         Module:         CPU_1214C         Rack 0/ Slot 1         Description:         CPU info: New startup information         Pending startup inhibit(2):         - Nanual restart required         CPU_1214C / CPU_1214C         CPU_1214C / CPU_1214C         Help on event:         The startup inhibit conditions for an operating mode transition to RUN have changed, for example, because blocks or a hardware configuration have been loaded.         The current startup information is available in the detailed information for the event.	
	Freeze display         Details on event:         Details on event:         Image: Details on event:         The startup inhibit conditions for an operating mode transition to RUN have changed, for example, because blocks or a hardware configuration have been loaded.         The current startup information is available in the detailed information for the event.         Plant designation:       Location ID:	

® Next you receive information about the cycle time of the executed program. (® Cycle time)

031-100_FC_Programming	CPU_1214C [CPU 1214C DC/DC/		_ # = >
Online access	Π		
Diagnostics	Cycle time		
General	Cycle time diagram		
Diagnostic status	cycle and diagram		
Diagnostics buffer			
Cycle time			
Memory			
PROFINET interface [X1]			
Functions			
			ms
	13		150
	Cuelo timo cot		
	, Cycle time set		
	Minimum cycle time:	0	ms
	Cycle monitoring time:	150	ms
	Cycle times measured		
	Shortest cycle time:	1.000	ms
	Current/last cycle time:	3.000	ms
	Longest cycle time:	3 000	ms

® The memory utilization can be seen here in detail (® Memory)

031_100_FC-Programming	▶ CPU_1214C [CPU 1214	C DC/DC/DC]			_ II 🖬 🗡
Online access					
<ul> <li>Diagnostics</li> </ul>	Memory				
General					
Diagnostic status					
Diagnostics buffer					
Cycle time					
Memory					
PROFINET interface [X1]		0.23 %	0.17 %	0 %	
Functions	Sizes in bytes	Load memory	Work memory	Retain memory	
	Free:	4184632	102229	10240	
	In use:	9672	171	0	
	Total:	4194304	102400	10240	

The network settings and the status of the PROFINET interface [X1] can also be displayed.
 (
 PROFINET interface [X1])

Online access	Π						
Diagnostics	PROFINET inte	erface [X1]					
General	> Ethomot	ddrocs					
Diagnostic status	- Luiemere						
Diagnostics buffer	>> Networ	k connection					
Cycle time Memory							
PROFINET interface [X1]		MAC addr	ess: 28-63-36	-88-FF-DA			
unctions							
	>> IP parar	meters					
		IP addr	ess: 192.168.	.0.1			
		Subnetma	ask: 255.255.	.255.0			
		Default rou	ter: 0.0.0.0				
	4	IP settir	nas:				=1
		IP setting ti	met				
	-	in second o					
1-100_FC_Programming Online access	CPU_1214C [     Ports	CPU 1214C DC	/DC/DC]				
1-100_FC_Programming	CPU_1214C [	CPU 1214C DC	/DC/DC]			-	
1-100_FC_Programming Online access Diagnostics	CPU_1214C [     Ports	CPU 1214C DC	/DC/DC]			-	
I-100_FC_Programming Inline access iagnostics General	Ports     Ports     Ports	CPU 1214C DC	/DC/DC]				
I-100_FC_Programming Inline access iagnostics General Diagnostic status	CPU_1214C [4     Ports Ports	CPU 1214C DC	/DC/DC]			-	
I-100_FC_Programming Inline access iagnostics General Diagnostic status Diagnostics buffer	POI_1214C [     Ports Ports	CPU 1214C DC	/DC/DC]			-	
I-100_FC_Programming Inline access isgnostics General Diagnostic status Diagnostics buffer Cycle time	CPU_1214C [ Ports Ports	CPU 1214C DC	/DC/DC]	Settings	Mode		
-100_FC_Programming nline access iagnostics General Diagnostic status Diagnostics buffer Cycle time Memory 00001012 Transformed IV1	CPU_1214C [ Ports Ports	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex		
I-100_FC_Programming Inline access iagnostics General Diagnostics buffer Cycle time Memory PROFINET interface [X1] unctions	CPU_1214C [ Ports Ports	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex	_	
I 100_FC_Programming nline access iagnostics General Diagnostic status Diagnostic buffer Cycle time Memory PROFINET interface [X1] unctions	CPU_1214C [     Ports Ports	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex	_	
-100_FC_Programming nline access iagnostics General Diagnostic status Diagnostics buffer Cycle time Memory PROFINET interface [X1] intrions	CPU_1214C [     Ports Ports	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex		
-100_FC_Programming nline access iagnostics General Diagnostic status Diagnostics buffer Cycle time Memory FROFINET interface [X1] unctions	CPU_1214C [     Ports Ports	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex		
-100_FC_Programming Inline access lagnostics General Diagnostic status Diagnostics buffer Cycle time Memory PROFINET interface [X1] unctions	CPU_1214C [     Ports Ports	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex		
-100_FC_Programming Inline access lagnostics General Diagnostic status Diagnostics buffer Cycle time Memory PROFINET interface [X1] unctions	CPU_1214C [  Ports Ports Details:	Name Port 1 (X1P1)	Status OK	Settings Automatically	Mode TP 100 Mbps full duplex		
I-100_FC_Programming Inline access isgnostics General Diagnostic status Diagnostic status Diagnostic buffer Cycle time Memory PROFINET interface [X1] unctions	CPU_1214C [  Ports Ports Details:	Name Port 1 (X1P1)	Status OK	Settings Automatically •88-FF-DA	Mode TP 100 Mbps full duplex		
-100_FC_Programming Inline access isagnostics General Diagnostic status Diagnostic status Diagnostics buffer Cycle time Memory FROFINETinterface [X1] unctions	CPU_1214C [  Ports Ports Details: MAC ad Medium	Name Port 1 (X1P1) dress of the inter 1: Copper	Status OK	Settings Automatically -88-FF-DA	Mode TP 100 Mbps full duplex		
100_FC_Programming nline access iagnostics General Diagnostic status Diagnostic sbuffer Cycle time Memory FROFINET interface [X1] anctions	CPU_1214C [  Ports Ports  Details: MAC ad Medium Neighbor Neighbo	Name Port 1 (X1P1) dress of the inter 1: Copper	Status OK	Settings Automatically +88-FF-DA	Mode TP 100 Mbps full duplex		
-100_FC_Programming Inline access iagnostics General Diagnostic status Diagnostics buffer Cycle time Memory FROFINET interface [X1] unctions	CPU_1214C [  Ports Ports  Details:  MAC ad MAC ad MAC ad MAC ad	Name Port 1 (X1P1) dress of the inter 1: Copper or: desktop-d591 ddress of the inter	Status OK face: 28-63-36 nt0r.Port 1 rface: D4-81-D	Settings Automatically -88-FF-DA 17-BD-EB-91	Mode TP 100 Mbps full duplex		-
-100_FC_Programming Inline access iagnostics General Diagnostic status Diagnostics buffer Cycle time Memory FROFINET interface [X1] unctions	CPU_1214C [  Ports Ports  Details: MAC ad Medium Neighbi MAC ad	Name Port 1 (X1P1) dress of the inter 1: Copper or: desktop-d591 ddress of the inte	Status OK face: 28-63-36 nt0r.Port 1 erface: D4-81-D	Settings Automatically -88-FF-DA 17-8D-EB-91	Mode TP 100 Mbps full duplex		
I 100_FC_Programming Inline access isgnostics General Diagnostic status Diagnostics buffer Cycle time Memory PROFINET interface [X1] unctions	CPU_1214C [  Ports Ports  Details: MAC ad MAC ad	Name Port 1 (X1P1) dress of the inter 1: Copper or: desktopd591 ddress of the inte	Status OK face: 28-63-36 ntOr.Port 1 erface: D4-81-D	Settings Automatically -88-FF-DA -97-8D-E8-91	Mode TP 100 Mbps full duplex		
1.100_FC_Programming Dnline access Diagnostics General Diagnostic status Diagnostics buffer Cycle time Memory PROFINET interface [X1] Functions	CPU_1214C [  Ports Ports  Details: MAC ad Medium Neighb. MAC at	Name Port 1 (X1P1) dress of the inter h: Copper or: desktopd590 ddress of the inte	Status OK face: 28-63-36 http://port 1 erface: D4-81-D	Settings Automatically +88-FF-DA +7-8D-E8-91	Mode TP 100 Mbps full duplex		

Inder Functions, "Assign IP address", you can assign the IP address to a controller.
 However, this is only possible when no hardware has yet been downloaded to the CPU.
 (Institution (Institution)) (Institution)

	▶ CPU_1214C [CPU 1214C DC/DC/DC]	_ # = ×
Online access		
<ul> <li>Diagnostics</li> </ul>	Assign in address	
General		
Diagnostic status	Assign IP address to the device	
Diagnostics buffer		
Cycle time	Devices connected to an enterprise network or directly to the internet must be appropriately protected against unauthorized access, e.g. by use of firewalls and network representation	
Memory	For more information about industrial security, please visit	
PROFINET interface [X1]	http://www.siemens.com/industrialsecurity	
<ul> <li>Functions</li> </ul>		
Assign IP address		
Set time		
Firmware update		
Assign PROFINET devic	MAC address: 28 - 63 - 36 - 88 - FF - DA Accessible devices	
Reset to factory settings		
Format memory card	IP address: 192 . 168 . 0 . 1	
	Subnet mask: 255 . 255 . 0	
	Use router	
	Router address: 192.168.0.1	
	Assign IP address	

® Under "Set time", you can set the time of the CPU. (® Functions ® Set time)

Online access	C. Martine	
<ul> <li>Diagnostics</li> </ul>	Set time	
General		
Diagnostic status		
Diagnostics buffer		
Cycle time	PG/PC time:	
Memory	(UTC+01:00) Amsterdam, Berlin, Bern, Bome, Stockholm, Vienna	<b>_</b>
PROFINET interface [X1]		
Functions	July 05, 2017 💌 12:24:52 PM 🖨	
Assign IP address		
Set time	Module time	
Firmware update		
Assign PROFINET devic	January 03 , 2012 🐨 08 : 47 : 46 PM 🖵	
Reset to factory settings	Take from PG/PC	
Format memory card	поле полга при	

- ® Under "Firmware update", you can update the firmware of the PLC.
  - (® Functions ® Firmware update)

Online access	Firmware update		
Diagnostics General	Online data		
Diagnostic status	Article number:	6F57 214-14G40-0XB0	
Diagnostics buffer			
Cycle time	Firmware:	V 4.2.1	
Memory	Name:	CPU_1214C	
PROFINET interface [X1]			
Functions	Rack:	0	
Assign IP address	Slot		
Set time	5101.		
Firmware update Assign PROFINET devic			
Reset to factory settings	Firmware loader		
Format memory card			
	Firmware file:	Rrowse	
	Firmware vertion:		
	Suitable for modules with:	Article number Firmware version and higher	
	Status:		

- Inder "Assign name", you can assign a PROFINET device name to the configured field devices on PROFINET. The device name of the CPU cannot be changed here. It can only be changed by downloading a modified hardware configuration.
  - (® Functions ® Assign name)

031-100_FC_Programming	CPU_1214C [CPU 12]	14C DC/DC/DC]				_ 🖉 🖬 🗙
Online access	Accien PROFINET day	vice name				^
<ul> <li>Diagnostics</li> </ul>	Assign PROFINET dev					
General						
Diagnostic status						
Diagnostics buffer		Configured PR	OFINET de	evice		
Cycle time		PROFINET day	ico nomo:	cou 1214c		
Memory		FROFINET dev	Ace name:	cpu_1214c		
<ul> <li>PROFINET interface [X1]</li> </ul>		D	evice type:	CPU 1214C DC/DC/DC		
<ul> <li>Functions</li> </ul>		Online access				
Assign IP address		Tune of the PG/P	interface:	Please select		-
Set time		ippe of the form		Trease serect		
Firmware update		PG/P0	Cinterface:			
Assign PROFINET devic						
Reset to factory settings		Device filter				
Format memory card						
	2	Only sho	w devices of	the same type		
		Only sho	w devices w	ith bad parameter settings		
	-	Onlysho	w devices w	ithout names		
			in devices in	in our normes		
	Accessible de	vices in the network:				
	IP address	MAC address	Device	PROFINET device name	Status	
			LEI	) flashes Up	date list	Assign name

Inder "Reset to factory settings", you can restore the factory settings of the CPU.
 (® Functions ® Reset to factory settings ® Retain or delete IP address ® Reset)

	• CPU_1214C [CPU 1214C DC/DC/DC]		_ # # ×
Online access	Pasat to factory cattings		
<ul> <li>Diagnostics</li> </ul>	Reset to factory settings		
General			
Diagnostic status			
Diagnostics buffer			
Cycle time	IP address:	192.168.0.1	
Memory	PPOEINET davisa pamau	cnu 1214c	
PROFINET interface [X1]	PROFINE I DEVICE name:	[cp0_1214c	
		0	
Assign IP address		e Retain IP address	
Set time		O Delete IP address	
Firmware update		Reset	
Assign PROFINET devic			
Reset to factory settings			
Format memory card			

Inder "Format memory card", you can format the optional memory card if it is inserted in the CPU. (® Functions ® Format memory card ® Format)

031-100_FC_Programming	CPU_1214C [CPU_1214C DC/DC/DC]	_ # # ×
Online erees	Π	
Discussion of the second secon	Format memory card	
Diagnostics		
General		
Diagnostic status		
Diagnostics buffer		
Cycle time	IP address:	192.168.0.1
Memory		cou 1314c
PROFINET interface [X1]	PROFINE I device name:	cha_1214c
Assign IP address		Format
Set time		
Firmware update		
Assign PROFINET devic		
Reset to factory settings		
Format memory card		

- ® The online connection should be disconnected again before the next chapter.
  - (® Online access ® Go offline)

Online access     Diagnostics	Online access
General Diagnostic status Diagnostic stuffer Cycle time Memory PROFINET interface [X1] FUnctions Assign IP address Set time Firmware update	Status Online
Reset to factory settings Format memory card	Online access         Type of the PG/PC interface:         PG/PC interface:         PG/PC interface:         Connection to interface/subnet:         1st gateway:         Device address:         192.168.0.1

 The TIA Portal is now back in offline mode. The orange-colored bars and the diagnostic symbols are no longer displayed.

## 7.5 Online/offline comparison

It is often important to know whether the saved data matches the data loaded in the controller. First, remove the negation from the "Safety\_shutoff\_active" tag at the AND function in the "MOTOR\_MANUAL [FC1] block.

Then save the "MOTOR\_MANUAL [FC1]" block, but do **NOT** download it to the controller. Close the "MOTOR\_MANUAL [FC1] block again.

To compare, right-click the "PLC\_1" controller and select "Compare", "Offline/online".
 (
 Select controller 

 Compare 



® The Compare editor online opens.

Compare editor onli												∎ ≡ ×
🍤 0 🌮 ± 💵 🗄	P 0	ž 🚮 🗄										
					-	50						
"031-100_FC_Programmi	ng: CPU_1214	4C*		_				*Online PLC*	_	_		
Name	Address	Туре	Time stamp	Time s	Status	Action		Name	Address	Туре	Time stamp	Time s
▼ 🚰 CPU 1214C					0	п	-	CPU 1214C				
<ul> <li>Program blocks</li> </ul>					0							
Main [OB1]	OB1	OB	7/21/2008	7/4/20	•			- Main [OB1]	OB1	OB	7/21/2008	7/4/20
MOTOR_MA.	FC1	FC	7/3/2017	7/5/20	0	11		MOTOR_MANUAL [FC1]	FC1	FC	7/3/2017	7/4/20
Technology obj					•							
PLC tags					•							
PLC data types					•							
<	H	1		>				<	I	1		>
Comparison result: No de	etailed proper	ty compariso	n available.		1	191 (19 <b>1</b> -191)						
								•				
			(	PU 1214	-				(	PU 1214C		

Main [OB1]

-11

MOTOR\_MANUAL [FC1] FC1

OB1

OB

H

-

MOTOR\_MANUAL [FC1]

-

>

Time stamp... Time s.

7/21/2008 -... 7/4/20.

If, for example, block differences are indicated 🤍, first select the block involved. You can R then click the <sup>Start</sup> button to "Start detailed comparison".

Compare editor onlin	e								
🌯 0 🌮 ± 🗉 🛙	P 2 3	2 🕅 🗄							
	Start d	letailed comp	arison		-	50			
*031-100_FC_Programmin	g: CPU_1214	+C*					*Online PLC*		
Name	Address	Туре	Time stamp	Time s	Status	Action	Name	Address	Туре
<ul> <li>CPU_1214C</li> </ul>					0	Ш	CPU_1214C		
🔻 🛃 Program blocks					0				

>

F

MOTOR\_MANUAL [FC1]

0

0

. 0

7/21/2008 - 7/4/20

- Main [OB1] OB1

MOTOR\_MA... FC1

Comparison result: Objects are different.

🙀 Technology obj. PLC tags

<

OB

III

(® MOTOR\_MANUAL ® Start detailed comparison).

The selected offline/online block will be compared in the code block comparison. A detailed R description of the difference is shown in the comparison result.

<

0

Code block comparison (FC1)										- • •	×
CPU_1214C > MOTOR_MANUAL - (	Offline				NOT	OR_MANUAL - Onlin	10				
ий ий 🐨 🐨 🗖 🔚 🚾 🥐 🖕 (	fe 🕀 😫										
MOTOR_MANUAL					M	OTOR_MANUAL					
Name	Data type	Default value	C			Name		Data type	Default value	C	
1 🕣 🔻 Input				~ 1	-	🕶 Input					-
2 💶 🖷 Manual_mode_active	Bool	]	M	~	•	Manual_mode	_active	Bool			~
<	Ш		>		<					>	
<ul> <li>Block title: Motor control in manual</li> <li></li> <li>Network 1: Control of the convolution</li> <li>Comment</li> <li>#Manual_mode</li></ul>	#Conveyor_ motor_manual_ mode	node _				Network 1: Control Comment #Manual_mode	ol in manu of the conv &	#Com motor_r motor_r	manual mode veyor_ nanual_ de 		
Comment				~		Comment					*
<	100%	· · · · · · · · · · · · · · · · · · ·				III	>	100%	·		-
						Q Pro	perties	1 Info	Diagnostics	18	
General Cross-references	Compile En	erav Suite	Synt	ax	C	omparison result	1				

Close the window of the code block comparison. R

® An action can be selected for the block involved in the Compare editor.

Either the "MOTOR\_MANUAL" block will be downloaded from the programming device to the controller and overwritten there or the "MOTOR\_MANUAL" block will be read in from the controller and overwritten in the TIA Portal.

Select the "Upload from device" action ( $\leftarrow$  Upload from device).

Compare editor online	e									-	∎≡×
🌯 0 🌮 ± 🗉 🕯	8 Ø 3	t to 🗄									
						<u>ар</u>					
*031-100_FC_Programmin	g: CPU_1214	IC*					*Online PLC*				_
Name	Address	Туре	Time stamp	Time s	Status	Action	Name	Address	Туре	Time stamp	Time s
▼ 🚰 CPU_1214C					0	Ш	CPU_1214C				
<ul> <li>Program blocks</li> </ul>					0						
Main [OB1]	OB1	OB	7/21/2008	7/4/20	•		Amain [OB1]	OB1	OB	7/21/2008	7/4/20
MOTOR_MA	FC1	FC	7/3/2017	7/5/20	0	11 .	MOTOR_MANUAL [FC1]	FC1	FC	7/3/2017	7/4/20
🙀 Technology obj					•	II No act	ion				
PLC tags					•	+ Upload	d from device				
PLC data types					•	-> Downl	oad to device				

® Click the "Execute actions" button 2 (® Execute actions)

Compare editor online										
9 0 8 ± 1 1	8 B	e of ±								
		Execute ad	ctions		50					
*031-100_FC_Programmine	g: CPU_1214	C*				*Online PLC*				
Name	Address	Туре	Time stamp Time	s Status	Action	Name	Address	Туре	Time stamp	Time s
▼ 🚰 CPU_1214C				0	+	CPU_1214C				
🔻 🛃 Program blocks				0	+					
Main [OB1]	OB1	OB	7/21/2008 7/4/2	0		Aain [OB1]	OB1	OB	7/21/2008	7/4/20
MOTOR_MA	FC1	FC	7/3/2017 7/5/2	0 🌗	¢= 1	MOTOR_MANUAL [FC1]	FC1	FC	7/3/2017	7/4/20
Technology obj				•						
PLC tags				•						
PLC data types				•						

® Confirm "Upload from device" (® Upload from device).

tatus	1	Target	Message	Action
τŋ	×.	▼ CPU_1214C	Ready for loading.	
	4	<ul> <li>Conflicts</li> </ul>	Conflicts occurred during loading.	Overwrite
r				
<u>.</u>				

 After the upload, there are no more differences. You should now save your project again and close the online connection.

## 7.6 Monitor and modify tags

® To monitor and modify tags, you need a watch table.

Double-click "Add new watch table" in the project tree. (® Add new watch table).

Siemens - C:\Users\mde\Documents\Autom	ation\031-100_FC	_Programming\031-100_	FC_Programm	ing				3.
oject Edit View Insert Online Options	Tools Window	Help					Tet	ally Integrated Automation
📑 🔚 Save project 📑 🐰 💷 🗐 🗙 🖛	) ± (* ± 🖥 🖽	🔓 🖳 🙀 💋 Go onlin	ie 🖉 Go offline	17 III III ×	🗧 🛄 🛹 Search in p	oroject>	100	PORT
Project tree								
Devices								
PG (W)	-3							
O31-100_FC_Programming								
Add new device								
	1							
Device configuration								
Contine & diagnostics								
Tashaalaay objects								
External course files								
PIC tage								
PIC data tunes								
Watch and force tables								
Add new watch table								
E Force table	1.7 C							
Online backups								
Fraces								
Device proxy data								
Program info								
PLC alarm text lists								
Local modules								
Grouped devices								
Common data	a subscription							
Documentation settings	Concelling of							
Languages & resources	LINDS VITE							
Gonline access	100 100							
Card Reader/USB memory	A CONTRACTOR							
	100010001							
							1111	
						Properties	L'unto	Diagnostics
	General	Cross-references	Compile	Energy Suite				
> Details view	- O 🛦 🛈	Show all messages						
Portal view							Connection	to CPU_1214C terminated.

® Open the newly created "Watch table\_1" by double-clicking it (® "Watch table\_1").

You can enter individual tags in the table or you can select the "Tag\_table\_sorting\_station" and then select the tags to be monitored and drag them from the Details view to the watch table (® Tag\_table\_sorting\_station).

猪 🔚 Save project ا 🐰 🗎 🗎 🗙	<b>``) ± (</b> <sup>24</sup> ±	B 🖸 🖬 関	📑 💋 Go online 🖉	Go offline 🔥 🖪	× = 🗆	Search in pro	ject>	POI
oject tree	🛙 📢 031-1	100_FC_Progra		4C [CPU 1214C DC/I	DC/DC] → Wate		ables 🕨 Watch tal	ole_1 🖬
Devices								
ł	1 2 2 1	4 14 Lo	9, 9, 9 00 00					
	i	Name	Address	Display format	Monitor value	Modify value	2 Comment	Tag comment
031-100 FC Programming	A 1	"-A1"	%10.0	Bool				return signal emergency stop ok (nc)
Add new device	2	*-K0*	%IO.1	Bool				main switch "ON" (no)
B Devices & networks	3	*-50*	%10.2	Bool				mode selector manual(0) / automatic(1)
- CPU_1214C [CPU 1214C DC/DC/DC]	= 4	"-53"	%11.4	Bool				pushbutton manual mode conveyor -M1 forwa
Device configuration	5	"-B1"	%10.5	Bool				sensor cylinder -M4 retracted (no)
Q Online & diagnostics	6	"-S4"	%11.5	Bool				pushbutton manual mode conveyor -M1 back
Program blocks	7	"-Q1"	%Q0.0	Bool				conveyor motor -M1 forwards fixed speed
Add new block	8		Add new>					
- Main [OB1]								
TOTOR_MANUAL [FC1]								
Technology objects								
External source files								
🕶 🎑 PLC tags								
🍇 Show all tags								
📑 Add new tag table								
🝯 Default tag table [29]								
🛓 Tag table_sorting_station [28]	~							
Details view								
Details view	_							
Name Data type								
-A1 Bool								
-B1 Bool	=							
-B2 Bool								
-B3 Bool								
-B4 Bool						111		
-B5 Bool							Proper	ies Til Info Diagnostics
-B6 Bool					2.46.2		Stropen	I a binghoutes
-87 Bool	Ger	neral Cros	s-references Co	mplie Energy	suite			

® To have all monitoring and modifying functions available for selection, the following columns can be displayed:

'All modify columns' 💹 and 'All expanded mode columns'



Continue by selecting the trigger timing for the monitoring (® Permanent).

031-1	00_FC_Progr	amming	CPU_1214C [C	PU 1214C DC/[	OC/DC] • Watch	and force tables	<ul> <li>Watch tal</li> </ul>	ble_1		_₽≣>		
22												
i	Name	Address	Display format	Monitor value	Monitor with trig	Modify with trigge	Modify value	3	Comment	Tag comment		
1	"-A1"	%10.0	Bool		Permanent	Permanent				return signal emergency sto.		
2	*-K0*	%IO.1	Bool		Permanent	Permanent				main switch "ON" (no)		
3	"-SO"	%10.2	Bool		Permanent	Permanent				mode selector manual(0) / a		
4.	"-53"	%11.4	Bool		Permanent	Permanent				pushbutton manual mode c.		
5	"-B1"	%10.5	Bool		Permanent	Permanent				sensor cylinder -M4 retracte		
5	*-S4*	%11.5	Bool		Permanent	Permanent				pushbutton manual mode c.		
7	"-Q1"	%Q0.0	Bool	•	Permanent 💌	Permanent 👻	]			conveyor motor -M1 forwar		
						Permanent Permanently, at stat Once only, at start Permanently, at end Once only, at trans Once only, at trans	art of scan cycle of scan cycle d of scan cycle of scan cycle nsition to STOP ition to STOP	P				

#### The following monitoring and modifying modes are available:

- Permanent (in this mode, the inputs are monitored/modified at the start of the cycle and the outputs at the end.)
- Once only, at start of scan cycle
- Once only, at end of scan cycle
- Permanently, at start of scan cycle
- Permanently, at end of scan cycle
- Once only, at transition to STOP
- Permanently, at transition to STOP



® Next, click "Monitor all values once and now" or "Monitor all values according to trigger settings" (
® 
Monitor all).

)31-10	0_FC_Prog	ramming	CPU_1214C [C	PU 1214C DC/D	OC/DC] > Watch	and force tables	Watch tab	ole_1		_ # =>
9 🛫	11 <sup>22</sup> 11/9 1	91%								
i	Name	Address	Display format	Monitor value	Monitor with trig	Modify with trigge	Modify value	9	C	Tag comment
	"-A1"	%10.0	Bool	TRUE	Permanent	Permanent				return signal emergency stop ok (no
	*-K0*	%IO.1	Bool	TRUE	Permanent	Permanent				main switch "ON" (no)
	*-S0*	%10.2	Bool	FALSE	Permanent	Permanent				mode selector manual(0) / automat
	"-S3"	%11.4	Bool	FALSE	Permanent	Permanent				pushbutton manual mode conveyor
	"-81"	%10.5	Bool	TRUE	Permanent	Permanent				sensor cylinder -M4 retracted (no)
	*-S4*	%11.5	Bool	FALSE	Permanent	Permanent				pushbutton manual mode conveyor
	"-Q1"	%Q0.0	Bool	FALSE	Permanent	Permanent				conveyor motor -M1 forwards fixed s.
						-	1			-

® To modify tags, enter the desired "Modify values". Then, click 1 to "Modify all activated values once and now" or 1 to "All active values will be modified by modify with trigger".

( IRUE IN TRUE IN TAIL active values will be modified by modify with trigger")

031-10	0_FC_Progra	amming I	CPU_1214C [C	PU 1214C DC/I	OC/DC] • Watch	and force tables	<ul> <li>Watch tab</li> </ul>	ole_1		_ # =×
<b>9</b> 9	1. 14 Lo	9, %	2 00 00 1							
i	Name	Address	Display format	Monitor value	Monitor with tria	Modify with trigge	Modify value	3	C	Tag comment
1	"-A1"	%IO. All	active values will b	e modified by "m	odify with trigger*.	Permanent				return signal emergency stop ok (nc)
2	*-K0*	%10.1	Bool	TRUE	Permanent	Permanent				main switch "ON" (no)
3	*-S0*	%10.2	Bool	FALSE	Permanent	Permanent				mode selector manual(0) / automatic
4	*-53*	%11.4	Bool	FALSE	Permanent	Permanent				pushbutton manual mode conveyor
5	*-B1*	%10.5	Bool	TRUE	Permanent	Permanent				sensor cylinder -M4 retracted (no)
6	*-54*	%11.5	Bool	FALSE	Permanent	Permanent				pushbutton manual mode conveyor
7	*-Q1*	%Q0.0	Bool	FALSE	Permanent 💌	Permanent 💌	TRUE	. 🗹 🔺		conveyor motor -M1 forwards fixed s

® Confirm the warning with 'Yes' (® Yes).



The output becomes active even though the programmed conditions are not met.

		_FC_Progra				C/DC] → Watch					_ # = ×
ý	2	<i>1.</i>	91 %							_	
	i	Name	Address	Display format	Monitor value	Monitor with trig	Modify with trigge	Modify value	9	C	Tag comment
1		"-A1"	%10.0	Bool	TRUE	Permanent	Permanent				return signal emergency stop ok (nc)
2		*-K0*	%IO.1	Bool	TRUE	Permanent	Permanent				main switch "ON" (no)
3		*-S0*	%10.2	Bool	FALSE	Permanent	Permanent				mode selector manual(0) / automatic
4		"-S3"	%11.4	Bool	FALSE	Permanent	Permanent				pushbutton manual mode conveyor
5		"-B1"	%10.5	Bool	TRUE	Permanent	Permanent				sensor cylinder -M4 retracted (no)
6		*-S4*	%11.5	Bool	FALSE	Permanent	Permanent				pushbutton manual mode conveyor
7	-	*-Q1*	%Q0.0	Bool [		Permanent 💌	Permanent 💌	TRUE			conveyor motor -M1 forwards fixed s

**Note:** If the watch table is closed or the connection to the PLC is lost, all modify commands are nullified.

## 7.7 Force tags

In the "Force" function can be used to assign a fixed value to tags. Force values are specified in a similar way as for the "Modify tags" function but, in contrast, are retained after the CPU is switched off or stopped. The "Modify tags" and "Force" functions essentially differ as follows:

In contrast to "Modify tags", it is not possible to assign values to data blocks, timers, counters and bit memory with the "Force" function.

IO device inputs (e.g., IWxx:P) cannot be modified but can be pre-assigned by the "Force" function.

Unlike with the "Modify" function, values permanently assigned by the "Force" function cannot be overwritten by the user program.

If you close the force table, the force values are retained. This is not the case with the "Modify" function.

If the online connection to the CPU is interrupted, the tags assigned with the "Force" function retain their value.



To force tags, you must first double-click the force table to open it. (® Force table)

® Select the "Q1" operand with address %Q0.0 from the list. (® Q1)

1		F. F. oo oo							
i	Name	Address	Display format	Monitor	value For	ce value	F	Comment	Tag commen
		<add new=""></add>							
	*-P5*		Bool	%Q1.1	display "a	utom	]		
	-P6*		Bool	%Q1.2	display cy	linder			
	• *-P7*		Bool	%Q1.3	display cy	linder			
	-Q1*		Bool	%Q0.0	conveyor	moto			
	*-Q2*		Bool	%Q0.1	conveyor	moto			
	-Q3*		Bool	%Q0.2	conveyor	moto			
	*-S0*		Bool	%10.2	mode sel	ector			
	*-S1*		Bool	%10.3	pushbutte	on aut	1		

® With forcing, the operands are entered with direct IO access (%Q0.0:P).

	CPU_1214C [CPU	1214C DC/DC/DC]	<ul> <li>Watch and for</li> </ul>	rce tables 🔸 Fo		_ # # ×
🧀 🔓 🖬 F	F. 00 00					
Name	Address	Display format	Monitor value	Force value	F	Comment
"-Q1":P	1 %Q0.0:P	Bool	- 8			
	ogramming ► Name <sup>*</sup> -Q1*:P	ogramming ► CPU_1214C [CPU Name Address *-Q1*:P II %Q0.0:P	ogramming > CPU_1214C [CPU 1214C DC/DC/DC]         Image: Second state stat	ogramming > CPU_1214C [CPU 1214C DC/DC/DC] > Watch and for         Image: Imag	ogramming > CPU_1214C [CPU 1214C DC/DC/DC] > Watch and force tables > For         Image: Ima	ogramming > CPU_1214C [CPU 1214C DC/DC/DC] > Watch and force tables > Force table         Image: Second se

® Enter the desired force value and activate it

Click "Start or replace forcing" . The new force request will be transferred to the CPU.

(® %Q0.0:P ® TRUE ® 🗹 ® 🌆 Start or replace forcing)

]	FC_Pro		<ul> <li>CPU_1214C [CPU</li> </ul>	1214C DC/DC	7DC] 🕨 Watch an	id force tables 🕨 For		_ 🛛 🖬 🗙
-	<b>1</b>	🥼 🗓 🖬	F. F. 😤 😋					
	i	Name	Start or replace for	rcing of the visib	ole addresses in the f	Force table. ce value	F	Comment
1		"-Q1":P	%Q0.0:P	Bool	- 8	TRUE		N.
2								

® Confirm the warning with 'Yes' (® Yes).

Force al	(0710:001)		?	×
	Force all			
	CAUTION: Forcing with " !			
	Do you want to start "forcing" now?			
		Yes N	lo	1

Forcing is activated and the yellow MAINT LED on the CPU lights up. In addition, an F on a red background is shown at the top right of the display of the S7-1200.

	FC_Pro	ogramming 🕨	CPU_1214C [CPU	1214C DC/DC/DC]	<ul> <li>Watch and for</li> </ul>	rce tables 🔸 Fo	rce table	_ # # X
ý	🥂 I	🧟 💪 🗛 F	F. 📬 📬					
	i	Name	Address	Display format	Monitor value	Force value	F	Comment
1	F	"-Q1":P	1 %Q0.0:P	Bool	- 8	TRUE		
2								

**Note:** If the watch table is closed or the connection to the PLC is lost, **forcing remains active** and the yellow **FORCE LED** on the CPU continues to be lit.

- If you want to 'Stop forcing', simply click " Stop forcing" and confirm the next dialog with "Yes".
  - (® **I** Stop forcing) '**Yes'** (® Yes)

	FC_Pro	gramming 🕨	CPU_1214C [CPU	1214C DC/DC/	DC] 🕨	Watch and for	ce tables 🔸 For	ce table	_ # # ×
Ť	👻 II	🏥 🔓 🕅 I	F> F. Or 1						
-	i	Name	Stops forcing of	the selected add	dresses.	Monitor value	Force value	F	Comment
1	F	"-Q1":P	1 %Q0.0:P	Bool	-	00	TRUE		
2									

Forcing is stopped and the yellow MAINT LED on the CPU switches off.

	Progr	amming ►	CPU_1214	IC [CPU 1214C DC	7DC/DC] + 1	Vatch and force t	ables 🔸 Watch t	able_1 _	
-	i	Name	Address	Display format	Monitor value	Monitor with trig	Modify with trigge	Modify value	9
1		"-A1"	%10.0	Bool		Permanent 💌	Permanent 🔽		
2		*-K0*	%10.1	Bool		Permanent	Permanent		
З		*-S0*	%10.2	Bool		Permanent	Permanent		
4		*-S3*	%11.4	Bool		Permanent	Permanent		
5		"-B1"	%10.5	Bool		Permanent	Permanent		
6		*-S4*	%11.5	Bool		Permanent	Permanent		
7	E	*-Q1*	%Q0.0	Bool		Permanent	Permanent	TRUE	M 🚹
8			<add new:<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td></add>						

- If a force request already exists in the controller, it can also be displayed and stopped via the online device view. To do this, you must right-click the CPU in online mode of the device view and select "Update and display forced operands".
- Ita Siemens C:\Users\mde\Documents\Automation\031-100\_FC\_Programming\031-100\_FC\_Programming Char Q Properties Alt+Enter Edit View Inse Opt Tools Export module labeling strips.. lly Integrated Automation PORTAL Copy Ctrl+C 💁 🔒 Save project 🔒 💢 🟥 📬 🗙 🌇 🛨 (주 ± 🐁 🔃 🖬 🖳 🖉 G J Go offline Ctrl+V × Delete Go to topology view Go to network view Devices Ha 💌 🖽 📰 🔏 🖽 [ CPU\_1214C [CPU 1214C] Compile og D load to device 031-100\_FC\_Program 0 0 Upload from device (software) init init Profile: - 💕 Talog Go online Go offline Online & diagnostics Devices & networks Ctrl+M ▼ CPU\_1214C [CPU 1214C DC/DC/.... . Ctrl+D Device configuration nal boards nmunications Q Online & diagnostics ų, 102 101 Program blocks
   Technology objects 103 • tery boards Update and dis Rack C Cross-references F11 External source files Cross-reference information Shift+F11 Call structure Assignment list PLC tags • 0 Watch and force tables Show catalog Ctrl+Shift+C Tasks Add new watch table Force table Communications mo
   Technology modules Watch table\_1 Online backups 5 ✓ Details view ✓ Information ~ Device Nan > 1009 < 11 -• Article no. 1 Info L Diagnostics **Properties** • General Cross-references Compile Energy Suite 0 1 0 Description Show all messages • CPU\_12140 Portal vi ed to CPU 12140
- (® right-click the CPU ® Update and display forced operands")

- ® The force table with the current force requests will now be displayed and you can stop these.
  - (® **E**Stop forcing)

Siemens - C:\Users\mde\Documents\	Automatio	n\031-10	D_FC_Programmi	ing\031-100_FC_P	rogramming						_ = ×
Project Edit View Insert Online C	Dptions To X 5 ±	ols Win C <sup>al</sup> ± ⊡	dow Help	🚿 Go online 💋	Go offline		⊲earch în project>	-		Totally Integra	ated Automation PORTAL
Project tree		FC_F							_ 🖬 🖬 🗙	Testing	
Devices										Options	8
1		# #	12 🗓 Fal F	F. 00 00							Tes
5 2		i	Name	Stops forcin	ng of the selected	addresses. litor value	Force value	F	Comment	✓ CPU operator p	banel
O31-100_FC_Programming      Add new device     Add new device     Devices & networks	0 • ^	1 E	*-Q1*:P	1 %Q0.0:P	Bool	<b>• *</b>	TRUE			CPU_1214C [CPU 12 RUN / STOP	214C DC/DC/DC]
CPU_1214C [CPU 1214C DC/DC/	- 🔽 🔍 =									ERROR [	STOP 00

## 7.8 Checklist

No.	Description	Completed
1	Project 031-100_FC-programming successfully retrieved.	
2	CPU 1214C from project 031-100_FC-Programming successfully downloaded.	
3	CPU 1214C connected online.	
4	Status of the CPU 1214C checked with Online & Diagnostics.	
5	Offline/online comparison of blocks in the CPU 1214C performed.	
6	Watch table_1 created.	
7	Tags (-S0 / -S3 / -K0 / -B1 / -S4 / -A1 / -Q1) entered in watch table.	
8	Switch on conveyor motor forward by modifying the output $(-Q1 = 1)$ in watch table.	
9	Switch off conveyor motor forward by modifying the output $(-Q1 = 0)$ in watch table.	
10	Open force table	
11	Tag (-Q1:P) entered in force table.	
12	Switch on conveyor motor forward by forcing the output $(-Q1 = 1)$ in force table.	
13	Force output -Q1 to switch off again.	

## 8 Exercise

### 8.1 Task – Exercise

In this exercise, the MOTOR\_AUTO [FB1] function block from chapter SCE\_EN\_031-200\_FB-Programming is to be tested.

The challenge here is that the cylinder is in the front end position and thus the enable conditions for switching on the conveyor are not met.

Using a watch table, the cylinder is to be moved to its rear end position so that the enable conditions for the MOTOR\_AUTO [FB1] block are met.

## 8.2 Planning

Plan the implementation of the task independently using the step-by-instructions as an aid.

## 8.3 Checklist – Exercise

No.	Description	Completed
1	Project 031-200_FB-Programming successfully retrieved.	
2	CPU 1214C from project 031-200_FB-Programming successfully downloaded.	
3	Watch table created and renamed as "Watch_table_cylinder".	
4	Tags (-B1 / -B2 / -M2) entered in watch table.	
5	Retract cylinder by modifying the output $(-M2 = 1)$ in watch table.	
6	Cylinder retracted (-B1 = 1)	
7	Reset output for Retract cylinder in watch table again $(-M2 = 0)$ .	

# 9 Additional information

More information for further practice and consolidation is available as orientation, for example: Getting Started, videos, tutorials, apps, manuals, programming guidelines and trial software / firmware, under the following link:

#### www.siemens.com/sce/s7-1200

#### Preview "Additional information"

- Getting Started, Videos, Tutorials, Apps, Manuals, Trial-SW/Firmware
  - ↗ TIA Portal Videos
  - ↗ TIA Portal Tutorial Center
  - > Getting Started
  - ↗ Programming Guideline
  - ↗ Easy Entry in SIMATIC S7-1200
  - > Download Trial Software/Firmware
  - ↗ Technical Documentation SIMATIC Controller
  - ↗ Industry Online Support App
  - TIA Portal, SIMATIC S7-1200/1500 Overview
  - ↗ TIA Portal Website
  - ↗ SIMATIC S7-1200 Website
  - ↗ SIMATIC S7-1500 Website

### **Further Information**

Siemens Automation Cooperates with Education siemens.com/sce

SCE Learn-/Training Documents siemens.com/sce/documents

SCE Trainer Packages siemens.com/sce/tp

SCE Contact Partners siemens.com/sce/contact

Digital Enterprise siemens.com/digital-enterprise

Industrie 4.0 siemens.com/future-of-manufacturing

Totally Integrated Automation (TIA) siemens.com/tia

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SIMATIC Technical Documentation siemens.com/simatic-docu

Industry Online Support support.industry.siemens.com

Product catalogue and online ordering system Industry Mall **mall.industry.siemens.com** 

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