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Time Synchronization with an HMI Operator Panel and a SIMATIC PLC

WinCC V13 SP1, Comfort Panels, S7-1200/S7-1500 and S7-300/S7-400

https://support.industry.siemens.com/cs/ww/de/view/69864408

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Table of Contents

1 Task

1.1 Introduction

In order for components such as HMI operator panels and SIMATIC controllers of a plant to operate with an identical time, one of the listed components has to be the timer for all other components.

- The component acting as the timer is called the time master.
- The time receiving components are the time slaves.

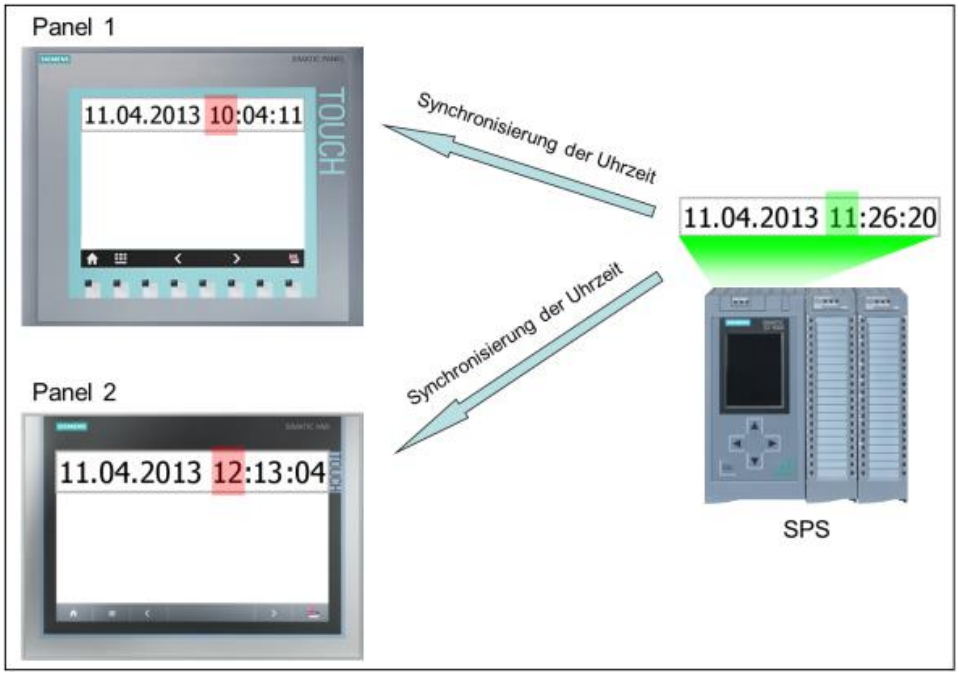
The application shows the respective time synchronization options and their implementation in the program.

Use the selection aid to select the time synchronization option that suits your requirements. For more information, please see chapter 2.1.1.

1.2 Overview of the automation task

The figure below provides an overview of the automation task.

Figure 1-1



Description of the automation task

In a plant, there are several HMI operator panels that exchange data with a SIMATIC PLC.

The following tasks are to be implemented:

1. For the first task, a SIMATIC PLC is to be the timer component (SIMATIC PLC → HMI operator panel).
2. For the second task, an HMI operator panel is to be the timer component (HMI operator panel → SIMATIC PLC).

2 Solution

2.1 Overview of the overall solution

WinCC TIA Portal offers various solutions for the tasks described in chapter 1. The solutions depend on

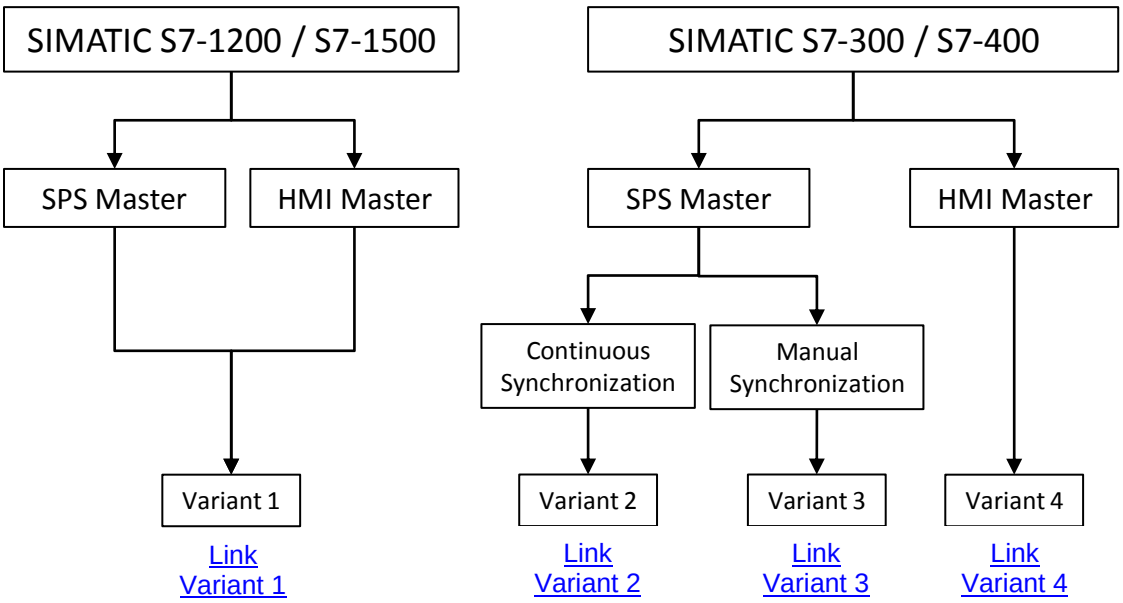
- the SIMATIC PLC used.
- the time synchronization required.
- the HMI operator panel used.

2.1.1 Selection aid

The PLC is normally used as the time master (timer component). However, it is also possible that the operator panel is the time master. This allows the user to specify, for example, the time using the operator panel (start value) and then the PLC applies the time synchronization as it has a higher accuracy.

The following figure supports you in selecting the different time synchronization variants.

Figure 2-1



2.1.2 Supported HMI operator panels:

- Basic Panels
- Comfort Panels
- Mobile Panels
- RT Advanced
- Multi Panels

The diagrammatic representation below shows the different time synchronization variants between the above-listed operator panels and the SIMATIC controllers.

Table 2-1

	S7-1200	S7-1500	S7-300	S7-400
HMI time synchronization (master) → see sample project for variant 1	X[1]	X[2]	--	--
HMI time synchronization (slave) → see sample project for variant 1	X[3]	X[4]	--	--
Area pointer: DateTimePLC → see sample project for variant 2	X	X	X	X
Area pointer: DateTime → see sample project for variant 3	X	X	X	X
Area pointer: JobMailbox (controller job 14 and 15) → see sample project for variant 4	X	X	X	X

The following chapters provide a more detailed description of the individual “time synchronization” variants.

[1] Except Basic Panels
[2] Except Basic Panels
[3] WinCC V12 or higher also Basic Panels
[4] WinCC V12 or higher also Basic Panels

2.1.3 Description of the time synchronization variants

The following sections provide a brief description of the individual time synchronization variants and list the functional differences.

Variant 1

Variant 1 allows the user to parameterize the operator panel as a master or slave. The functionality is only supported when using a SIMATIC S7-1200 / S7-1500 as the communications driver.

Table 2-2

Timer component (master): Operator panel or S7-1200 / S7-1500
Transferring date and time via an integrated system function If you are using a SIMATIC S7-1200 / S7-1500, the only thing you have to do is select whether the operator panel will be the time master or slave. This is done in the “HMI configuration”, “HMI time synchronization mode” option. **No** other settings are required. If, for example, the PLC is the time master, the time on the operator panel will be automatically synchronized with the PLC time every 10 minutes. • For more information, please refer to the “Basics” chapter, 3.1. • For a configuration guide, please see chapter 5.1

Note Variant 1 is the variant recommended for the current HMI device generation (e.g., Comfort Panels) in conjunction with the SIMATIC S7-1200 / S7-1500 controllers.

Variant 2

This variant is recommended when the PLC is the time master and you want synchronization to be performed automatically and continuously in a fixed time frame.

Table 2-3

Timer component (master): S7-1200 / S7-1500 / S7-300 / S7-400
Transferring date and time together Date and time synchronization is performed on the operator panel in a fixed cycle. The current PLC system time is read out via the PLC program and the value is transferred to the “DateTimePLC” area pointer. The refresh cycle of the area pointer is permanently stored in the HMI configuration. The time selected should not be less than 1 minute. • For information on the area pointer, please refer to the “Basics” chapter, 3.2.1. • For a configuration guide, please see chapter 5.2.

Variant 3

This variant is recommended when the PLC is the time master and you want to **manually** trigger the time for the synchronization.

Table 2-4

Timer component (master): S7-1200 / S7-1500 / S7-300 / S7-400
Transferring date and time separately The date and time of the operator panel can be separately synchronized with the PLC system time. The time for the synchronization is specified manually, for example, by pressing a button on the operator panel. In terms of the example, a function block was created that facilitates handling time synchronization. The function block evaluates the “JobMailbox” area pointer (controller job 14 and 15) and transfers the data to the operator panel. • Chapter 4.3 provides detailed information on the structure of the function block used, “FB120” or “FB210”. • For a configuration guide, please see chapter 5.3.

Variant 4

This variant is recommended when the operator panel is the time master and you want to manually specify the time for the synchronization.

Table 2-5

Timer component (master): HMI operator panel
Transferring date and time together Synchronization of the PLC system time with the operator panel system time is performed manually, for example, by pressing a button on the operator panel. In terms of the example, a function block was created that facilitates handling time synchronization. The function block evaluates the “DateTime” area pointer and the “JobMailbox” area pointer (controller job 40) and transfers the operator panel data to the PLC. • Chapter 4.2 provides detailed information on the structure of the function block used, “FB110” or “FB210”. • For a configuration guide, please see chapter 5.4.

2.2 Description of the core functionality

The core functionality is the implementation of the time synchronization variants described in chapter 2.1.3 (variants 1 to 4).

For each of the different time synchronization variants, the application is supplied with a sample project and an “FB_TimeSyn” TIA Portal library file.

You can customize the configurations to your tasks as needed.

The following chapters of the application provide a detailed description of the individual projects.

- Variant 1: Project_01 (includes two projects)

  Note: For SIMATIC S7-1200 / S7-1500 only.

  - HMI time synchronization (master).
    In this application, the operator panel is the timer component.
  - HMI time synchronization (slave).
    In this application, the SIMATIC PLC is the timer component.
- Variant 2: Project_02
  In this application, the SIMATIC PLC is the timer component.
- Variant 3: Project_03
  In this application, the SIMATIC PLC is the timer component and the operator panel’s date and time can be synchronized independently of each other.
- Variant 4: Project_04
  In this application, the operator panel is the timer component.
- TIA Portal library: FB_TimeSyn
  Contains the function blocks used in the projects, FB110; FB120 (FB210; FB220), and the “DB10” data block with the data areas of the individual area pointers.
  As an alternative, copy the appropriate blocks from the projects.

Scope

This application does not include a description of …

- the SIMATIC PLC used.
- the HMI operator panels used.
- the WinCC V12 configuration user interface.

Basic knowledge of these topics is required. If necessary, please refer to the appropriate manuals. For a list of manuals, please see chapter 8 “Links & Literature”.

Required knowledge

Implementing time synchronization via area pointers requires basic knowledge of the STEP 7 configuration.

2.3 Hardware and software components used

The application was created with the following components:

Hardware components

Table 2-6

Component	No.	Article number	Note
CPU S7-1200 CPU 1212C DC/DC/DC	1	6ES7 212-1AD30-0XB0	All S7-1200 / S7-1500 controllers can be used.
CPU S7-300 CPU 315-2 PN/DP	1	6ES7 315-2EH14-0AB0	All S7-300 / S7-400 controllers can be used.
TP1200 Comfort Panel	1	6AV2124-0MC01-0AX0	All WinCC (TIA Portal) operator panels can be used. See notes in the documentation.

Standard software components

Table 2-7

Component	No.	Article number	Note
WinCC Advanced V13 SP1	1	6AV2102-0AA03-0AA5	Depending on the operator panel used, WinCC V13 Basic or higher.
STEP 7 Professional V13 SP1	1	6ES7822-1AA03-0YA5	A CPU S7-1500 can be used for WinCC V13 or higher.

Sample files and projects

The following list contains all files and projects that are used in this example.

Table 2-8

Component	Note
69864408_WinCC_TimeSyn_CODE_v40.zip The zip file contains four sample projects and a library file with four function blocks. • Project_01 (variant 1) - HMI time synchronization (master) - HMI time synchronization (slave) • Project_02 (variant 2) - The SIMATIC PLC is the timer component.	This zip file contains the STEP 7 project and the HMI project.

2.3 Hardware and software components used

Component	Note
• Project_03 (variant 3) - The SIMATIC PLC is the timer component. Date and time of the operator panel can be synchronized independently of each other. • Project_04 (variant 4) - The HMI operator panel is the timer component. • Libraries (FB_TimeSyn) - Contains the function blocks used in Project_03 and Project_04, FB110; FB120 (FB210; FB220), and the DB10 data block with the data areas of the individual area pointers.	
69864408_WinCC_TimeSyn_DOKU_v41_e.pdf	This document.

3 Basics

Introduction

The aim of this chapter is to provide a technical overview of the functions, area pointer blocks and system data blocks used in the different time synchronization variants.

This chapter is **not** relevant to implementing the tasks.

3.1 HMI time synchronization mode

Concerns time synchronization variant 1

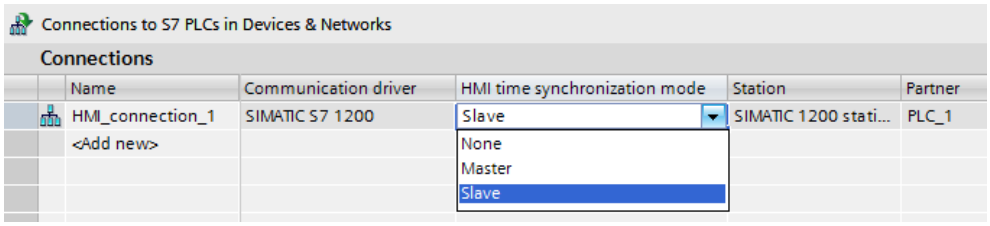
If an S7-1200 or S7-1500 controller is selected as a communication partner in the WinCC engineering system, one of the following options can be selected in the connection settings in “HMI time synchronization mode”.

- None: No time synchronization is used.
- Master: The operator panel specifies the time.
  If multiple operator panels are used, one operator panel is configured as the “master” and all other operator panels are configured as “slaves”.
- Slave: The PLC specifies the time.

For this type of time synchronization, **no** further configuration steps are needed.

Select menu view in the HMI configuration.

Figure 3-1



Time synchronization properties

- The operator panel can specify the time as a master.
  - In “Master mode”, time synchronization is performed each time a connection is established.
- The operator panel can apply the time from the PLC as a slave.
  - In “Slave mode”, time synchronization is performed each time a connection is established and then every 10 minutes.
- The first time synchronization is performed directly after starting Runtime on the operator panel.
- Time synchronization is only performed while running Runtime on the operator panel.

Time synchronization restrictions

Time synchronization with the “HMI time synchronization mode” function can be configured with the following operator panels:

- Basic Panels
- Comfort Panels
- KTP Mobile
- Mobile 277F IWLAN V2
- WinCC Runtime Advanced
- WinCC Runtime Professional
- TP177 4
- Multi Panel 177
- Multi Panel 277
- Multi Panel 377
- Mobile Panel 277

Restrictions during the configuration

- If multiple connections to a SIMATIC S7-1200 / SIMATIC S7-1500 are configured for an operator panel, you can only configure one connection as a “slave”.
- If you have enabled time synchronization for the operator panel as a “slave”, you can no longer use the “DateTimePLC” global area pointer.
- Basic Panels can only be configured as a “slave”.
- If you are using Basic Panels for the configuration, it is not possible to simultaneously use time synchronization via NTP and the “DateTimePLC” area pointer.
- If a PLC is configured with the “Complete protection” protection level, an operator panel can poll the time only if the correct access password was configured on the operator panel. The access password for communication with a PLC with the “Complete protection” protection level is configured in the “Connections” editor of the operator panel. The access password must match the configured password in the PLC. The password for the PLC is assigned in the PLC properties in: “General > Protection”.

3.2 Area pointer

An area pointer allows you to access a data area in the controller. During communication, alternate read/write processes between the controller and the operator panel take place in these data areas. By evaluating the stored data, controller and operator panel mutually trigger predefined actions.

This application uses the “DateTimePLC”, “DateTime” and “JobMailbox” area pointers.

3.2.1 DateTimePLC (PLC → operator panel)

Transferring date and time from the controller to the operator panel

→ Concerns time synchronization variant 2.

The “DateTimePLC” data area has the following structure:

Figure 3-2

Data word	Most significant byte		Least significant byte	
	7 0		7 0	
n+0	Year (80 to 99/0 to 29)		Month (1 to 12)	
n+1	Day (1 to 31)		Hour (0 to 23)	
n+2	Minute (0 to 59)		Second (0 to 59)	
n+3	Reserved		Reserved	Weekday (1 to 7, 1=Sun-day)
n+4 [1)]	Reserved		Reserved	
n+5 [1)]	Reserved		Reserved	

In the PLC, “Struct” is used as the data type. For more information, please see the structure of the configured DB10 in chapter 4.1.

3.2.2 DateTime (operator panel → PLC)

Transferring date and time from the operator panel to the controller

→ Concerns time synchronization variant 4.

The “DateTime” data area has the following structure:

Figure 3-3

Data word	Most significant byte	Least significant byte	
	7 0	7 0	
n+0	Reserved	Hour (0 to 23)	Time
n+1	Minute (0 to 59)	Second (0 to 59)	
n+2	Reserved	Reserved	
n+3	Reserved	Weekday (1 to 7, 1=Sunday)	Date
n+4	Day (1 to 31)	Month (1 to 12)	
n+5	Year (80 to 99/0 to 29)	Reserved	

In the PLC, “Date_And_Time” is used as the data type. For more information, please see the structure of the configured DB10 in chapter 4.1.

3.2.3 Controller job

Triggering functions on the operator panel using the control program

→Concerns time synchronization variants 3 and 4

The “JobMailbox” data area has the following structure:

Figure 3-4

Word	Most significant byte	Least significant byte
n+0	0	Job number
n+1	Parameter 1	
n+2	Parameter 2	
n+3	Parameter 3	

The first word of the controller job mailbox contains the job number. Depending on the controller job, up to three parameters can then be transferred.

If the first word of the controller job mailbox is not equal to 0, the operator panel evaluates the controller job. For this reason, the parameters first have to be entered in the controller job mailbox (parameter 1 to parameter 3), followed by the job number.

If the operator panel has accepted the controller job, the first word is reset to 0. At this time, the controller job execution is generally **not** yet completed.

In the PLC, “Array [0..3] of Word” is used as the data type. For more information, please see the structure of the configured DB10 in chapter 4.1.

Concerns only variant 4, controller job 40 (job number)

Controller job 40 transfers the system time from the operator panel to the PLC.

Controller job 40 parameters

Figure 3-5

No	Function	
40	Transfer date/time to PLC	
	(in the S7 format DATE_AND_TIME) An interval of at least 5 seconds must be maintained between two successive jobs to prevent overload of the HMI device.	

Concerns only variant 3, controller job 14 (job number)

Controller job 14 transfers the (BCD-coded) time from the PLC to the operator panel.

Controller job 14 parameters

Figure 3-6

No.	Function	
14	Set time (BCD-coded)	
	Parameter 1	Left byte: - Right byte: hours (0-23)
	Parameter 2	Left byte: minutes (0-59) Right byte: seconds (0-59)
	Parameter 3	-

Concerns only variant 3, controller job 15 (job number)

Controller job 15 transfers the (BCD-coded) date from the PLC to the operator panel.

Controller job 15 parameters

Figure 3-7

No	Function	
15	Setting the date (BCD coded)	
	Parameter 1	Left byte: - Right byte: weekday (1-7: Sunday-Saturday)
	Parameter 2	Left byte: day (1-31) Right byte: month (1-12)
	Parameter 3	Left byte: year

Notes:

- The KTP 600 BASIC PN operator panel ignores the weekday.
- If you are using the “DateTimePLC” area pointer, the weekday will be ignored.

4 Functional Mechanisms of this Application

Introduction

The following sections describe the structure, principle of operation and data structure of the created data blocks and program blocks.

You only need this chapter if you need detailed information on the function block used, “DB10”, or want to reproduce the method of functioning of the function blocks used, “FB110”(FB210) or “FB120” (FB220).

This chapter is **not** relevant to implementing the tasks.

4.1 Data block “DB10_HMI_AreaPointer” (DB10)

Concerns time synchronization variants 2, 3 and 4

DB10 includes a summary of the possible area pointers and their data areas. The time synchronization implementation does **not** require all of the listed area pointers.

“DB10” is included in the “FB_TimeSyn” TIA Portal library file.

- “Coordination” area pointer (unused).
- “DateTime” area pointer.
- “JobMailbox” area pointer.
- “DataRecord” area pointer (unused).
- “ProjectID” area pointer (unused).
- “ScreenNumber” area pointer (unused).
- “DateTimePLC” area pointer.

Figure 4-1

DB10_HMI_AreaPointer

	Name	Data type	Offset	Start value	Retain	Visible in ...
1	Static				☐	☐
2	Coordination	Word	0.0	16#0	☑	☑
3	DateTime	Date_And_Time	2.0	DT#1990-01-01-00:00:00	☑	☑
4	JobMailbox	Array [0..3] of Word	10.0		☑	☑
5	JobMailbox[0]	Word	0.0	16#0	☑	☑
6	JobMailbox[1]	Word	2.0	16#0	☑	☑
7	JobMailbox[2]	Word	4.0	16#0	☑	☑
8	JobMailbox[3]	Word	6.0	16#0	☑	☑
9	DataRecord	Array [0..4] of Word	18.0		☑	☑
10	ProjectID	Word	28.0	16#0	☑	☑
11	ScreenNumber	Array [0..4] of Word	30.0		☑	☑
12	DateTimePLC	Struct	40.0		☑	☑
13	DateTime	Date_And_Time	0.0	DT#1990-01-01-00:00:00	☑	☑
14	Reserve_01	Word	8.0	16#0	☑	☑
15	Reserve_02	Word	10.0	16#0	☑	☑

4.2 Function block “FB110_TimeSyn_HMI_To_PLC”

Time synchronization “operator panel → PLC”

FB110 is used in the “TimeSyn_Project_04” project.

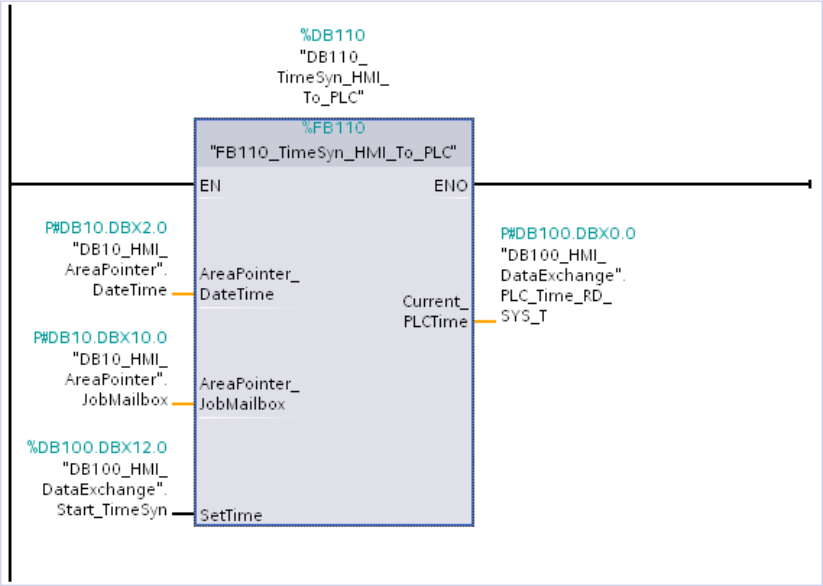
When the operator panel is the time master, use “FB110”.

“FB110” has “input/output parameters” that are interconnected as specified. You can edit the FB if needed. By default, it is **not** necessary to edit the FB.

“FB110” is included in the “FB_TimeSyn” TIA Portal library file.

“FB110” view

Figure 4-2



Principle of operation

Time synchronization is implemented via the following area pointers:

- “DateTime”.
- “JobMailbox” with job number “40”.

The block includes the following system function blocks:

- WR_SYS_T
  (call sets the time and date of the CPU clock).
- RD_SYS_T
  (the “RD_SYS_T” instruction reads the current date and time out of the CPU clock).

FB110 functional sequence

The following table describes the program flow of FB110. The program flow is implemented as a sequencer.

Table 4-1

Network	Comment
1.	**General:** Copy values from the “DateTime” area pointer to the static area. The “**AreaPointer_DateTime**” input parameter is used to read in the contents of the assigned “DateTime” area pointer. The input parameter has the “Date_And_Time” data type. For later evaluation of the time synchronization, it is necessary to divide the input parameter “byte by byte”. The result is copied to the data area of the static “**Edited_AreaPointer_DateTime**” tag. “AreaPointer_DateTime” → “Edited_AreaPointer_DateTime”.
2.	**Step 1:** Start time synchronization. The “**SetTime**” InOut parameter is used to read in/out the “start signal” for enabling time synchronization. The InOut parameter has the “Bool” data type. The “**AreaPointer_JobMailbox**” InOut parameter is used to read in/out the contents of the “JobMailbox” area pointer. The input parameter has the “Array [0..3] of Word” data type. With the start of time synchronization, the “JobMailbox” area pointer assigns the default value “0” to parameters 1 to 3.
3.	**Step 2:** Save the current value from the DateTime area pointer. In the network, the “**Edited_AreaPointer_DateTime**” tag is read out and its contents are divided into the - “SaveData_Previous_HMI_Time_01” “SaveData_Previous_HMI_Time_02” tags and temporarily stored. **Technical background:** The “Edited_AreaPointer_DateTime” tag has the “Date_And_Time” data type, which corresponds to a length of 2 double words. The tag will later be needed for a “time comparison”. To be able to compare the contents of the tag to the “**==D**" instruction, the tag is divided into two separate double words.

4.2 Function block “FB110_TimeSyn_HMI_To_PLC”

Network	Comment
4.	**Step 3:** Execute controller job “40”. Job number “40” is transferred to the “AreaPointer_JobMailbox” InOut parameter. **Note:** The job number must be specified in “hex format”.
5.	**Step 4:** Evaluation, job “40” done. The “AreaPointer_JobMailbox" InOut parameter is used to evaluate when the previously set controller job “40” was reset to “0” by the operator panel. **Note:** If the operator panel has accepted the controller job, the controller job will be reset to “0”. At this time, the controller job execution is generally **not** yet completed.
6.	**Step 5:** Evaluation, new HMI time applied? The static “**Edited_AreaPointer_DateTime**” tag is read out via the network and its contents are divided into the - “SaveData_New_HMI_Time_01” - “SaveData_New_HMI_Time_02” tags and temporarily stored. **Technical background:** To detect that the controller job has been fully completed, the network compares the time. The controller job is completed when the comparison of the ”SaveData_Previous_HMI_Time” and “SaveData_New_HMI_Time” tags is not equal.
7.	**Step 6:** Transfer new HMI system time to PLC. Via the network, the PLC system time is synchronized with the operator panel system time. For this purpose, the “**AreaPointer_DateTime**” input parameter tag is assigned to the “IN Parameter” of the “WR_SYS_T” system function block.
8.	**General:** Output current PLC time on operator panel. The read out PLC system time is output via the “**Current_PLCTime**” output parameter tag. For this purpose, the “**Current_PLCTime**” tag is assigned to the “OUT Parameter” of the “RD_SYS_T” system function block. The output parameter has the “Date_And_Time” data type.

4.3 Function block “FB120_TimeSyn_PLC_To_HMI”

Time synchronization “PLC → operator panel”

FB120 is used in the “TimeSyn_Project_03” project.

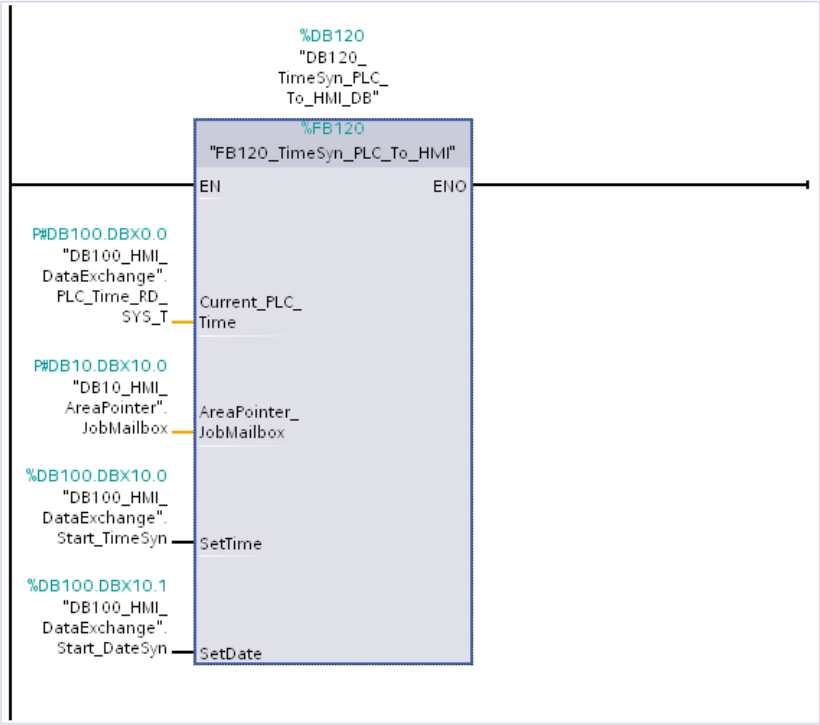
When the PLC is the time master, use “FB120”.

“FB120” has “input/output parameters” that are interconnected as specified. You can edit the FB if needed. By default, it is **not** necessary to edit the FB.

“FB120” is included in the “FB_TimeSyn” TIA Portal library file.

“FB120” view

Figure 4-3



Principle of operation

The function block allows you to separately synchronize the **time** and the **date** of the HMI operator panel with the time of the PLC.
Time synchronization is implemented via the following area pointer:

- “JobMailbox” with job number “14” (time).
- “JobMailbox” with job number “15” (date).

FB120 functional sequence

The following table describes the program flow of FB120. The program flow is implemented as a sequencer.

Table 4-2

Network	Comment
1.	**General:** Copy values from the “JobMailbox” area pointer to the temp area. The contents of the “JobMailbox” area pointer are read in via the “**AreaPointer_JobMailbox**” InOut parameter. The InOut parameter has the “Array [0..3] of Word” data type. For the later parameter assignment, it is necessary to divide the input parameter “byte by byte”. The result is temporarily stored in the “temp area”. **Note:** The InOut parameter has to be edited for the implementation. For information on how to program a structured data type in the InOut area of an FB and parameterize a function call with an ARRAY tag, please refer to Entry ID: 19106712.
2.	**General:** Copy and exclude “ms” from PLC time. The current PLC system time is read out via the “**Actual_PLC_Time**” In parameter. The In parameter has the “Date_And_Time” data type. For the later parameter assignment, it is necessary to divide the input parameter “byte by byte” and hide the “milliseconds” contained in the time. The result is copied to the data area of the static “**Edited_PLC_Time**” tag. For details on the structure of the “Date_And_Time” format, please refer to the WinCC Advanced system manual.
3.	**Step 1:** Start time synchronization via controller job “**14**” → **time**. The “**SetTime**” InOut parameter is used to read in/out the “start signal” for enabling time synchronization. The InOut parameter has the “Bool” data type. With the start of time synchronization, the “JobMailbox” area pointer assigns the default value “0” to parameters 1 to 3.

Network	Comment
4.	**Step 2:** Enter parameters in “JobMailbox” area pointer. In the network, the parameters provided for job number “14” are transferred to the “JobMailbox” area pointer. For details on the structure of controller job “14”, please refer to chapter 3.2.3. From the tag area of the “Edited_PLC_Time” tag, the • hour • minute • second are read out and transferred to the parameters of the “JobMailbox” area pointer.
5.	**Step 3:** Execute controller job “14”. Job number “14” is transferred to the auxiliary tag of the “AreaPointer_JobMailbox” InOut parameter. **Note:** The job number must be specified in “hex format”.
6.	**Step 4:** Evaluation, job “14” done. The auxiliary tag of the “AreaPointer_JobMailbox” InOut parameter is used to evaluate when the previously set controller job “14” was reset to “0” by the operator panel. **Note:** If the operator panel has accepted the controller job, the controller job will be reset to “0”. At this time, the controller job execution is generally **not** yet completed.
	The evaluation of time synchronization via controller job “14” is now complete.
7.	**Step 1:** Start time synchronization via controller job “**15**” → **date**. The “**SetDate**” InOut parameter is used to read in/out the “start signal” for enabling time synchronization. The InOut parameter has the “Bool” data type. With the start of time synchronization, the “JobMailbox” area pointer assigns the default value “0” to parameters 1 to 3.

4.3 Function block “FB120_TimeSyn_PLC_To_HMI”

Network	Comment
8.	**Step 2:** Enter parameters in “JobMailbox” area pointer. In the network, the parameters provided for job number “15” are transferred to the “JobMailbox” area pointer. For details on the structure of controller job “15”, please refer to chapter 3.2.3. From the tag area of the “Edited_PLC_Time” tag, the • weekday • day • month • year are read out and transferred to the parameters of the “JobMailbox” area pointer.
9.	**Step 3:** Execute controller job “15”. Job number “15” is transferred to the auxiliary tag of the “AreaPointer_JobMailbox” InOut parameter. **Note:** The job number must be specified in “hex format”.
10.	**Step 4:** Evaluation, job “15” done. The auxiliary tag of the “AreaPointer_JobMailbox” InOut parameter is used to evaluate when the previously set controller job “15” was reset to “0” by the operator panel. **Note:** If the operator panel has accepted the controller job, the controller job will be reset to “0”. At this time, the controller job execution is generally **not** yet completed.
	The evaluation of time synchronization via control job “15” is now complete.
11.	**General:** Write values back to the “**AreaPointer_JobMailbox**” InOut tag. In network 1 for the evaluation, the parameter values of job numbers “14” and “15” have been written to the associated auxiliary tags (#Tmp_JobMailBox_Byte0, etc.). Now the values of the auxiliary tags are written back to the “**AreaPointer_JobMailbox**” InOut parameter. The implementation of “time synchronization” via controller jobs “14” and “15” is now complete.

4.4 Function block “FB210_TimeSyn_HMI_To_PLC”

Time synchronization “operator panel → PLC” (operator panel is the master)

“FB210” is **only** included in the “FB_TimeSyn” TIA Portal library file that can be found in the download section of this application example.

If you are using a SIMATIC S7-1200 / S7-1500, you can use the integrated system function to synchronize the time (time synchronization for integrated connections). For more information, please see chapter 5.1 (link).

If you want to synchronize the time manually, use “FB210_TimeSyn_HMI_To_PLC”.

“FB210” was implemented in “SCL” and has the same functionality as “FB110_TimeSyn_HMI_To_PLC”. Therefore, the block is not described in greater detail at this point.

The block is parameterized with the same tags as “FB110”.

4.5 Function block “FB220_TimeSyn_PLC_To_HMI”

Time synchronization “PLC → operator panel” (PLC is the master)

“FB220” is **only** included in the “FB_TimeSyn” TIA Portal library file that can be found in the download section of this application example.

If you are using a SIMATIC S7-1200 / S7-1500, you can use the integrated system function to synchronize the time (time synchronization for integrated connections). For more information, please see chapter 5.1 (link).

If you want to synchronize the time manually, you can optionally use “FB220_TimeSyn_PLC_To_HMI”.

“FB220” was implemented in “SCL” and has the same functionality as “FB120_TimeSyn_HMI_To_PLC”. Therefore, the block is not described in greater detail at this point.

The block is parameterized with the same tags as “FB120”.

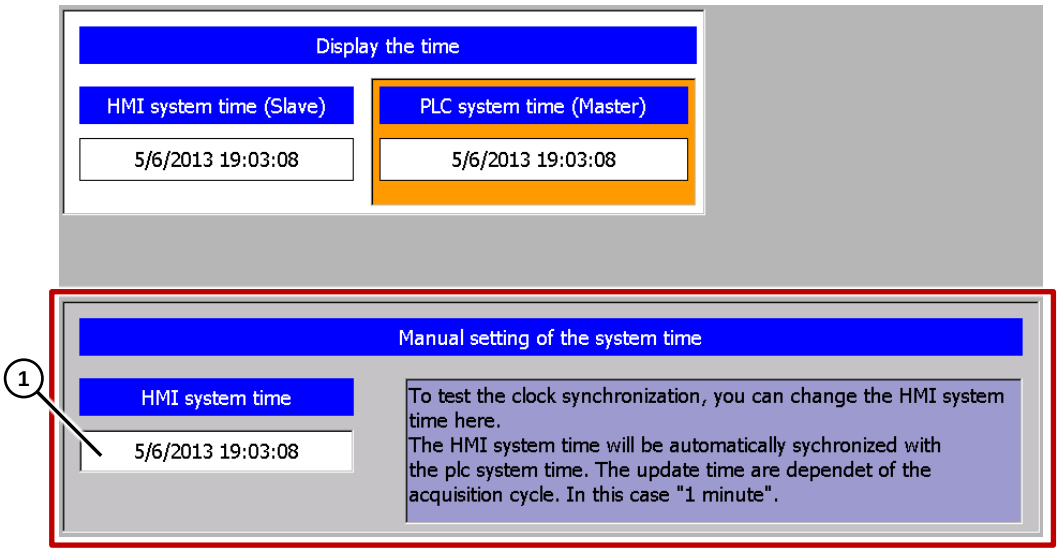
5 Configuration and Project Engineering

The following sections provide a detailed description of the individual sample configurations.

Remarks

- Please note the settings in chapter 6.2. “Adjusting the time zone on the panel and in the CPU”.
- To be able to test the time synchronization functionality, additional I/O fields are configured in the bottom part of the HMI screens (1).
  The I/O fields are not relevant to the implementation of the time synchronization and are therefore not described in greater detail.
  The I/O fields are used to test the function to be executed.

Figure 5-1



5.1 Variant 1: PLC (master/slave) ↔ HMI operator panel

Time synchronization between an S7-1200 and a TP1200 Comfort Panel

Note The guide can also be used for a SIMATIC S7-1500 controller.

Project_01, “TimeSyn_Project_01”.

In the sample project, time synchronization is performed using the “HMI time synchronization mode” (Master/Slave) HMI system function.

- CPU: S7-1200
- HMI_1: TP1200 “HMI time synchronization mode” => Slave
- HMI_2: TP1200 “HMI time synchronization mode” => Master

5.1 Variant 1: PLC (master/slave) ↔ HMI operator panel

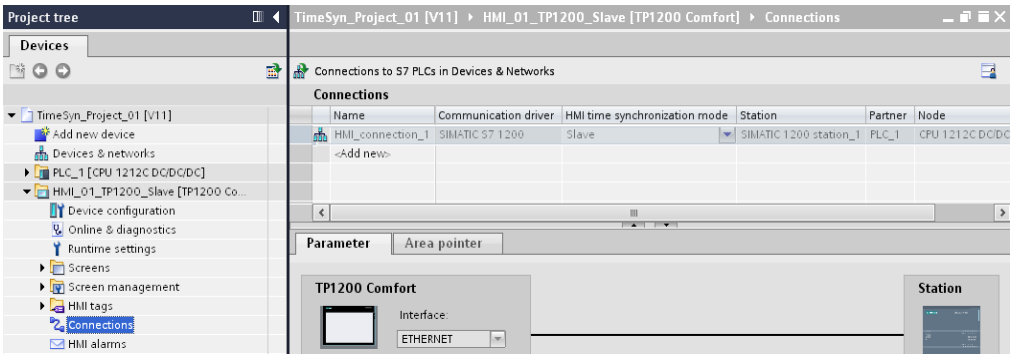
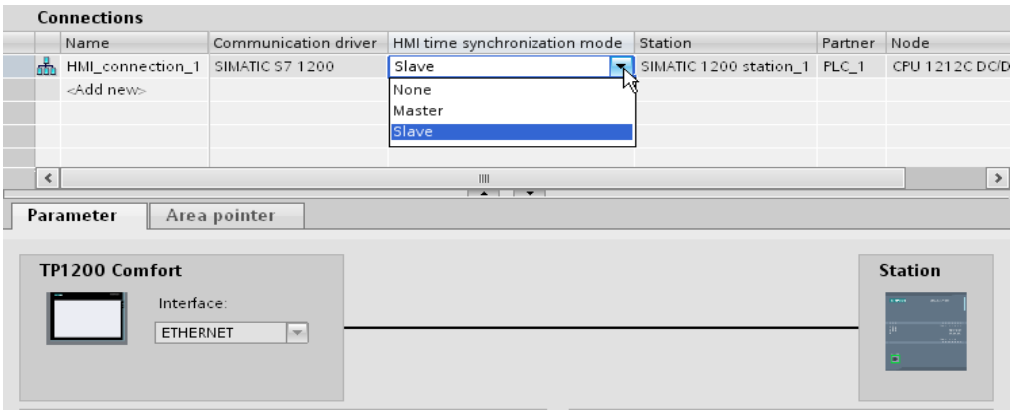
HMI configuration

The sample project includes two HMI configurations. The configurations differ only in the type of time synchronization (master/slave).

HMI_1 (Slave)

In this configuration, the **PLC** is the timer (master). The operator panel is the time receiving component (slave).

Table 5-1

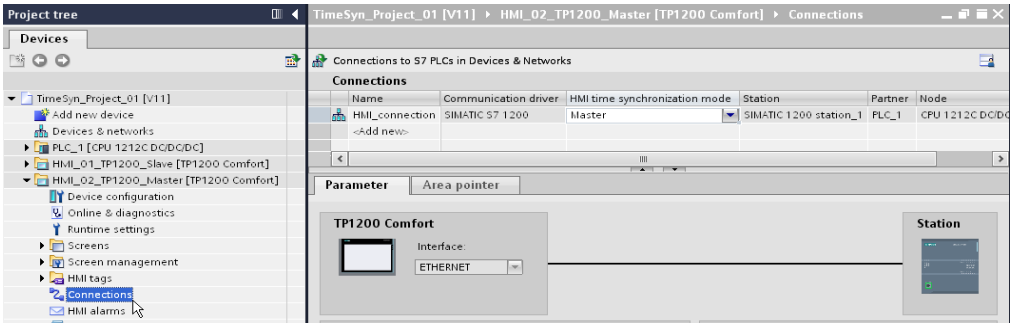
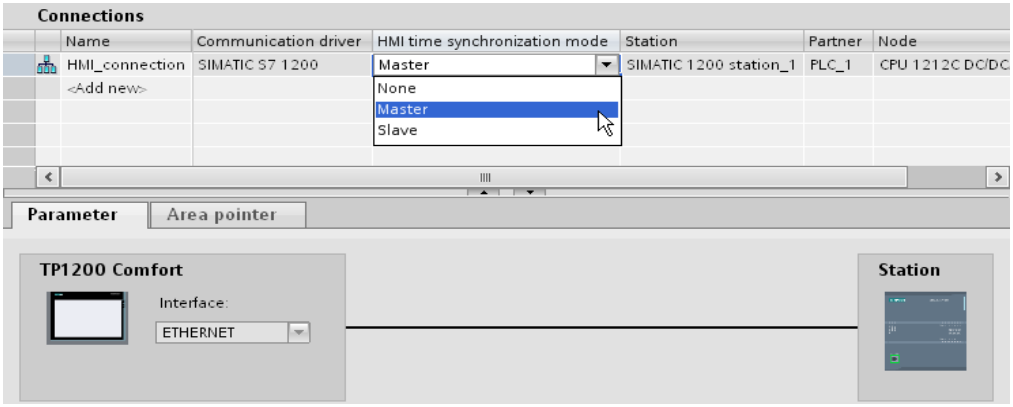
No.	Action
1.	**Connections** In the project tree, open the "**Connections**" component. The existing connections are displayed in the working window. **Note:** It is required that a connection to an S7-1200 / S7-1500 PLC has already been configured. 
2.	**Selecting time synchronization** In "HMI time synchronization mode", open the drop-down list and select the "**Slave**" item. The time synchronization settings are now complete. The connected PLC is now the timer component. 
3.	Other time synchronization settings are not required.

5.1 Variant 1: PLC (master/slave) ↔ HMI operator panel

HMI_2 (Master)

In this configuration, the **operator panel** is the timer (master). The PLC is the time receiving component (slave).

Table 5-2

No.	Action
1.	**Connections** In the project tree, open the "**Connections**" component. The existing connections are displayed in the working window. **Note:** It is required that a connection to an S7-1200 / S7-1500 PLC has already been configured. 
2.	**Selecting time synchronization** In "HMI time synchronization mode", open the drop-down list and select the "**Master**" item. The time synchronization settings are now complete. The connected HMI operator panel is now the timer component. 
3.	Other time synchronization settings are not required.

5.2 Variant 2: PLC (master) → HMI operator panel (slave)

Time synchronization between an S7-300 and a TP1200 Comfort Panel

Project_02, "TimeSyn_Project_02".

Time synchronization via the "DateTimePLC" area pointer

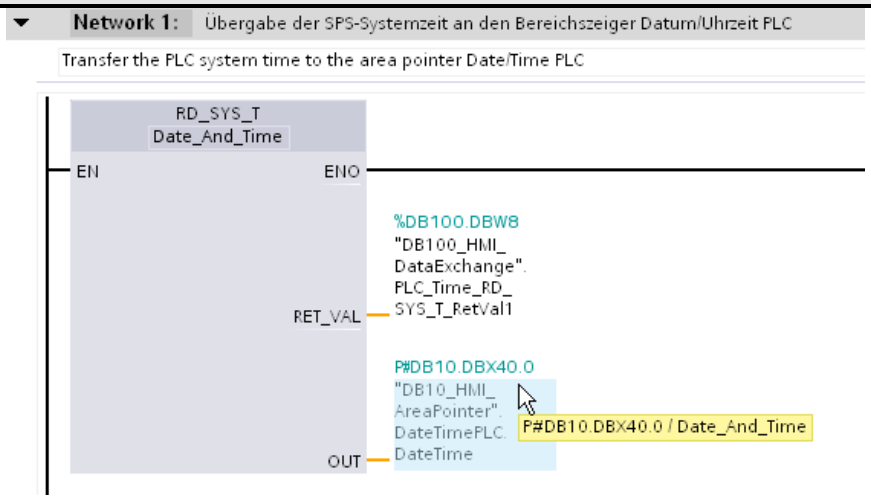
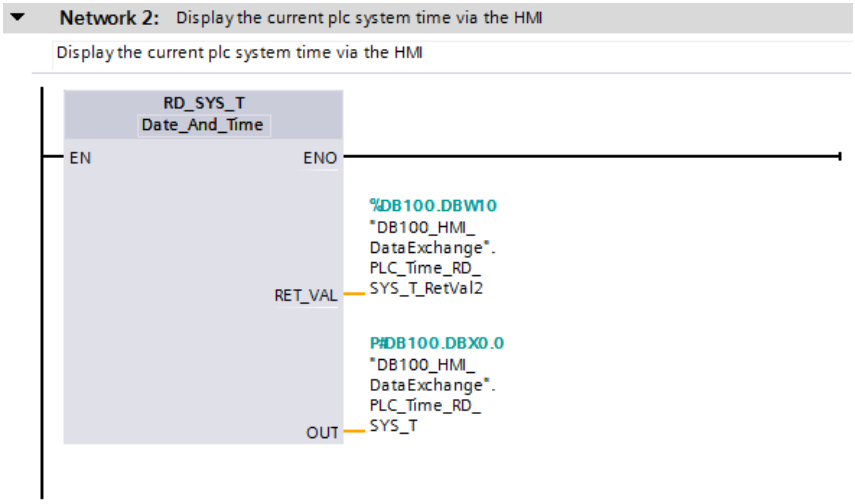
- CPU: S7-300
- HMI: TP1200 Comfort Panel

PLC program

Table 5-3

No.	Action
1.	**DB100 (DB100_HMI_DataExchange)** For data exchange between the PLC and the operator panel, DB100 was created with the following data structure. DB100_HMI_DataExchange Name / Data type / Offset / Start value / Retain / Visible in ... 1 Static 2 PLC_Time_RD_SYS_T — Date_And_Time — 0.0 — DT#1990-01-01-0 3 PLC_Time_RD_SYS_T_RetVal1 — Int — 8.0 — 0 4 PLC_Time_RD_SYS_T_RetVal2 — Int — 10.0 — 0
2.	**OB1 (Main), network 1** In network 1, the "**RD_SYS_T**" system block is called. The block is used to read out the PLC system time and transfer it to the "**DateTimePLC**" area pointer. For this purpose, the "**DateTime**" tag of the "**DateTimePLC**" area pointer is assigned to the output of the system block. **In this example:** "DB10_HMI_AreaPointer".DateTimePLC.DateTime (DB10.DBX40.0) For details on DB10 (DB10_HMI_AreaPointer), please refer to chapter 4.1. The different time functions can be found in the "Instructions" task card. The individual time functions are listed in the "Extended instructions > Date and time-of-day > Time-of-day functions" palette.

5.2 Variant 2: PLC (master) → HMI operator panel (slave)

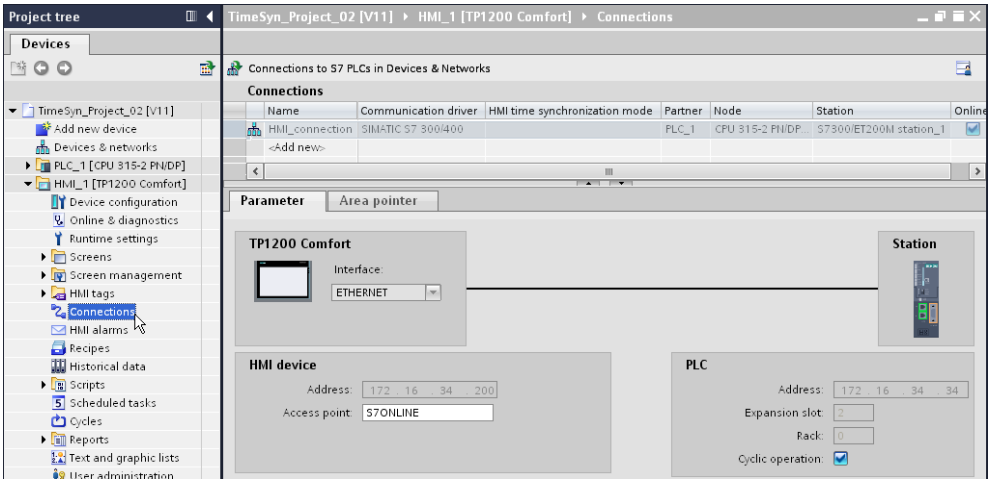
No.	Action
	
3.	**OB1, network 2 (optional network)** In network 2, the "**RD_SYS_T**" system block is called. The block is used to read out the PLC system time and directly output it in an I/O field on the operator panel. In terms of the example, this allows you to compare the current operator panel system time to the PLC system time. This network is not required to implement the task. 
4.	In the PLC, other time synchronization settings are not required.

5.2 Variant 2: PLC (master) → HMI operator panel (slave)

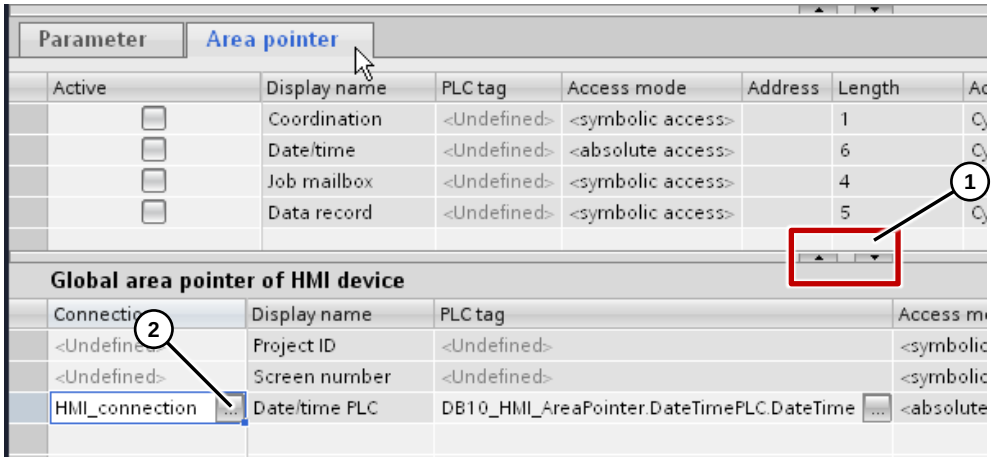
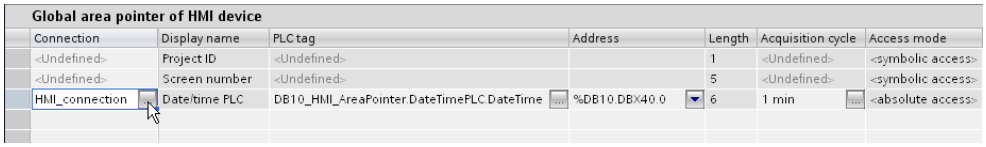
HMI configuration

In this configuration, the **PLC** is the timer (master). The HMI operator panel is the time receiving component (slave).

Table 5-4

No.	Action
1.	**Connections** In the project tree, open the "**Connections**" component. The existing connections are displayed in the working window. **Note:** It is required that a connection to a SIMATIC S7 controller has already been configured. **In this example:** SIMATIC S7 300/400 

5.2 Variant 2: PLC (master) → HMI operator panel (slave)

No.	Action
2.	**Selecting the area pointer** • In the “Connections” editor, select the “**Area pointer**” tab. • The “Area pointer” tab includes two tables with area pointers. Open the “**Global area pointer**” table. You may have to use the arrow buttons (1) to open the table. • Assign a connection to be used for time synchronization to the “DateTimePLC” area pointer. (2). 
3.	**Parameterizing the “DateTimePLC” area pointer** The figure below shows the parameterized “DateTimePLC” area pointer.  Parameter description Connection: In the window, select the PLC connection. Selecting the connection (controller) activates the area pointer. In this example: HMI_connection Display name: Name of the area pointer. Set by WinCC. PLC tag: This is where you select the PLC tag you have configured as the data area for the area pointer. In this example: DB10_HMI_AreaPointer.DateTimePLC.DateTime Address: When you have symbolically selected the tag in the “PLC tag” field, this field displays the tag address. Alternatively, enter the tag address manually. In this example: %DB10.DBX40.0 Length: Length of the area pointer. Set by WinCC. Acquisition cycle: In this field, define the acquisition cycle. Please keep in mind that a very short acquisition time can influence the operator panel performance. In this example: 1 min
4.	Other time synchronization settings are not required.

5.3 Variant 3: PLC (master) → HMI operator panel (slave)

Time synchronization between an S7-300 and a TP1200 Comfort Panel

Project_03, "TimeSyn_Project_03".

Time synchronization via the "JobMailbox" area pointer with controller job numbers 14 (time) and 15 (date).

For this time synchronization, the time and the date of the operator panel can be synchronized with the PLC system time/date independently of each other.

- CPU: S7-300
- HMI: TP1200 Comfort Panel
- PLC program block: FB120 (S7-300/400) or FB220 (S7-1200 / S7-1500)

Note If you are using an S7-1200 / S7-1500, please follow the information provided in chapter 4.5.

PLC program

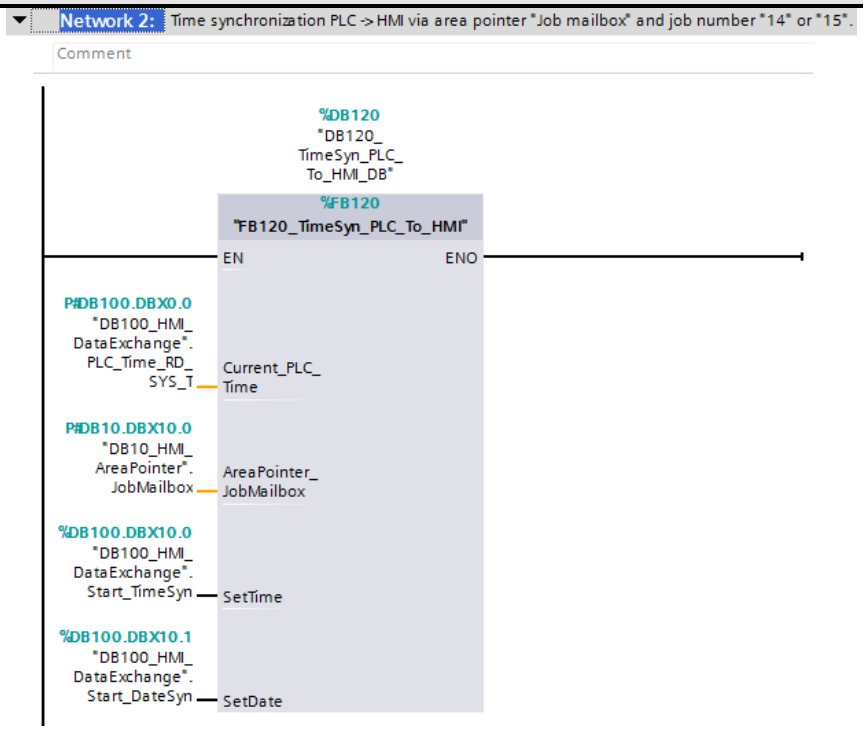
Table 5-5

No.	Action
1.	**DB10 (DB10_HMI_AreaPointer)** A data block that contains the data structure for all area pointers was created for the area pointers. For details on DB10 (DB10_HMI_AreaPointer), please refer to chapter 4.1. **DB10_HMI_AreaPointer** Name / Data type / Offset / Start value 1 Static 2 Coordination — Word — 0.0 — 16#0 3 DateTime — Date_And_Time — 2.0 — DT#1990-01-01-0 4 JobMailbox — Array [0..3] of Word — 10.0 5 DataRecord — Array [0..4] of Word — 18.0 6 ProjectID — Word — 28.0 — 16#0 7 ScreenNumber — Array [0..4] of Word — 30.0 8 DateTimePLC — Struct — 40.0

5.3 Variant 3: PLC (master) → HMI operator panel (slave)

No.	Action
2.	**DB100 (DB100_HMI_DataExchange)** For data exchange between the PLC and the operator panel, DB100 was created with the following data structure. DB100_HMI_DataExchange Name / Data type / Offset / Start value 1 Static 2 PLC_Time_RD_SYS_T — Date_And_Time — 0.0 — DT#1990-01-01-0 3 PLC_Time_RD_SYS_T_RetVal — Int — 8.0 — 0 4 Start_TimeSyn — Bool — 10.0 — false 5 Start_DateSyn — Bool — 10.1 — false
3.	**OB1 (Main), network 1** In network 1, the "**RD_SYS_T**" system block is called. The block is used to read out the PLC system time and transfer it to FB120 "**FB120_TimeSyn_PLC_To_HMI**" via a tag. Furthermore, the PLC system time is output on the operator panel via the used tag. **In this example:** "DB100_HMI_DataExchange".PLC_Time_RD_SYS_T (DB100.DBX0.0) Network 1: Read current PLC system time Comment RD_SYS_T Date_And_Time EN / ENO %DB100.DBW8 "DB100_HMI_DataExchange".PLC_Time_RD_SYS_T_RetVal RET_VAL P#DB100.DBX0.0 "DB100_HMI_DataExchange".PLC_Time_RD_SYS_T OUT
4.	**OB1 (Main), network 2** In network 2, the "**FB120**" program block is called. **(FB120_TimeSyn_PLC_To_HMI)**. FB120 evaluates the data of the "JobMailbox" area pointer and, based on this information, provides the time and date of the operator panel. FB120 was created specifically for this time synchronization. It is **not** necessary to edit the program block. The block includes all the necessary functions. To implement time synchronization, it is only necessary to parameterize FB120 according to the specifications. For details on FB120, please refer to chapter 4.3.

5.3 Variant 3: PLC (master) → HMI operator panel (slave)

No.	Action
	
5.	**FB120, parameterization** Name/no. of FB: Any FB name/number can be selected. **In this example:** Name: FB120_TimeSyn_PLC_To_HMI FB no.: 120 Instance DB: Any instance DB name/number can be selected. **In this example:** Name: DB120_TimeSyn_PLC_To_HMI_D Current_PLCTime: IN parameter of the “Date_And_Time” type The parameter is used to read in the current PLC system time. Link the parameter to the OUT parameter of the “RD_SYS_T” system block (network 1). **In this example:** “DB100_HMI_DataExchange”.PLC_Time_RD_SYS_T DB100.DBX0.0 AreaPointer_Job_Mailbox: INOUT parameter of the “Array [0..3] of Word” type Link the parameter to the address of the “JobMailbox” area pointer. **In this example:** “DB10_HMI_AreaPointer”.JobMailbox DB10.DBX10.0 6. SetTime: INOUT parameter of the “Bool” type A button on the operator panel starts time

5.3 Variant 3: PLC (master) → HMI operator panel (slave)

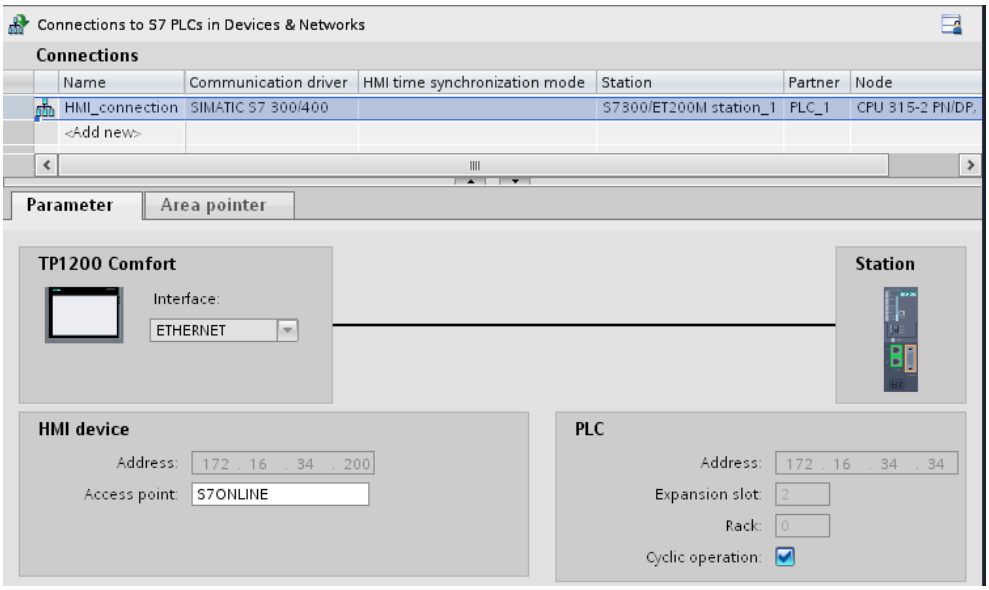
No.	Action
	synchronization on the operator panel. Link the parameter to the address of the used button. **In this example:** "DB100_HMI_DataExchange".Start_TimeSyn DB100.DBX10.0 SetDate: INOUT parameter of the "Bool" type A button on the operator panel starts date synchronization on the operator panel. Link the parameter to the address of the used button. **In this example:** "DB100_HMI_DataExchange".Start_DateSyn DB100.DBX10.1 Link to the HMI configuration
7.	In the PLC, other time synchronization settings are not required.

5.3 Variant 3: PLC (master) → HMI operator panel (slave)

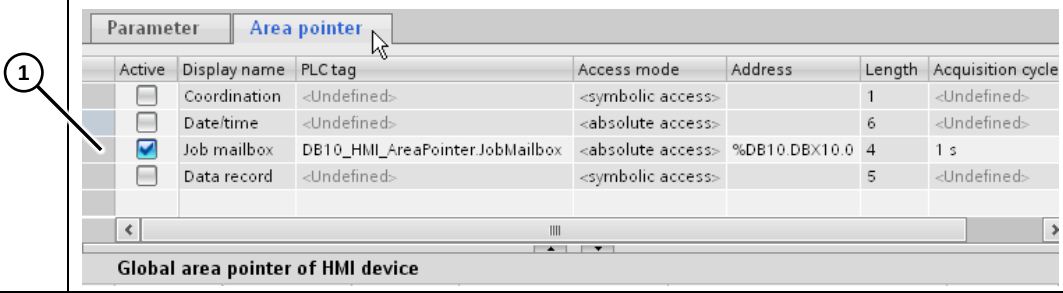
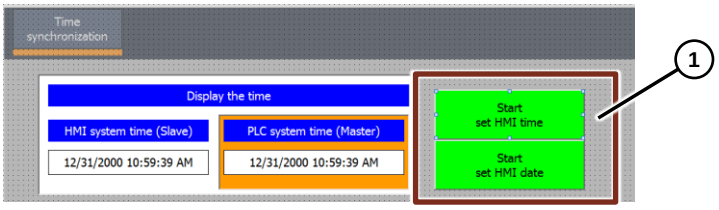
HMI configuration

In this configuration, the **PLC** is the timer (master). The operator panel is the time receiving component (slave).

Table 5-6

No.	Action
1.	**Connections** In the project tree, open the "**Connections**" component. The existing connections are displayed in the working window. Select the connection via which the operator panel is to be synchronized. **In this example:** HMI_connection **Notes:** • It is required that a connection to a SIMATIC S7 controller has already been configured. • The area pointer used in this example can be activated separately for each configured connection. **In this example:** SIMATIC S7 300/400 connection 

5.3 Variant 3: PLC (master) → HMI operator panel (slave)

No.	Action
2.	**Selecting the area pointer** In the “Connections” editor, select the “**Area pointer**” tab (1). 
3.	**Parameterizing the “JobMailbox” area pointer** **“JobMailbox” parameter description** Active: Check the check box to the left of the “**JobMailbox”** area pointer. Display name: Name of the area pointer. Set by WinCC. PLC tag: This is where you select the PLC tag you have configured as the data area for the area pointer. **In this example:** DB10_HMI_AreaPointer.JobMailbox Address: When you have symbolically selected the tag in the “PLC tag” field, this field displays the tag address. Alternatively, enter the tag address manually. **In this example:** DB10.DBX10.0 Length: Length of the area pointer. Set by WinCC. Acquisition cycle: In this field, define the acquisition cycle. Please keep in mind that a very short acquisition time can influence the operator panel performance. **In this example:** 1 s
4.	**HMI screen**  Two buttons are required to execute the functions (1). • **Button 1**: Time synchronization In “Properties > Events > Press”, use the “SetBit” system function. Link the parameter to this address: “DB100_HMI_DataExchange”.Start_TimeSyn (DB100.DBX10.0) • **Button 2**: Date synchronization In “Properties > Events > Press”, use the “SetBit” system function. Link the parameter to this address: “DB100_HMI_DataExchange”.Start_DateSyn (DB100.DBX10.1)
5.	Other time synchronization settings are not required.

5.4 Variant 4: HMI operator panel (master) → PLC (slave)

Time synchronization between an S7-300 and a TP1200 Comfort Panel

Project_04, "TimeSyn_Project_04".

Time synchronization via the "DateTime" and "JobMailbox" area pointers with job number 40.

- CPU: S7-300
- HMI: TP1200 Comfort Panel
- PLC program block: FB110 (S7-300/400) or
  FB210 (S7-1200 / S7-1500)

Note If you are using an S7-1200 / S7-1500, please follow the information provided in chapter 4.4.

PLC program

Table 5-7

No.	Action
1.	**DB10 (DB10_HMI_AreaPointer)** A data block that contains the data structure for all area pointers was created for the area pointers. For details on DB10 (DB10_HMI_AreaPointer), please refer to chapter 4.1. DB10_HMI_AreaPointer Name / Data type / Offset / Start value 1 Static 2 Coordination — Word — 0.0 — 16#0 3 DateTime — Date_And_Time — 2.0 — DT#1990-01-01-0 4 JobMailbox — Array [0..3] of Word — 10.0 5 DataRecord — Array [0..4] of Word — 18.0 6 ProjectID — Word — 28.0 — 16#0 7 ScreenNumber — Array [0..4] of Word — 30.0 8 DateTimePLC — Struct — 40.0

5.4 Variant 4: HMI operator panel (master) → PLC (slave)

No.	Action
2.	**DB100 (DB100_HMI_DataExchange)** For data exchange between the PLC and the operator panel, DB100 was created with the following data structure. **DB100_HMI_DataExchange** Name / Data type / Offset / Start value 1 Static 2 PLC_Time_RD_SYS_T — Date_And_Time — 0.0 — DT#1990-01-01-00:00:00 3 PLC_Time_RD_SYS_T_RetVal — Int — 8.0 — 0 4 PLC_Time_WR_SYS_T_RetVal — Int — 10.0 — 0 5 Start_TimeSyn — Bool — 12.0 — false
3.	**OB1 (Main), network 1** In network 1, program block “**FB110**”(**FB110_TimeSyn_HMI_To_PLC**) is called. FB110 evaluates the data of the “DateTime” and “JobMailbox” area pointers and, based on this information, provides the time and date of the PLC. FB110 was created specifically for this time synchronization. It is not necessary to edit the program block. The block includes all the necessary functions. To implement time synchronization, it is only necessary to parameterize FB110 according to the specifications. For details on FB110, please refer to chapter 4.2. Block title: "Main Program Sweep (Cycle)" Comment Network 1: Übergabe der SPS-Systemzeit an den Bereichszeiger Datum/Uhrzeit Hand-off PLC system time to the area pointer Date/Time %DB110 "DB110_TimeSyn_HMI_To_PLC" %FB110 "FB110_TimeSyn_HMI_To_PLC" EN / ENO P#DB10.DBX2.0 "DB10_HMI_AreaPointer".DateTime — AreaPointer_DateTime P#DB10.DBX10.0 "DB10_HMI_AreaPointer".JobMailbox — AreaPointer_JobMailbox %DB100.DBX12.0 "DB100_HMI_DataExchange".Start_TimeSyn — SetTime Current_PLCTime — P#DB100.DBX0.0 "DB100_HMI_DataExchange".PLC_Time_RD_SYS_T

5.4 Variant 4: HMI operator panel (master) → PLC (slave)

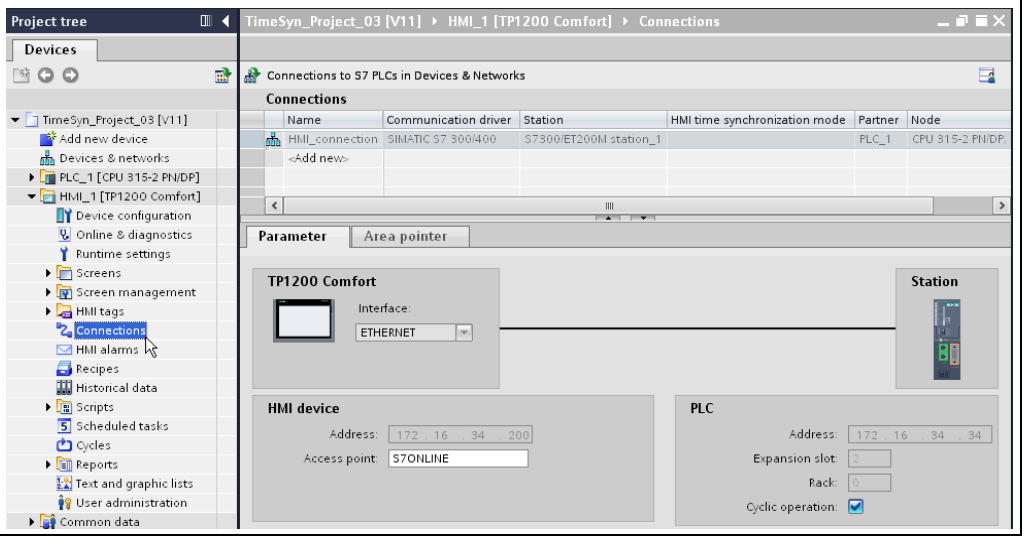
No.	Action
4.	**FB110, parameterization** Name/no. of FB: Any FB name/number can be selected. **In this example:** Name: FB110_TimeSyn_HMI_To_PLC FB no..: 110 Instance DB: Any instance DB name/number can be selected. **In this example:** Name: DB110_TimeSyn_HMI_To_PLC FB no.: 110 AreaPointer_DateTime: IN parameter of the “Date_And_Time” type Link the parameter to the address of the “DateTime” area pointer. **In this example:** “DB10_HMI_AreaPointer”.DateTime DB10.DBX2.0 AreaPointer_Job_Mailbox: INOUT parameter of the “Array [0..3] of Word” type Link the parameter to the address of the “JobMailbox” area pointer. **In this example:** “DB10_HMI_AreaPointer”.JobMailbox DB10.DBX10.0 SetTime: INOUT parameter of the “Bool” type A button on the panel starts time synchronization. Link the parameter to the address of this button. **In this example:** “DB100_HMI_DataExchange”.Start_TimeSyn DB100.DBX12.0 Current_PLCTime: OUT parameter of the “Date_And_Time” type The tag is used to output the current PLC system time on the panel. Link the parameter to the address of this “date/time field”. **In this example:** “DB100_HMI_DataExchange”.PLC_Time_RD_SYS_T DB100.DBX0.0 Link to the HMI configuration
5.	In the PLC, other time synchronization settings are not required.

5.4 Variant 4: HMI operator panel (master) → PLC (slave)

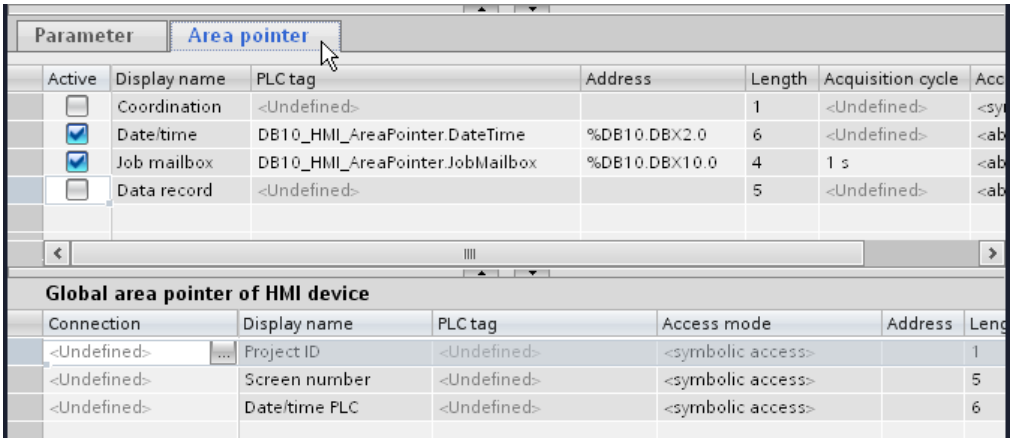
HMI configuration

In this configuration, the **operator panel** is the timer (master). The PLC is the time receiving component (slave).

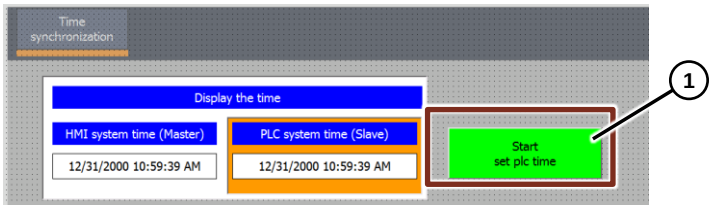
Table 5-8

No.	Action
1.	**Connections** In the project tree, open the "**Connections**" component. The existing connections are displayed in the working window. Select the connection via which the operator panel is to be synchronized. **In this example:** HMI_connection **Notes:** • It is required that a connection to a SIMATIC S7 controller has already been configured. • The area pointers used in this example can be activated separately for each configured connection. **In this example:** SIMATIC S7 300/400 connection 

5.4 Variant 4: HMI operator panel (master) → PLC (slave)

No.	Action
2.	**Selecting the area pointer** In the “Connections” editor, select the “**Area pointer**” tab. The “Area pointer” tab includes two tables with area pointers. For this application, open the “**Area pointer**” table. The “Global area pointer” table is not required. 
3.	**Parameterizing the “DateTime” and “JobMailbox” area pointers** **“DateTime” parameter description** Active: Check the check box to the left of the “**DateTime**” area pointer. Display name: Name of the area pointer. Set by WinCC. PLC tag: This is where you select the PLC tag you have configured as the data area for the area pointer. **In this example:** DB10_HMI_AreaPointer.DateTime Address: When you have symbolically selected the tag in the “PLC tag” field, this field displays the tag address. Alternatively, enter the tag address manually. **In this example:** DB10.DBX2.0 Length: Length of the area pointer. Set by WinCC. **“JobMailbox” parameter description** Active: Check the check box to the left of the “**JobMailbox”** area pointer. Display name: Name of the area pointer. Set by WinCC. PLC tag: This is where you select the PLC tag you have configured as the data area for the area pointer. **In this example:** DB10_HMI_AreaPointer.JobMailbox Address: When you have symbolically selected the tag in the “PLC tag” field, this field displays the tag address. Alternatively, enter the tag address manually. **In this example:** DB10.DBX10.0 Length: Length of the area pointer. Set by WinCC. Acquisition cycle: In this field, define the acquisition cycle. Please keep in mind that a very short acquisition time can influence the operator panel performance. **In this example:** 1 min

5.4 Variant 4: HMI operator panel (master) → PLC (slave)

No.	Action
4.	**HMI screen**  One button is required to execute the function (1). • **Button**: Time synchronization In “Properties > Events > Press”, use the “SetBit” system function. Link the parameter to this address: “DB100_HMI_DataExchange”.Start_TimeSyn (DB100.DBX12.0)
5.	Other time synchronization settings are not required.

6 Operation of the Application

6.1 General

The functionality described below is the same for all time synchronization projects / variants.

Transferring the configuration files

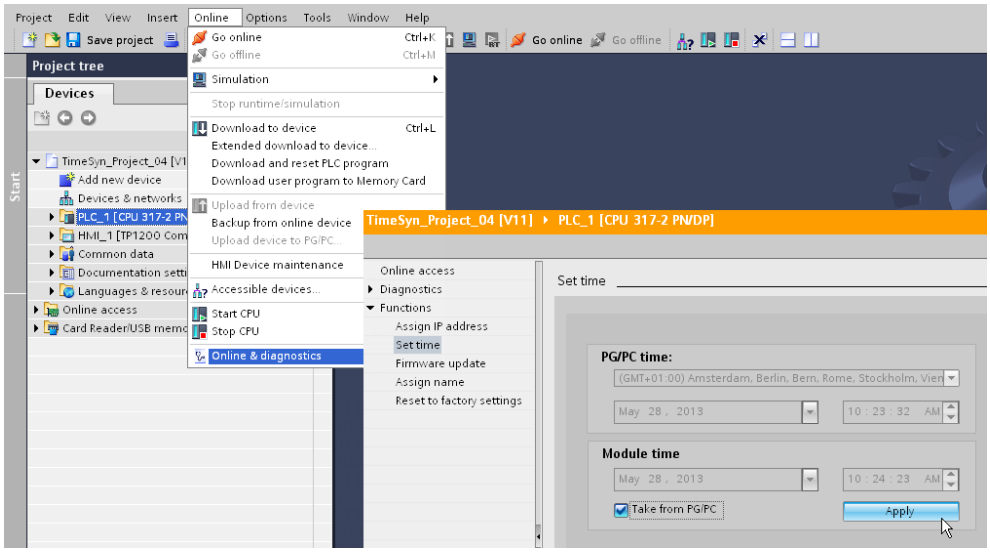
To operate the application, the following requirements must be met:

- The STEP 7 program was transferred to the PLC.
- The HMI configuration was transferred to the operator panel.

Note regarding the CPU system date
To use the application, the CPU system time must be set to a time after the year 2000. This has to be taken into account particularly after a general reset of the CPU.

The “Online > Online & diagnostics > Functions > Set time” menu command allows you to edit the CPU system time.

Figure 6-1



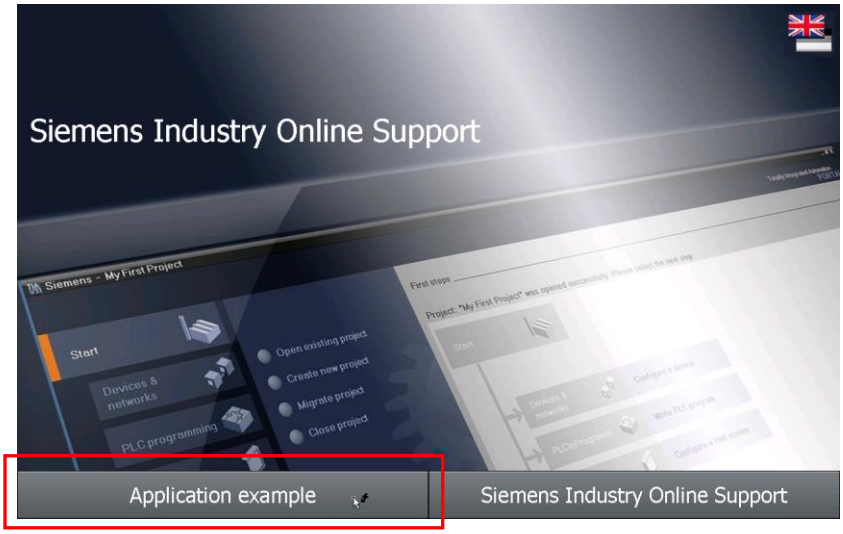
6.1.1 Opening the “plant screens”

Start screen

When starting the HMI project on the operator panel, the following start screen is displayed.

The “**Application example**” button takes you to the navigation overview of the created time synchronization plant screens.

Figure 6-2



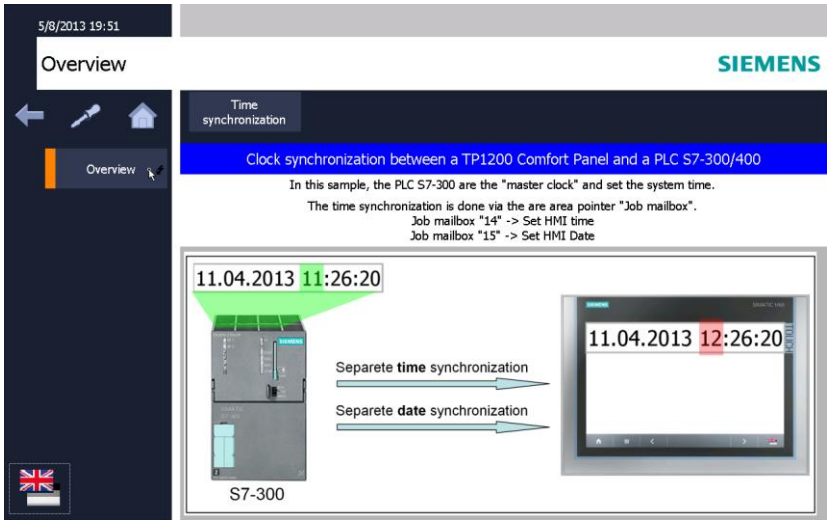
Navigation overview

This screen provides you with the navigation overview of the configured plant screens. In this example, there is only the “**Overview**” screen.

The “Overview” screen provides a summary of the task.

The “Time synchronization” button takes you to the time synchronization “plant screen”.

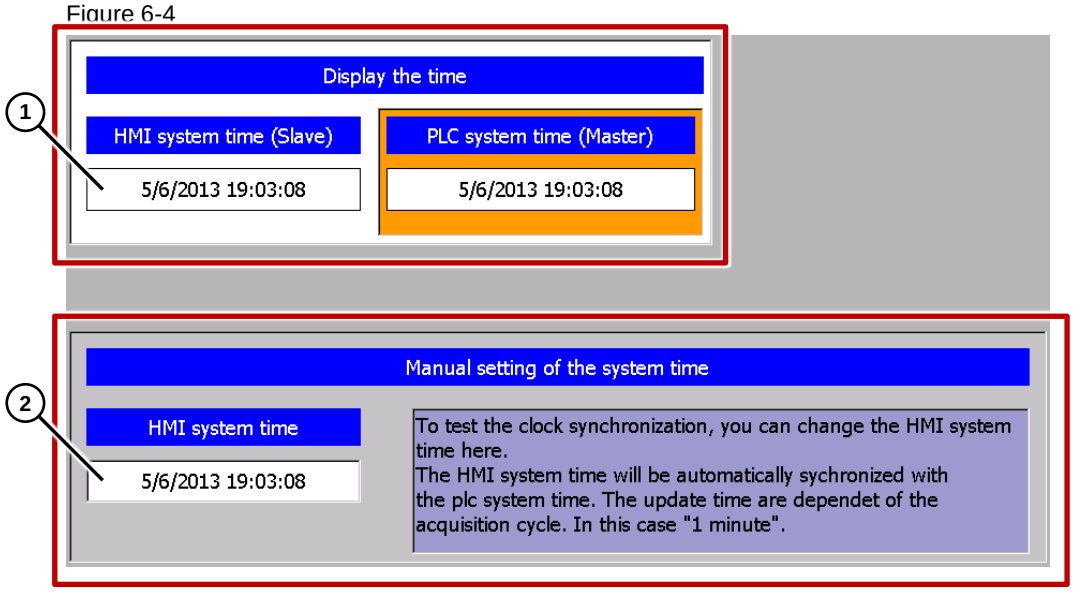
Figure 6-3



6.1.2 Functionality of the plant screens

The figure below shows the user interface. Except for the labels, the objects shown in this figure are identical in all sample projects.

Figure 6-4



Section 1:
The top part of the screen contains two output fields. The system time of the operator panel and the system time of the PLC are output in the output fields.

The two output fields are not mandatory for implementing time synchronization.

Section 2:
The “input/output field” in the bottom part of the screen is used to test the time synchronization functionality.

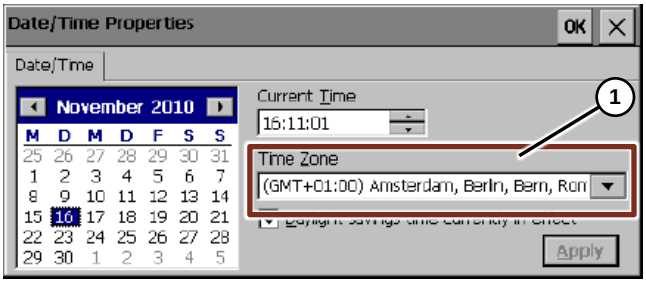
The “input/output field” is **not** mandatory for implementing time synchronization.

6.2 Adjusting the time zone on the panel and in the CPU

To make sure that the time is displayed correctly, the same time zone must be set on the panel and in the CPU.

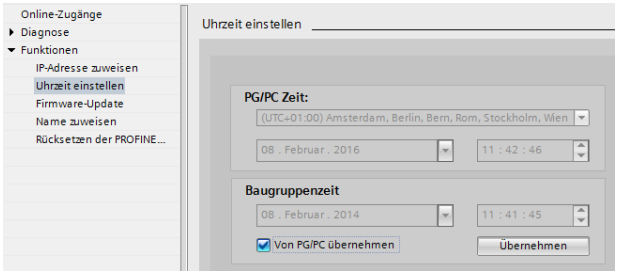
Setting the time zone on the panel

Table 6-1

No.	Action
1.	**Date/Time** On the panel, open the Control Panel and click the “Date/Time” dialog.  • In “Time Zone”, select the active time zone for the operator panel. • Select “Apply” to confirm your setting. The time displayed in “Current Time” is adjusted to the selected time zone. **Note regarding Basic Panels** For Basic Panels, you set the time shift directly in the “Date/Time” dialog box.

Setting the time zone in the CPU

Table 6-2

No.	Action
1.	**Time zone** Depending on the controller used, you can directly set the time zone using the menu on the display of the CPU (e.g., S7 1500) or using an online connection between the CPU and the configuration computer. In the configuration user interface, use the project tree to open “Online & diagnostics”. The “Set time” menu item allows you to change the module time. The time zone (“PG/PC time”) is applied from the time zone stored in the PC’s Control Panel. 

6.3 TimeSyn_Project_01 (variant 1)

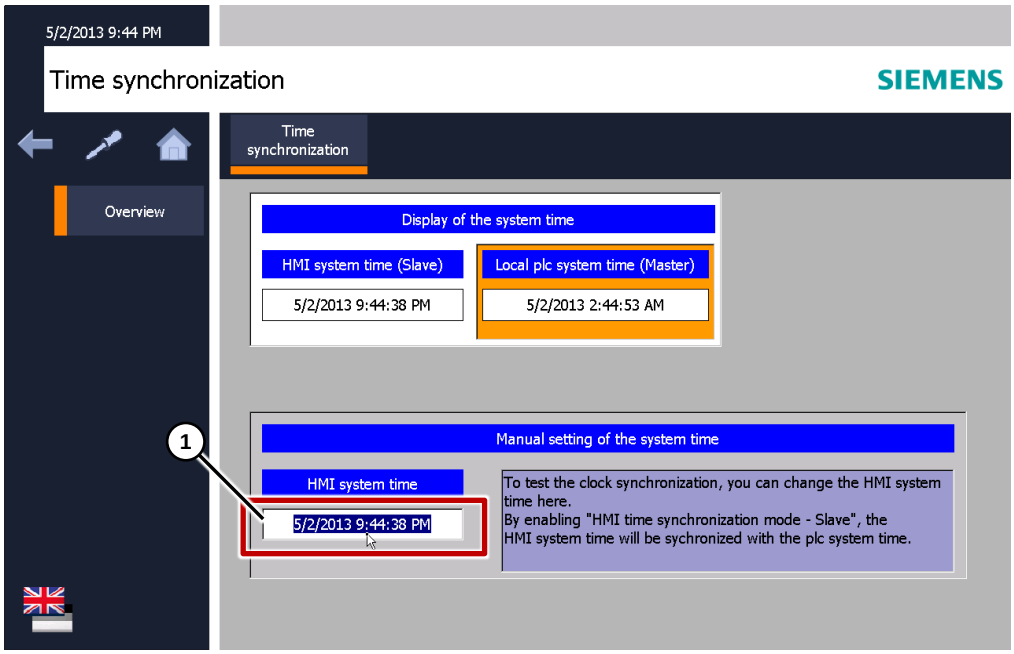
S7-1200 / S7-1500 time synchronization

Time synchronization between an S7-1200 and a TP1200 Comfort Panel.

HMI_01_TP1200_Slave

PLC (master) → HMI operator panel (slave)

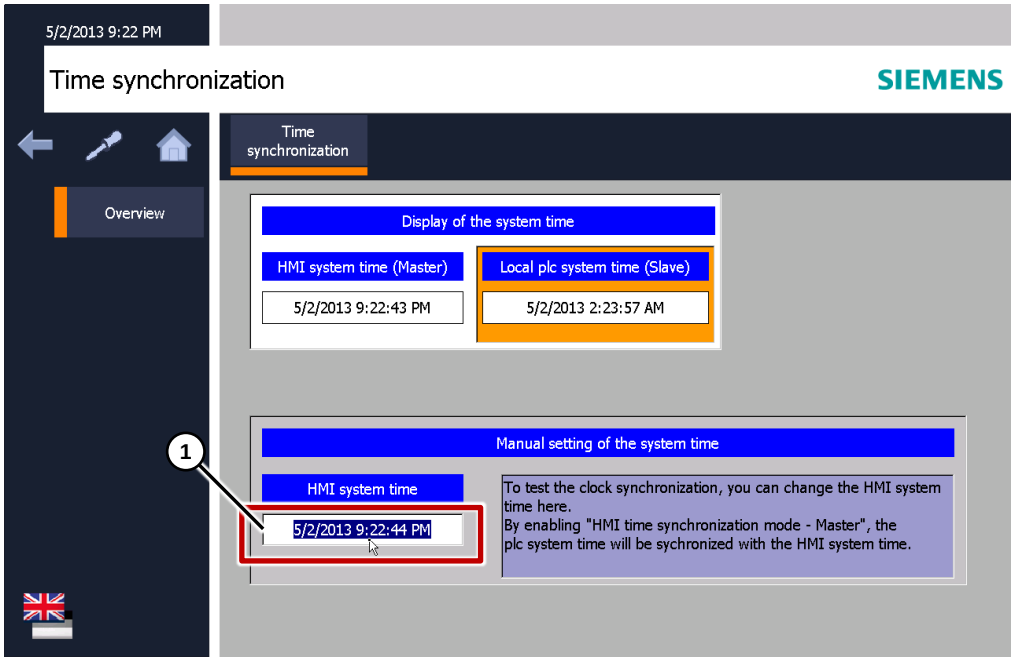
Table 6-3

No.	Action
1.	**Opening time synchronization** Select "**Application example > Overview > Time synchronization**" to open the time synchronization.
2.	**Specifying HMI time** In the I/O field, change the HMI system time and press "Enter" to complete your entry (1). **In this example:** The HMI time (hour) was changed to 7 p.m. The **HMI system time** is adjusted to the PLC system time within a minute. 

HMI_02_TP1200_Master

HMI operator panel (master) → PLC (slave)

Table 6-4

No.	Action
1.	**Opening time synchronization** Select "**Application example > Overview > Time synchronization**" to open the time synchronization.
2.	**Specifying HMI time** In the I/O field, change the HMI system time and press "Enter" to complete your entry (1). **In this example:** The HMI time (hour) was changed to 7 p.m. The **PLC system time** is adjusted to the HMI system time within a minute. 

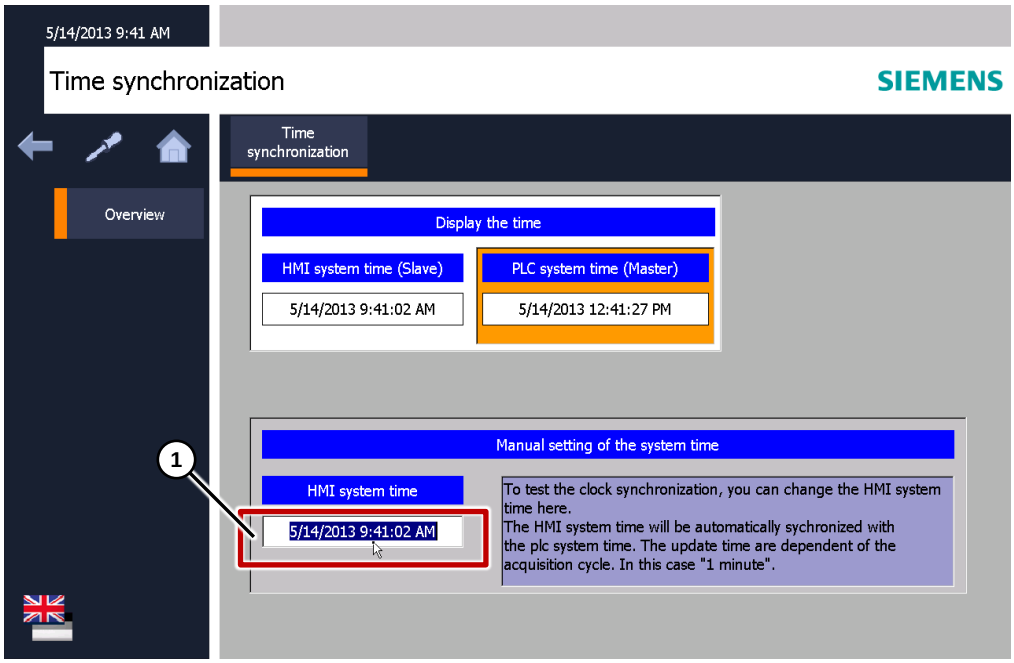
6.4 TimeSyn_Project_02 (variant 2)

PLC (master) → operator panel (slave)

Time synchronization between an S7-300 controller and a TP1200 Comfort Panel.

Time synchronization is performed via the “DateTimePLC” area pointer.

Table 6-5

No.	Action
1.	**Opening time synchronization** Select “**Application example > Overview > Time synchronization**” to open the time synchronization.
2.	**Specifying HMI time** In the I/O field, change the HMI system time and press “Enter” to complete your entry (1). **In this example:** The HMI time (hour) was changed to 9 a.m. The **HMI system time** is adjusted to the PLC system time within a minute. 

6.5 TimeSyn_Project_03 (variant 3)

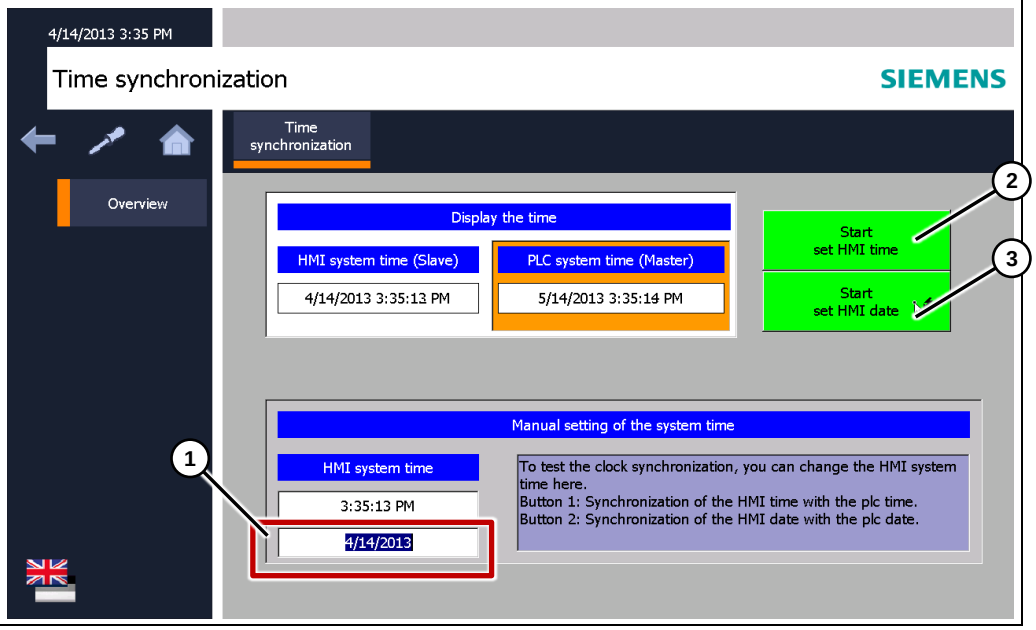
PLC (master) → operator panel (slave)

Time synchronization between an S7-300 controller and a TP1200 Comfort Panel.

Time synchronization is performed via the “JobMailbox” area pointer with controller job numbers 14 (time) and 15 (date).

For this time synchronization, the time and the date of the operator panel can be synchronized with the PLC system time independently of each other.

Table 6-6

No.	Action
1.	**Opening time synchronization** Select “**Application example > Overview > Time synchronization**” to open the time synchronization.
2.	**Specifying HMI date** (alternatively, the time) • In the I/O field, change the HMI system date and press “Enter” to complete your entry (1). • Select the “Start set HMI date” button (3). **In this example:** The HMI date (month) was changed to “4”. Selecting the button (3) adjusts the **HMI system date** to the PLC system date. 

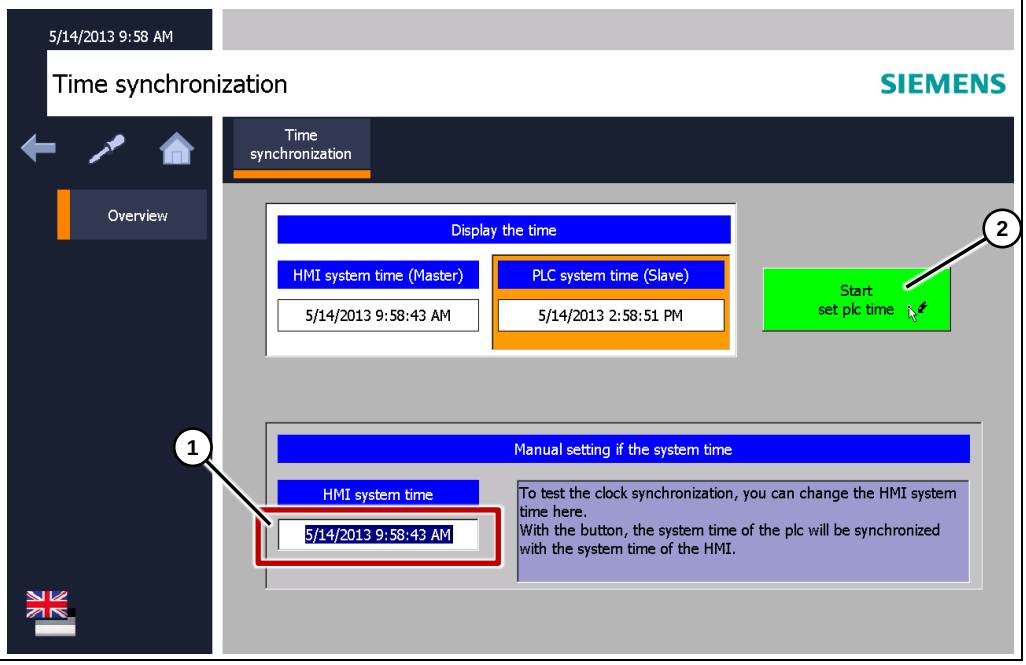
6.6 TimeSyn_Project_04 (variant 4)

Operator panel (master) → PLC (slave)

Time synchronization between a TP1200 Comfort Panel and a S7-300 controller.

Time synchronization is performed via the “DateTime” and “JobMailbox” area pointers with job number 40.

Table 6-7

No.	Action
1.	**Opening time synchronization** Select “**Application example > Overview > Time synchronization**” to open the time synchronization.
2.	**Specifying HMI time** • In the I/O field, change the HMI system time and press “Enter” to complete your entry (1). • Select the “Start set plc time” button (2). **In this example:** The HMI time (hour) was changed to 9 a.m. Selecting the button adjusts the **PLC system time** to the HMI system time. 

7 Notes and Tips

The aim of the following notes and tips is to provide support if you want to customize the supplied configurations to your project environment.

7.1 Replacing the PLC

Instead of the SIMATIC PLC used, other SIMATIC controllers from the WinCC TIA Portal hardware catalog can also be used.

When replacing the SIMATIC controller, consider and then check the following:

- Only SIMATIC S7-1200 and S7-1500 controllers support time synchronization via “HMI time synchronization mode”.
- If you are using the function blocks from the “TimeSyn_Project_03” (FB120) or “TimeSyn_Project_04” (FB110) projects, the SIMATIC controller used must support the “STL” programming language.
  The FBs were created in the STL programming language.
- If, for example, the connection paths (Ethernet/PROFIBUS) have changed, check the following in the HMI configuration …
  - the configured HMI connection
  - the connections used in the global area pointer
  - the addresses of the area pointers used.

7.2 Replacing the HMI operator panel

Instead of the TP1200 Comfort Panel used, you can also use a different operator panel from the WinCC TIA Portal hardware catalog.

When replacing the HMI operator panel, consider and then check the following.

- Area pointers used
  Before replacing the operator panel, make sure that the new operator panel supports the area pointer used. For more information, please refer to the WinCC (TIA Portal) system manual.
- Creating a new connection (PROFINET → PROFIBUS).
  If you create a new connection instead of the existing connection, you have to rebuild the area pointers.

8 Links & Literature

8.1 References

This list is not complete and only represents a selection of relevant literature.

Table 8-1

	Topic	Title
/1/	STEP7 SIMATIC S7-300/400	Automating with STEP7 in STL and SCL Author: Hans Berger Publicis Publishing ISBN: 978-3-89578-412-5
/2/	STEP7 SIMATIC S7-300/400	Automating with STEP7 in LAD and FBD Author: Hans Berger Publicis Publishing ISBN: 978-3-89578-410-1
/3/	STEP7 SIMATIC S7-300	Automating with SIMATIC S7-300 inside TIA Portal Author: Hans Berger Publicis Publishing ISBN: 978-3-89578-443-9
/4/	STEP7 SIMATIC S7-400	Automating with SIMATIC S7-400 inside TIA Portal Author: Hans Berger Publicis Publishing ISBN: 978-3-89578-383-8
/5/	STEP7 SIMATIC S7-1200	Automating with SIMATIC S7-1200 Author: Hans Berger Publicis Publishing ISBN: 978-3-89578-385-2

8.2 Internet links

This list is not complete and only represents a selection of relevant information.

Table 8-2

	Topic	Title
\1\	Reference to the entry	https://support.industry.siemens.com/cs/ww/de/view/69864408
\2\	Siemens Industry Online Support	https://support.industry.siemens.com
\3\	WinCC Advanced V13.0 System Manual	https://support.industry.siemens.com/cs/ww/en/view/91479053
\4\	FAQ	How do you parameterize a structured data type in the IN_OUT area of an FB and a function call with an ARRAY variable? https://support.industry.siemens.com/cs/ww/en/view/19106712

9 History

Table 9-1

Version	Date	Modifications
V1.0	08/2013	First version
V1.1	09/2013	Chapter 2.1, notes added
V1.2	11/2013	Controller job 13/14 => controller job 14/15
V1.3	04/2015	FBs adjusted. Initialization of address register
V4.0	03/2016	Documentation completely revised
V4.0	04/2017	Figures under chpater 3.2 changed (german -> english)