SIEMENS

SIMATIC

Process Control System PCS 7 High-precision time stamping (V8.0 SP1)

Function Manual

Valid for PCS 7 as of V8.0 SP1

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Preface

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Purpose of this documentation

This documentation provides you with a full overview of the topics relating to the use of high-precision time stamping:

- Required components
- Interaction of the components
- Configuration of the components

The first section gives you an overview of the option and use cases for high-precision time stamping and is intended for the following readership:

- Future users of SIMATIC PCS 7
- Persons responsible for deciding on the use of a control system
- Sales personnel and system configuration engineers either within Siemens or belonging to other companies

The subsequent sections show the configuration and parameter assignments for high-precision time stamping and is intended for persons involved in the following occupations:

- Conceptual design of PCS 7 solutions
- Device and system programming
- Configuration and commissioning
- Servicing

Options for accessing PCS 7 documentation

Note

PCS 7 Readme

The information in the *PCS 7 Readme* in the Internet takes precedence over all the PCS 7 manuals. Read this *PCS 7 Readme* carefully; it contains important information and amendments to PCS 7.

- The *PCS 7 Readme* on the *Process Control System; SIMATIC PCS 7* DVD contains important information about PCS 7 and takes precedence over the supplied PCS 7 documentation.
- After installation of PCS 7, you will find the document *Process Control System PCS 7; PCS 7 Readme* in the submenu **SIMATIC > Product information > <Language>**.

As of PCS 7 V8.0, you receive basic PCS 7 system documentation with the *Process Control System; SIMATIC PCS 7* DVD.

The PCS 7 Internet site http://www.siemens.de/pcs7-dokumentation (www.siemens.com/pcs7-documentation) provides convenient access to the complete PCS 7 documentation. You can find the following for the latest PCS 7 versions:

- **In the section "Hardware manuals for SIMATIC PCS 7 ..."**
  - The manuals for components approved for a PCS 7 version
- **In the section "Software manuals for SIMATIC PCS 7 ..."**
  - The complete system documentation
  - The separate setup program for PCS 7 documentation and the PCS 7 help system for download. After the installation of the setup program, you can find the documentation at the following locations on the engineering station:
    - As online help (CHM file) for the SIMATIC Manager application
    - As a PDF file in the Windows Start menu with the SIMATIC documentation
  - The complete documentation for PCS 7 as a *Manual Collection*

Required basic knowledge

General knowledge in the area of automation engineering and basic knowledge of PCS 7 is required to understand this documentation. It is also assumed that the reader knows how to use computers or other equipment similar to PCs (such as programming devices) with the Windows operating system.

The configuration manuals and the Getting Started documentation for PCS 7 will provide you with basic information regarding the use of PCS 7.

Conventions

In this documentation, the names of elements in the software interface are specified in the language of this documentation. If you have installed a multi-language package for the operating system, some of the designations will be displayed in the base language of the operating system after a language switch and will, therefore, differ from the designations used in the documentation.

Changes compared to the previous version

Below, you will find an overview of the most important changes in the documentation compared to the previous version:

PCS 7 V7.1 or later

- The IMDRV_TS and MSG_TS blocks replace the IM_DRV in the PCS 7 library. Message texts are retained following a future update of the library.
- High-precision time stamping using blocks from the Advanced Process Library (APL)
- High-precision time stamping with redundant signal acquisition
- You will find information about time synchronization in the *Process Control System PCS 7; Time Synchronization* function manual.

Basics of Time Stamping 2

2.1 Basics of High-precision Time Stamping

Introduction

This documentation describes the time stamping function for digital input signals. Users can activate time stamping in their system configuration and display the time information in their monitoring system.

Definition

The following is meant when referring to time stamping in this documentation:

The assignment of time information with a high degree of accuracy about the state changes of an acquired process signal.

The detection of changes in digital input signal states and the assignment of time information are performed by SIMATIC components.

Application

Possible applications for high-precision time stamping are:

- Accurately-timed detection of problems in process-related equipment. Time stamping enables you to explicitly identify signals that indicate the cause of the failure of a process unit.
- Analysis of system-wide interrelationships
- Detection and reporting of the sequence of time-critical signal changes
- Time-precise acquisition of signal changes in fail-safe devices

Requirement

The time must be synchronized on all the devices belonging to the system. The devices are connected to a time master for this purpose.

Precision

The following applies to high-precision time stamping:

- If process signals are acquired from a separate PROFIBUS DP master systems and results arrive **simultaneously** at the input module, the time stamps of the resulting messages in the HMI system differ by maximum x milliseconds (see table below). The achievable precision depends on the I/O modules used.
- The signals receive a time stamp regardless of whether the PROFIBUS DP master systems are located in one or more SIMATIC 400 stations.

Achievable precision	I/O	Description
1 ms	ET 200M	With ET 200M, you can acquire signal changes with selected digital input modules with an **accuracy of 1 ms**. Additional information on this topic is available in section "High-precision time stamping with 1 ms accuracy (Page 21)".
10 ms	ET 200M	With ET 200M, you can acquire signal changes with selected digital input modules with an **accuracy of 10 ms**.
20 ms	ET 200iSP	With ET 200iSP, you can acquire signal changes with selected digital input modules with an **accuracy of 20 ms**.
20 ms	ET 200M	During fail-safe signal acquisition with ET 200M, you can acquire signal changes with selected digital input modules with an **accuracy of 20 ms**.

Resolution

The displayed resolution of the time is 1 ms (regardless of the precision).

Advantage

The high-precision time stamping does not depend on cycle times.

Property

The high-precision time stamping can only be used for digital input modules.

Additional information

For additional information about released digital input modules, refer to the section "Systems and components (Page 23)".

2.2 Time stamping of signal transitions

Time-precise acquisition

The use of time stamps makes it easier to analyze the causes of problems.

Example

If a boiler used to produce steam fails, this event causes a surge of messages:

- The temperature and pressure fall below a specified limit value, the flame monitor responds, the next plant unit signals "steam low", etc.
- To determine the actual cause of the failure, the first message in this surge of messages must be identified (for example, "gas pressure too low").
- Following the failure of a plant unit, a large number of messages will arrive at the monitoring stations within the same second. A resolution of 1 second for the message time is inadequate. You can use time stamping to selectively detect the signals that can potentially lead the shutdown of the boiler with a resolution in the millisecond range. This option gives the operator the opportunity of finding the cause of the event.

Plant-Wide Interrelationships

A further aspect of 10 ms time stamping is the determination of interrelationships between units in a plant.

Example

High-precision time stamping is implemented throughout the plant. Relevant signals of the individual automation systems configured with PCS 7 can be compared (for example, the signals of a filling station with the signals of a dosing station originating from another AS).

By comparing the time stamps of relevant signals throughout the plant, a momentary quality impairment in a unit can be traced to an event in another unit.

2.3 The time stamping process

Description

The following table describes the time stamping sequence.

The digital inputs of a module in the distributed I/O station (ET 200M, ET 200iSP) are monitored for signal transitions.

Step	Who/Where?	What?
1	IM	The interface module IM (IM 153-2, IM 152-1) stores the signal state change.
2	IM	The interface module IM (IM 153-2, IM 152-1) stores the information about an "incoming event" with the current time in a message list (in the IM). Features: • The time resolution of the time stamping is 1 ms. • Special messages are also saved in the message list (events influencing message processing). • An IM stores up to 240 messages. These messages are processed in data records. A data record contains a maximum of 20 messages.
3	IM	The interface module IM (IM 153-2, IM 152-1) triggers a hardware interrupt on the DP master (for example, SIMATIC station S7-4xx) if one of the following events occurs: • A message list (data record) in the IM is full. • There is at least one message in a message list after 1 second.
4	CPU	The CPU reads the reaction to the process alarm (OB 4x) from the data record.
5	IMDRV_TS	The driver block IMDRV_TS reads the data records of the interface module (IM 153-2, IM 152-1) and transfers the information to signal the APL block Pcs7DiIT . The information of the input signal is stored temporarily in the block Pcs7DiIT . The message texts are saved to the signaling block by default (you can find additional information on this in the "AS process control messages for time stamp faults" section).
6	EventTS	The APL block EventTS reads the time stamp via the block Pcs7DiIT from the output of IMDRV_TS. The EventTS block sends the message to the operator station. The message text depends on the configuration (see the paragraph "Additional information"). The configuration in HW Config defines which signal transition 0 > 1 or 1 > 0 is to be reported as "INCOMING". The "OUTGOING" message is generated when the state reported by "INCOMING" changes. The signals with a time stamp are entered without gaps and in ascending chronological order in the message list of the operator station.
7	Synchronization	All the operator stations and SIMATIC stations used in the system must be supplied with the same time: • The time master regulates the time synchronization for time stamping. • Various time masters are available, for example: – "SICLOCK TC 400" – "Real-time transmitter for Industrial Ethernet"

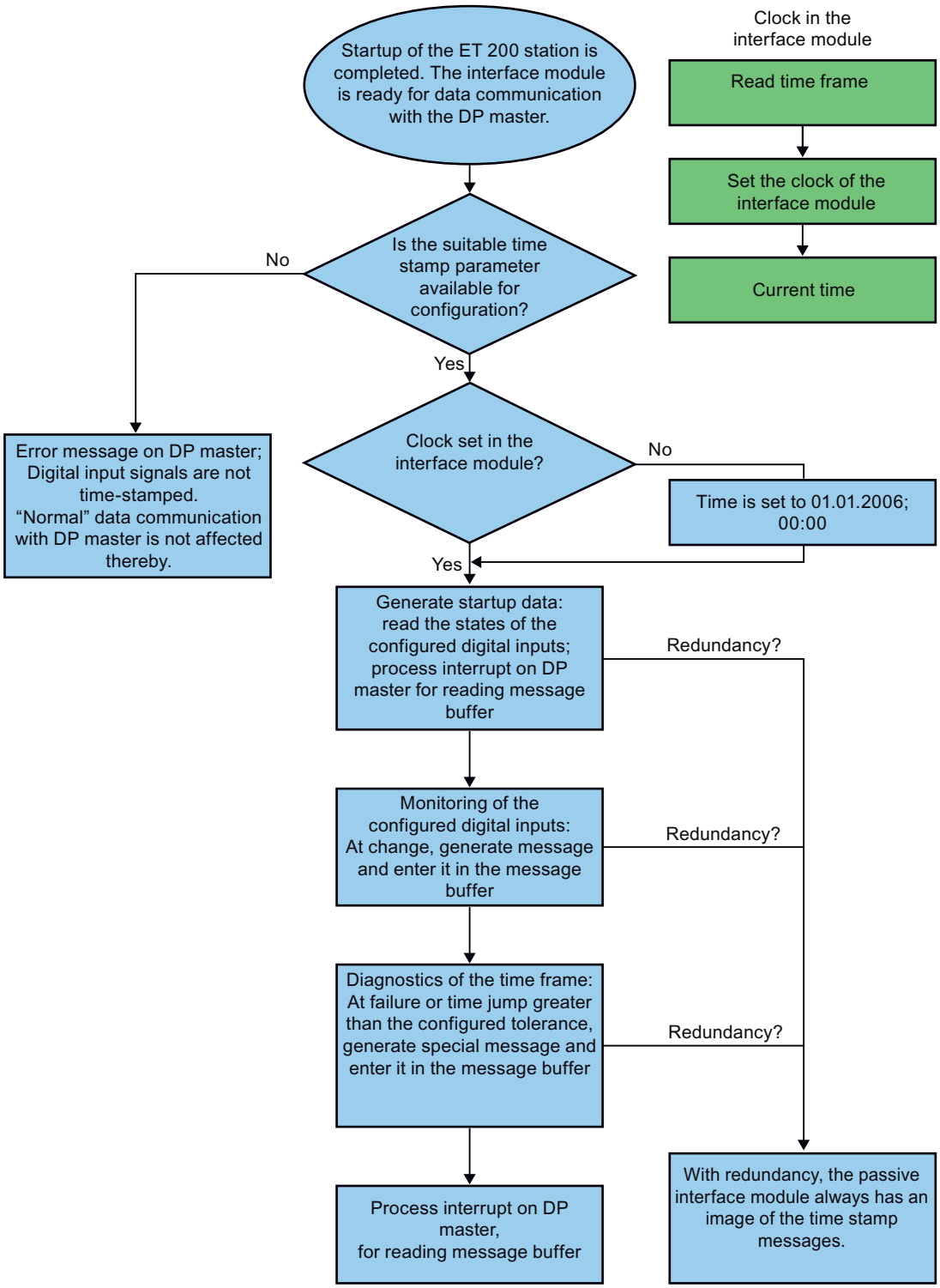
Additional information

- Section "How to configure messages with blocks of the PCS 7 Advanced Process Library (APL) (Page 60)"
- Operating Instructions *SIMATIC; Distributed I/O Device ET 200M*
- Operating Instructions *SIMATIC; Distributed I/O Device ET 200iSP*

2.4 The time stamping process in the interface module

Principle

The figure below shows how signal transitions are time stamped in the interface module (IM 153-2, IM 152-1).


Clock in the interface module
Startup of the ET 200 station is completed. The interface module is ready for data communication with the DP master.
Read time frame
Set the clock of the interface module
Current time
Is the suitable time stamp parameter available for configuration?
No
Yes
Error message on DP master; Digital input signals are not time-stamped. "Normal" data communication with DP master is not affected thereby.
Clock set in the interface module?
No
Time is set to 01.01.2006; 00:00
Yes
Generate startup data: read the states of the configured digital inputs; process interrupt on DP master for reading message buffer
Redundancy?
Monitoring of the configured digital inputs: At change, generate message and enter it in the message buffer
Redundancy?
Diagnostics of the time frame: At failure or time jump greater than the configured tolerance, generate special message and enter it in the message buffer
Redundancy?
Process interrupt on DP master, for reading message buffer
With redundancy, the passive interface module always has an image of the time stamp messages.

Note

Startup synchronization

A time stamp with the value "01.01.1984" will be sent if the interface module is not synchronized during startup. The events are correctly assigned a time stamp following the automatic configuration (synchronization) by the CPU.

Structure

3

3.1 System planning and configuration

The following rules apply to the configuration of high-precision time stamps in addition to the configuration rules of PCS 7 (see documentation *SIMATIC; Process Control System PCS 7; Engineering System*).

Introduction

The following rules are intended for the optimization of the plant with regard to high-precision time stamps.

Rules

- Configure time stamping for relevant signals only in SIMATIC stations. High precision time stamps are used for error analysis and should not be employed for process control.
  Additional information on this topic is available in the section "Basics of High-precision Time Stamping (Page 7)".
- High-precision time stamping can only be configured for digital inputs.
- Check the applicability of the modules.
  Additional information on this topic is available in the section "Systems and components (Page 23)".
- When planning your system and during configuration, ensure that the signals to be acquired are distributed uniformly throughout the system.
- Configure a maximum of 8 modules that can process data records for each PROFIBUS master system (IM, CP, FM).
- Configure the ET 200 stations as uniform as possible. The measurement results will be comparable with a uniform configuration.
  Examples:
  - Physical - cables and encoders (switches, sensors, etc.)
  - Hardware - module types
  - Configuration - for example, identical delay times for the inputs
- Configure only digital inputs in these ET 200 stations.

- Do not configure technological functions in these ET 200 stations; this omission will assure the deterministic characteristic of the plant.
- Plant-specific configuration:
  Design the assembly of an ET 200 station in such a way that, taken together, the digital inputs used will generate a limited number of signal changes for the plant even in critical situations. Individual defective encoders or massive switching operations (shutdown of a plant, for example) often generate a large number of signal changes. PCS 7 ensures that the cause of the event can be located in these situations. A transient buffer overflow that can occur with a plant failure is not critical, because the error messages causing it are recorded in the archive.

3.2 Hardware Configuration

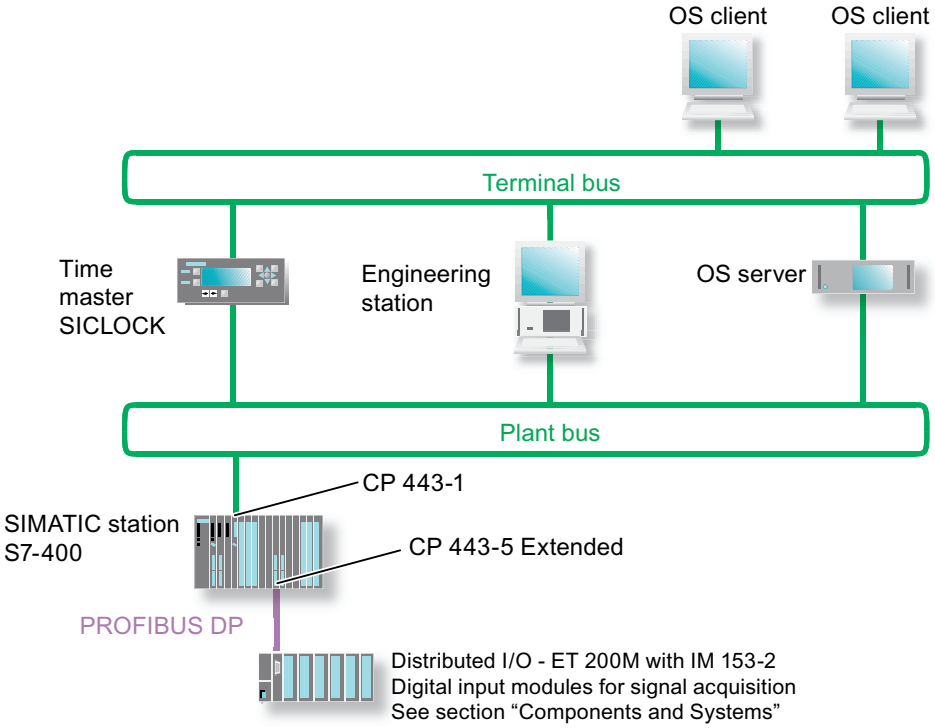
Introduction

You use the distributed I/O based on ET 200M or ET 200iSP to acquire the signals.

This section provides an example of a hardware configuration needed for time stamping.

Example system with time stamping

The following figure shows an example of a system configuration with time stamping.

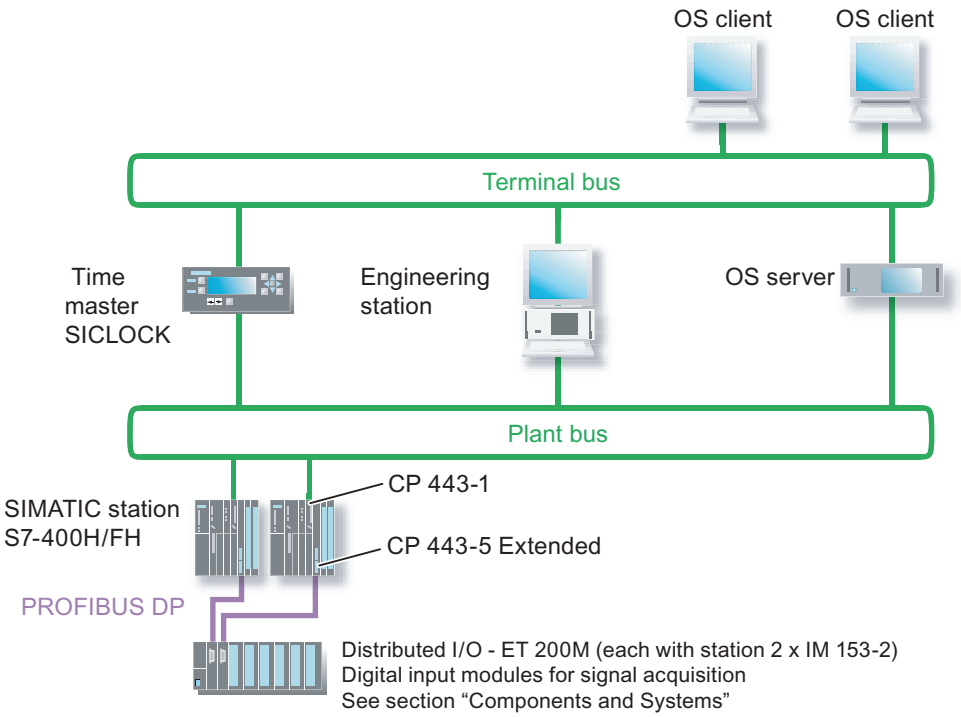


Example plant with time stamping in the fault-tolerant automation system

You can also use the time stamping function together with an S7-400H and distributed I/O:

- With an ET 200M, you can create a redundant configuration even to the sensor (fully redundant distributed I/O).
- With an ET 200iSP, you can connect to a redundant PROFIBUS DP (redundant interconnection).

Below you will see an example of a system using ET 200M.



Note

Redundant signal acquisition

The required resources depend on the number of inputs, not the number of redundantly acquired signals.

Additional information

- You will find information about time synchronization in the *Process Control System PCS 7; PCS 7 Time Synchronization* function manual.
- You can find information about the IM 153-2 interface module in the manual *Distributed I/O Device ET 200M*.
- You can find information about the IM 152-1 interface module in the manual *Distributed I/O Device ET 200iSP*.
- You can find information about the redundant configuration of a distributed I/O in PCS 7 in the following documentation:
  - Manual *Process Control System PCS 7; Fault-tolerant Process Control Systems*
  - Manual *Programmable Controller S7-400H, Fault-Tolerant Systems*

3.3 Special features of the interface module

Introduction

PCS 7 ensures that the cause of an event can be located in critical situations. This statement also applies if the message buffer of an interface module (IM 153-2, IM 152-1) becomes overloaded due to a signal surge and too many signals constantly being reported. Read section "System planning and configuration (Page 15)".
Constant overload can result in the loss of messages.

Message surge

When "unusual" events occur (for example, failure of a plant unit), signal transitions can occur almost simultaneously.

This behavior can be explained by analyzing the technological interrelationships.

Example

The frequency of signal transitions in a system can be projected as follows:

- On average, approximately 2% of the signals change per second.
- In the worst case (such as the failure of a plant unit), approximately 30% of the signals change state per second.

Message loss

If all the time-stamped signals of a system are collected on one ET 200 station, messages can be lost on the relevant interface module when "unusual" events occur. The message loss is displayed according to the cause using AS process control messages (you can find additional information in the "AS Process Control Messages for Time Stamp Faults (Page 63)" section).

Example for 10 ms time stamping

A system with ET 200M has 1,500 digital signals in its final configuration:

- Based on the projection, 450 signals per second can change in this system in the worst case.
- If numerous signals with high-precision time stamping are configured in an ET 200M station, for example, when there are 8 SM 321 digital input modules each with 16 inputs, messages can be lost due to the following reasons:
  - Other system-internal messages are generated in addition to the process messages (you can find additional information in the section "AS Process Control Messages for Time Stamp Faults").
  - The following processing levels (interface module, IMDRV_TS blocks, AS message processing, MSG_TS blocks and OS message processing) require more time to evaluate process messages (slow execution cycle of the blocks is set).

Additional information

- Operating Instructions *SIMATIC; Distributed I/O Device ET 200M*
- Operating Instructions *SIMATIC; Distributed I/O Device ET 200iSP*

3.4 High-precision time stamping with 1 ms accuracy

Configuration rules

- Synchronize the automation system via a time master, such as SICLOCK TC 400.
- Use the following modules in the automation system:
  - Interface module IM 153-2 (e.g 6ES7 153-2BAx1-0XB0, see "Distributed I/O (Page 26)" section)
  - Digital input modules of the ET 200M
- Use the 6ES7 321-7BHxx-0AB0 digital input module for high-precision time stamping.
- Install the digital input module (6ES7 321-7BHxx-0AB0) for processing the input signals with high-precision time stamping gapless starting with slot 4.
- Configure an identical input delay for all digital inputs with high-precision time stamping to a minimum value (100 microseconds).
- Leave the process interrupts deactivated.
- When configuring the plant, ensure that there is **no** repeater in the signal path between the CPU of the automation system and an ET 200M in the DP master system on which the digital inputs are acquired with high-precision time stamping.
- Do not evaluate the digital inputs with high-precision time stamping before the startup time of ET 200M has expired (at least 10 seconds).
- Use appropriate sensors for acquiring the signals.

Note

Keep the properties of the sensors in mind.

Input signal junctions can have differing effects on the accuracy of the time stamping. The varied response is effected by such criteria as:

- Ramp times
- Spikes

Validity

The accuracy of the high-precision time stamping with 1 ms accuracy applies per DP master system.

Note

The accuracy of the high-precision time stamping **between several DP master systems** with an accuracy of 1 ms is **10 ms**.

Restriction

The following events may be the cause for temporary degradation of the accuracy of the high-precision time stamping:

- Processing of diagnostic results
- Firmware update
- Reading identification and maintenance information (I&M data)
- Other acyclical services

Systems and components

4

4.1 Overview: Systems and components

Introduction

This section presents the systems and components required for time stamping of digital input signals.

Systems

The HMI system in the PCS 7 process control system is an operator station. The automation system in the PCS 7 process control system is a SIMATIC station.

Components

The following components are used for converting time stamping of digital input signals:

- SIMATIC station (Page 24)
- Communication modules (Page 25)
- Distributed I/O (Page 26)
- IMDRV_TS block (Page 28)
- EventTS block (Page 29)
- Time master (Page 30)

4.2 SIMATIC station

SIMATIC stations

You can use S7-400 and S7-400H series CPUs in the SIMATIC stations for processing messages and forwarding them to the operator stations.

4.3 Communication modules

Communication modules

You can use the following communication modules for time stamping:

- CP 443-1
- CP 443-5 Extended

Note

You can use the PROFIBUS DP connection of the CPU instead of the CP 443-5 Extended .

Properties

Property	CP 443-1	CP 443-5 Extended
Used as ...	... interface to the plant bus	... interface to the distributed I/O device
Used to establish connection between ...	... SIMATIC station and operator station	... SIMATIC station and distributed I/O device CP 443-5 Extended forwards the stamped messages transferred via the PROFIBUS DP (fieldbus) to the CPU.
Connection to bus system	Industrial Ethernet (plant bus)	PROFIBUS DP (fieldbus)
Order No.	6GK7 443-1EX20-0XE0 6GK7 443-1EX30-0XE0	6GK7 443-5DX05-0XE0 6GK7 443-5DX04-0XE0
Mounting	In the SIMATIC station slots in the rack (universal rack - UR))	In the SIMATIC station slots in the rack (universal rack - UR))

4.4 Distributed I/O

Distributed I/O

Time stamping can be configured with the following distributed I/O devices:

- ET 200M
- ET 200iSP

The following modules are used in the distributed I/O device to acquire signals:

- Interface module for PROFIBUS DP for preprocessing the signals
- Digital input modules for detecting signal transitions

Note

Discontinued modules

The modules that can currently be ordered are described in this documentation.

The following applies when using modules approved for high-precision time stamping in past versions of PCS 7:

Verify their continued use in PCS 7. You can find additional information on this in the documentation *Process Control System PCS 7; Released Modules*.

Interface modules for PROFIBUS DP

Distributed I/O device	Module	Order No.	Product version	Precision
ET 200M	IM 153-2	6ES7 153-2BA02-0XB0	All	1 ms (20 ms for fail-safe signal acquisition)
ET 200M	IM 153-2	6ES7 153-2BA82-0XB0	All	1 ms (20 ms for fail-safe signal acquisition)
ET 200iSP	IM 152-1	6ES7 152-1AA00-0AB0	1.0 (>=2.0 for redundant interfacing)	20 ms

Digital input modules

Distributed I/O device	Module	Order No.	Used as
ET 200M	SM 321	6ES7 321-7BH01-0AB0 Accuracy of 1 ms	Module for acquisition of process signals: 16 electrically isolated inputs (24 V DC) and diagnostic messages, redundant signal acquisition possible
ET 200M	SM 321	6ES7 321-7EH00-0AB0 Accuracy of 10 ms	Module for acquisition of process signals: 16 electrically isolated inputs (24-125 V DC) and diagnostic messages, redundant signal acquisition possible
ET 200M	SM 321	6ES7 321-7RD00-0AB0 Accuracy of 10 ms	Module for acquisition of process signals: 4 inputs (NAMUR), suitable for hazardous areas, redundant signal acquisition possible
ET 200M	SM 321	6ES7 321-7TH00-0AB0 Accuracy of 10 ms	Module for acquisition of process signals: 16 inputs (NAMUR), redundant signal acquisition possible
ET 200M	SM 326	6ES7 326-1BK02-0AB0 Accuracy from 20 to 30 ms	Module for acquisition of process signals: • 24 Inputs for use with interface module 6ES7 153-2BA02 • 12 inputs (CH 00 to CH 11) for use with interface module 6ES7 153-2BA01 • redundant signal acquisition and fail-safe signal acquisition possible
ET 200iSP	SM 131	6ES7 131-7RF00-0AB0 Accuracy of 20 ms	Module for acquisition of process signals: 8 inputs (NAMUR)

Modules for higher environmental requirements

You can use functionally equivalent SIPLUS modules for higher environmental requirements.

4.5 IMDRV_TS block

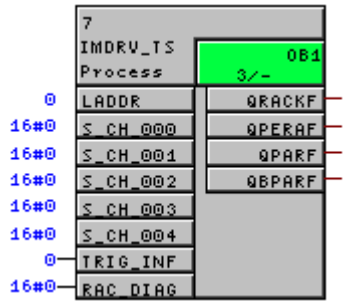
Using the IMDRV_TS block

The IMDRV_TS block is a driver block. IMDRV_TS performs the following tasks for time stamping:

- Transmits time-stamped process signal changes to the Pcs7DiIT block
- Transmits non-specific events (special messages) to the OS

When time stamping is configured for an AS, the "Generate Module Drivers" function inserts IMDRV_TS automatically in a CFC chart (system chart). The names of these CFC charts begins with the "@" character. One IMDRV_TS is inserted for each interface module.

IMDRV_TS reads the messages from the message buffer of an interface module and transfers the time stamp and process signal changes to the EventTS (Page 29) block.



System messages

IMDRV_TS outputs AS process control message if an error is detected in high-precision time-stamping.

Additional information

Additional information on the diagnostics response of the IMDRV_TS is available in the *CFC* online help for IMDRV_TS.

4.6 EventTS block

Signal detection with the channel driver block

If blocks from the PCS 7 Advanced Process Library (APL) for input signals are to be given a high-precision time stamp, you must use the following channel driver block for signal detection: Pcs7DiIT.

Using blocks of the Advanced Process Library

The EventTS block is a message block of the APL for signals with high-precision time stamping. Use EventTS to generate time-stamped process messages. You need to insert EventTS into a CFC chart when using time stamping.

EventTS has an integral alarm block (ALARM_8P). This alarm block signals a change to the assigned digital input.

EventTS can send messages from up to 8 digital inputs.

Additional information

You can find additional information about the messages and the response of the blocks in the online help for the *Advanced Process Library*.

4.7 Time master

Time master

The time master distributes the time signal to operator stations and SIMATIC stations that need to be synchronized.

The following time master is recommended for PCS 7:

SICLOCK TC400

- The time master synchronizes connected stations requiring synchronization via Industrial Ethernet/Fast Ethernet.
- The time master can be synchronized using a time signal from a SICLOCK GPS decoder, or SICLOCK DCFRS receiver, for example.

Additional information

- You can find information and ordering data on the SICLOCK TM components that can be used in PCS 7 in the ST PCS 7 catalog (add-ons for PCS 7).
- You can find information about time synchronization for a PCS 7 plant in the function manual *Process Control System PCS 7; Time Synchronization*.

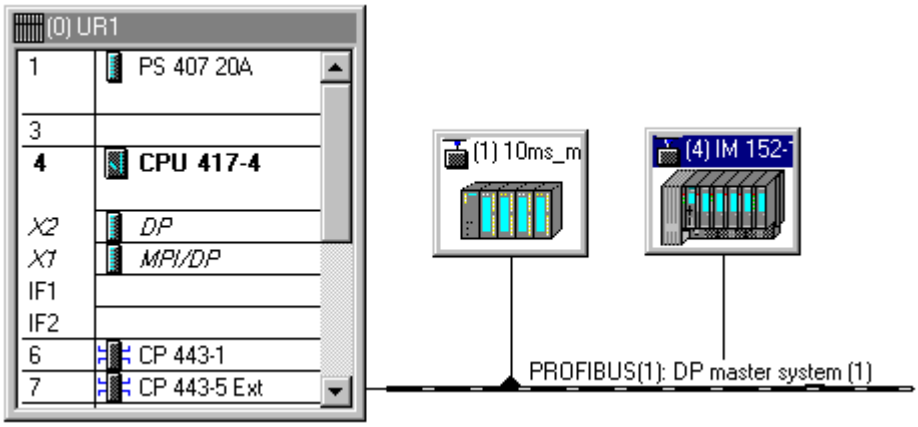
Configuring Time Stamping

5

5.1 Overview of configuration tasks

Requirement

The components of the automation system are inserted in HW Config.
The figure shows an example configuration for time stamping in HW Config:



Overview of configuration tasks

Step	What?
1	Configuring the CPs: • Configuring the CP 443-1 (Industrial Ethernet) (Page 33) • Configuring the PROFINET IO connection of the CPU (Page 34) • Configuring the CP 443-5 Extended (Page 36) • Configuring the PROFIBUS connection of the CPU (Page 37)
2	Configuring the ET 200M station: • Power supply (no configuration necessary) • Configuring the interface module: IM 153-2/IM 152-1 (Page 40) • Digital input modules: – Configuring the SM 321 digital input module (Page 44) – Configuring the SM 131 digital input module (Page 47) – Configuring the SM 326 digital input module (Page 49)
3	Configuring the symbols (Page 53)
4	Configuring the signaling block (Page 55)
5	Configuring the input signals (Page 56)
6	Configuring the messages for the high-precision time stamping (Page 60)

Step	What?
7	Compiling and downloading the AS (Page 61)
8	Compiling and downloading the OS (Page 62)

Additional information

- Online help for *HW Config*
- List *PCS 7 - released modules*

5.2 Configuring the networks

5.2.1 Configuring the networks

The following is described in this section:

- Configuring the CP 443-1 (Industrial Ethernet) (Page 33)
- Configuring a CPU with integrated PROFINET IO connection for connecting to Industrial Ethernet (Page 34)
- Configuring the CP 443-5 Extended (Page 36)
- Configuring the PROFIBUS connection of the CPU (Page 37)

Synchronization of the automation system

A master clock is required on the plant bus for the time synchronization of the automation system. We recommend you use the SINEC TC 400 master clock.

The following options are available for the interface of the automation system to the plant bus:

- Ethernet interface of the CP 443-1
- Integrated PROFINET IO connection of selected CPU types

PROFIBUS master

The PROFIBUS master is the component that distributes the system time to the PROFIBUS.

You can use the following components as the PROFIBUS master:

- CP 443-5 Extended
- Internal PROFIBUS connection of the CPU

5.2.2 How to configure the CP 443-1 (Industrial Ethernet)

The following procedure is based on SIMATIC stations connected to Ethernet via CP 443-1.

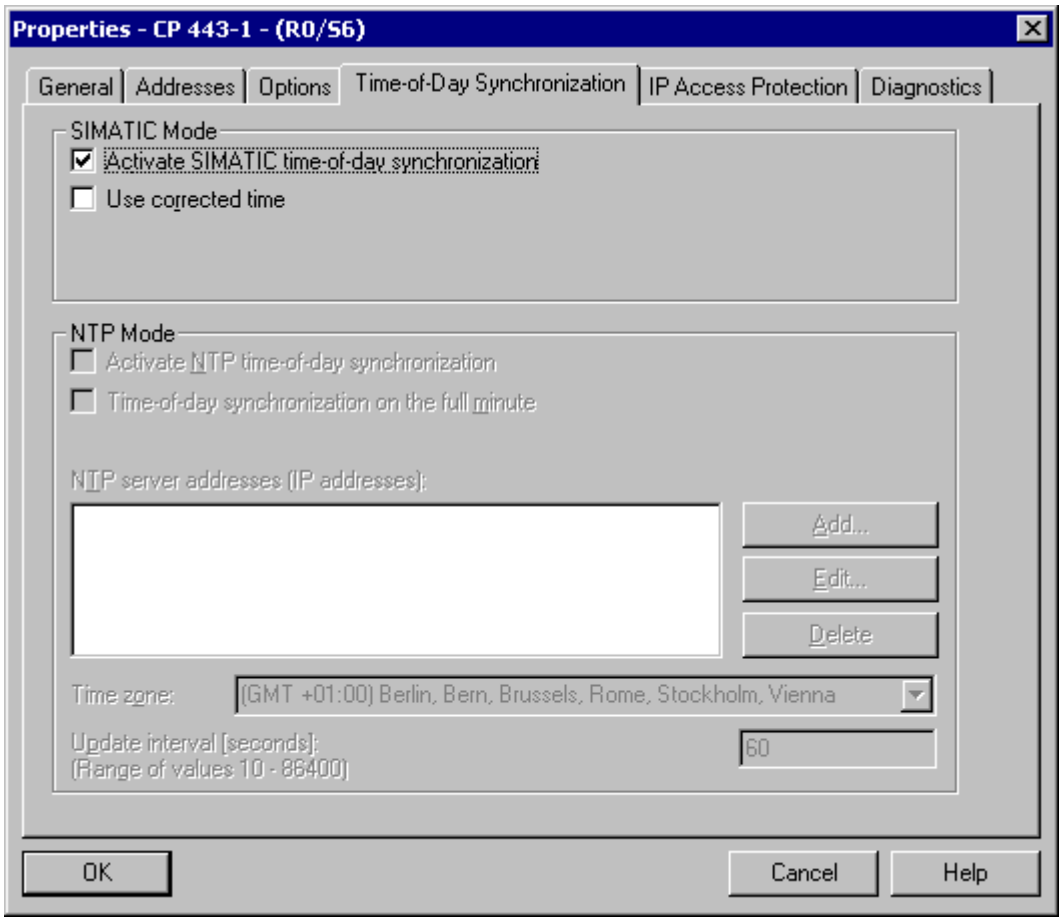
If the CPU is connected directly to Ethernet via an integrated PROFINET IO connection, the SIMATIC station is synchronized using NTP. Additional information is available in the section "How to configure the Ethernet connection for a CPU 41x PN/DP (Page 34)".

Requirement

A CP 443-1 is configured in the configuration table for the SIMATIC station (type of CP: See section "Components and Systems > Communication modules (Page 25)").

Procedure

1. Select the CP 443-1 in HW Config.
2. Select the menu command **Edit > Object Properties**.
3. In the "Time-of-Day Synchronization" tab, select the "Enable Time-of-Day Synchronization in SIMATIC Mode" check box:



4. Click "OK" to apply the settings.

5.2.3 How to configure the Ethernet connection for a CPU 41x PN/DP

The following procedure is based on SIMATIC stations in which one of the following CPU types are used:

- CPU 414-3 PN/DP
- CPU 416-3 PN/DP

This CPU type is synchronized via NTP. We recommend the SINEC TC 400 as the time master.

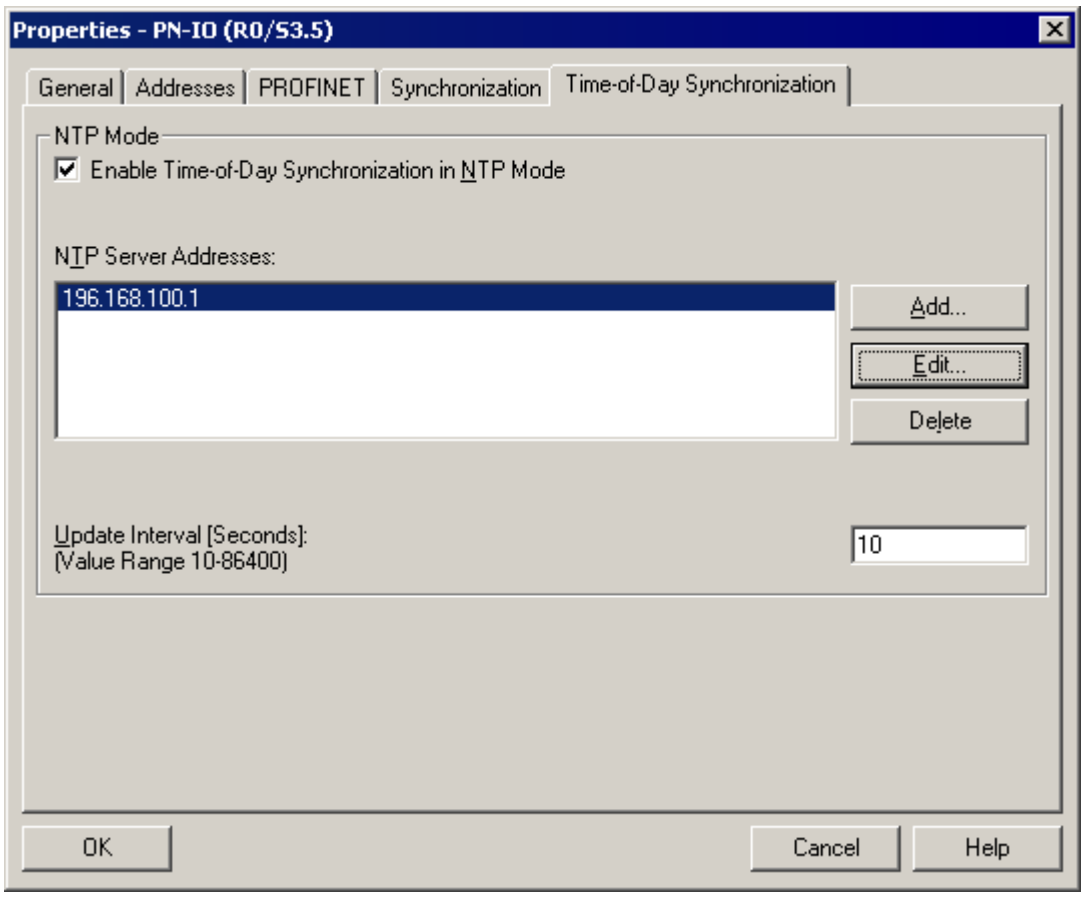
If the CPU is connected directly to Ethernet via a CP443-1 communication processor, the SIMATIC station is synchronized using the SIMATIC protocol. Additional information is available in the section "How to configure the CP 443-1 (Industrial Ethernet) (Page 33)".

Requirements

- The CPU is connected directly to Ethernet (plant bus).
- The time master is connected to the plant bus.

Procedure

1. Select the CPU in HW Config.
2. Select the menu command **Edit > Object Properties**.
3. In the "Time Synchronization" tab, activate the "Enable Time-of-Day Synchronization in NTP Mode" check box.
4. Click "Add".
   The "Edit NTP Server Address" dialog box opens.
5. Enter the Ethernet address of the time master in the "NTP server address" text box.



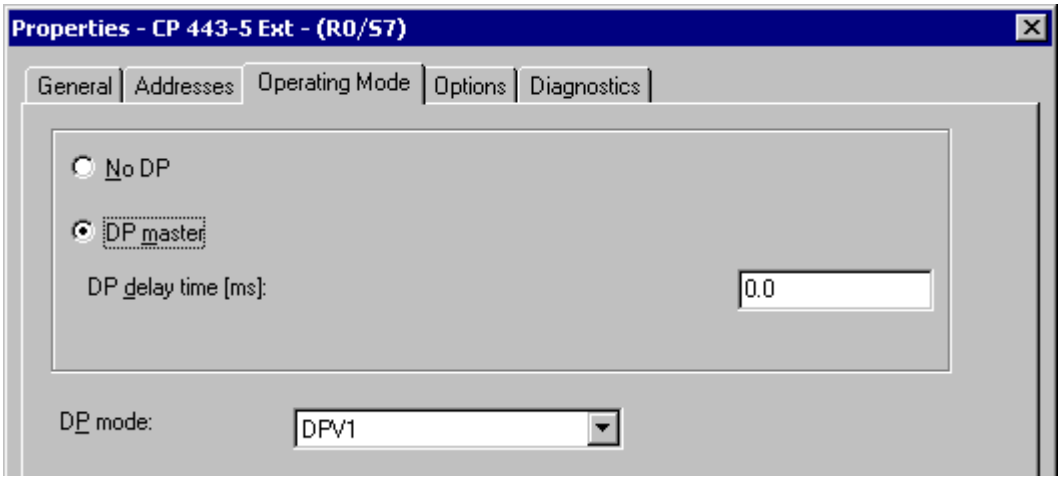
5.2.4 How to configure the CP 443-5 Extended

Requirement

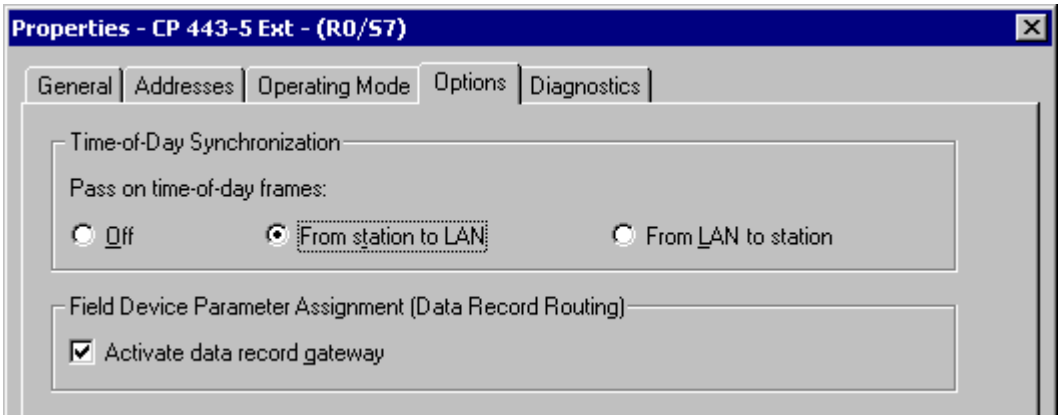
A CP 443-5 Extended is configured in the configuration table for the SIMATIC station (type of CP: see section "Components and Systems > Communication Modules (Page 25)").

Procedure

1. Select the CP 443-5 Extended in HW Config.
2. Select the menu command **Edit > Object Properties**.
3. In the "Operating Mode" tab, activate the "DP master" check box.



4. Select the "Options" tab.
5. Activate the check box "From station to LAN" in the "Time-of-Day Synchronization" group. By activating this option, the time frames of the time master are forwarded to the PROFIBUS network.



6. Click "OK" to apply the settings.

5.2.5 Rules for assigning the time interval

Configuration of the time interval should be noted in the following cases:

- Configuring the PROFIBUS connection of the CPU (Page 37)
- Configuring the interface module (IM) (Page 40)

Rules for assigning the time interval

The synchronization time interval setting depends on the interface modules (IM 153-2, IM 152-1) that are connected to the DP master systems:

Property	Rules
IM on the DP master system	If only interface modules (IM) with a variable time interval (such as the IM153-2BA00) are used on the DP master system, set the synchronization time interval of the CPU to e.g. **10 seconds**.
IMs with the same time interval (fixed or variable) are connected to the DP master system.	Setting for synchronization of the DP slaves: • If all DP slaves on the DP master system expect a time interval of one second for the synchronization, set the time interval for the synchronization for the CPU to e.g. **1 second**. • If all DP slaves on the DP master system expect a time interval of ten seconds for the synchronization, set the time interval for the synchronization for the CPU to e.g. **10 seconds**.
IMs with different time intervals (fixed or variable) are connected to the DP master system.	If you use interface modules (IM) with different time intervals on a DP master system, set the minimally required time interval for the respective DP master system (see rule for: IM with same time interval on the DP master system).
Rules for optimization:	
Multiple synchronization	Avoid multiple synchronization. Set the same interval values for all synchronizations. • Set the time interval for synchronization of the DP slaves. • Set the time interval for the time master that synchronizes the plant.

5.2.6 How to configure the PROFIBUS connection of the CPU

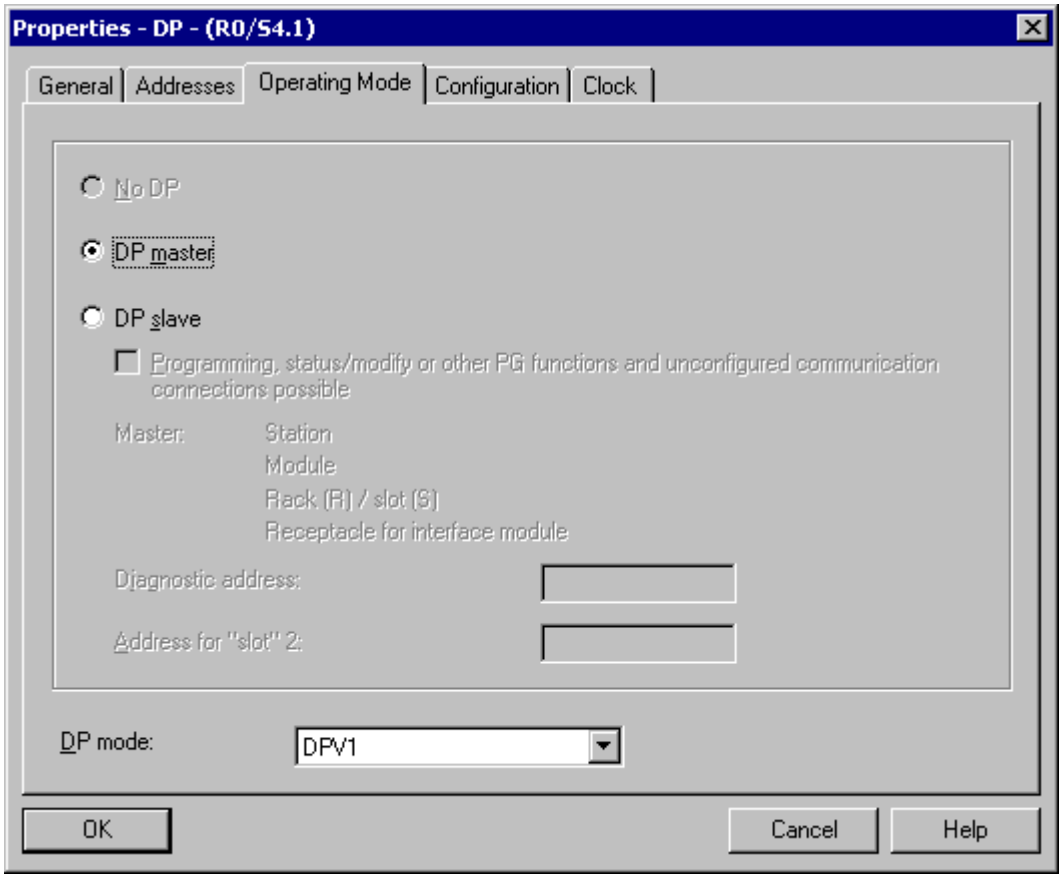
Requirement

The S7-400 CPU has been configured in the configuration table.

Procedure

1. Select the PROFIBUS connection of the CPU in HW Config.
2. Select the menu command **Edit > Object Properties**.

3. In the "Operating Mode" tab, activate the "DP master" check box.

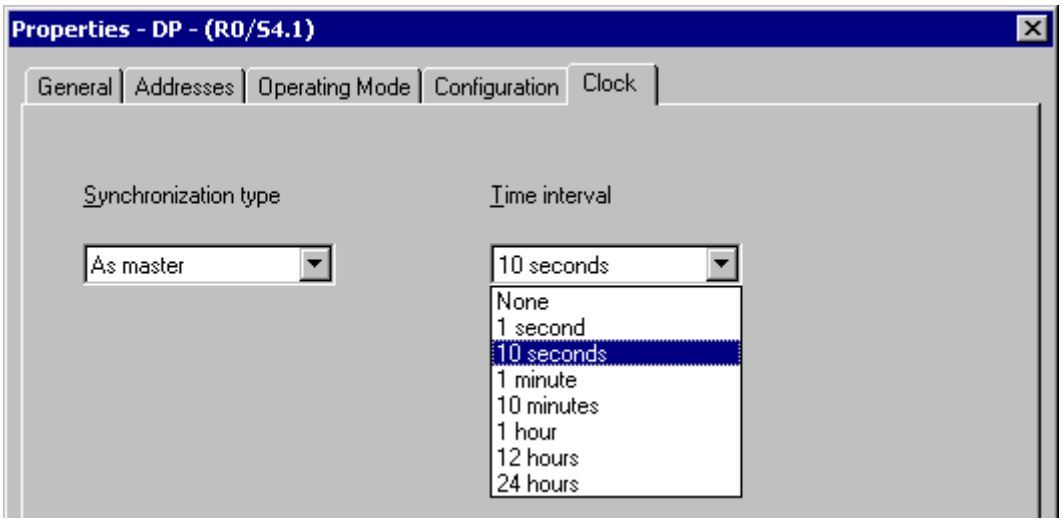


4. Select the "Clock" tab.

Note

The setting options in the "Clock" tab depend on the interface module (IM) used.

5. Select "As master" in the "Synchronization mode" list .
   The time frames of the time master are then forwarded to the PROFIBUS.



Note

When making a setting from the "Time Interval" drop-down list, keep in mind that the setting options depend on the interface modules (IM) used.
Note the " Rules for assigning the time interval (Page 37)" section.

6. Click "OK" to apply the settings.

5.3 Configuring the ET 200M station

5.3.1 Setting options on the ET 200 station

Hierarchy of Settings

On level …	... Set in HW Config	Affects	Setting options
DP slave (Rack)	Interface module properties	All digital input modules in an ET 200 station	• Time stamping on/off • Rising or falling edge (see section "Examples of settings for IM 153-2 interface module (Page 43)")
Module	Digital input module properties	All channels of a digital input module	• Time stamping on/off • Rising or falling edge (see section "Examples of settings for SM 321 digital input module (Page 46)")
Channel	Digital input module properties	One single channel of a digital input module	• Time stamping on/off • Rising or falling edge (see section "Examples of settings for SM 321 digital input module (Page 46)")

Note

The lower-level settings are overwritten by the activation/passivation at a high-level location (for example, on the DP slave).

5.3.2 How to configure the interface module

Requirements

- A DP master system is configured on a CP 443-5 Extended or on the PROFIBUS connection of the CPU.
- At least one digital input module that supports time stamping is configured in the ET 200 station (type of digital input module: See section "Components and Systems > Distributed I/O (Page 26)").

Setting the synchronization interval

The synchronization interval for the CPU should be set to 10 seconds for PCS 7.

Note

With some modules (for example, order no. 6ES7 153-2A...), the synchronization interval for the CPU is fixed at 1 second (increased CPU load).

Procedure

Note

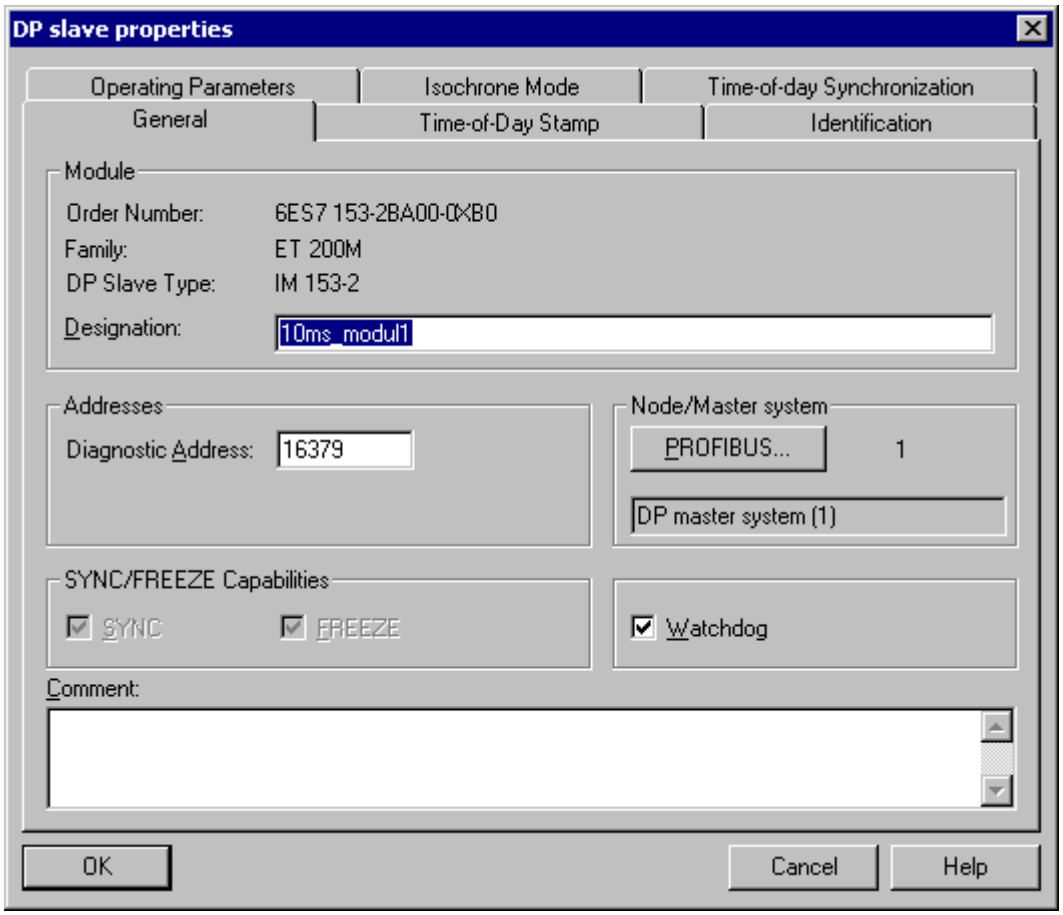
If you want to configure the digital input modules individually, open the object properties for the respective digital input modules.

Additional information:

- "How to configure the SM 321 digital input module (Page 44)" section.
- How to configure the SM 131 digital input module (Page 47)" section.

1. Select the interface module in HW Config.
2. Select the menu command **Edit > Object Properties**.

3. In the "Name" input box on the "General" tab, enter a unique name for the interface module . A unique name makes it easier to assign program blocks in other configuration tasks and messages.



4. Open the "Time Synchronization" tab.
5. Activate the "Time synchronization" check box.
   If possible, select the optimum synchronization interval.

Note

When selecting the synchronization interval, note the "Rules for assigning the time interval (Page 37)" section.

6. Open the "Time-of-day Stamp" tab.

Note

The "Time-of-Day Stamp" tab is available in the "Object Properties" dialog box for the interface module only if you have configured at least one digital input module that supports time stamping in the ET 200 station (see "Setting options on the ET 200 station" (Page 40)).

7. Select the "Time-of-day stamp" check box in the "Presetting of All Inputs" group.

8. Specify the edge of the process signal from the IM that should be interpreted as an "incoming event". The opposite signal transition is interpreted as the signal exiting the state. Select the check box for the required signal change:
   - "Falling Edge 1 -> 0" or
   - "Rising Edge 0 -> 1"

   When the static state of a signal changes, a message is generated at this point in time.
9. Click "OK" to apply the settings.

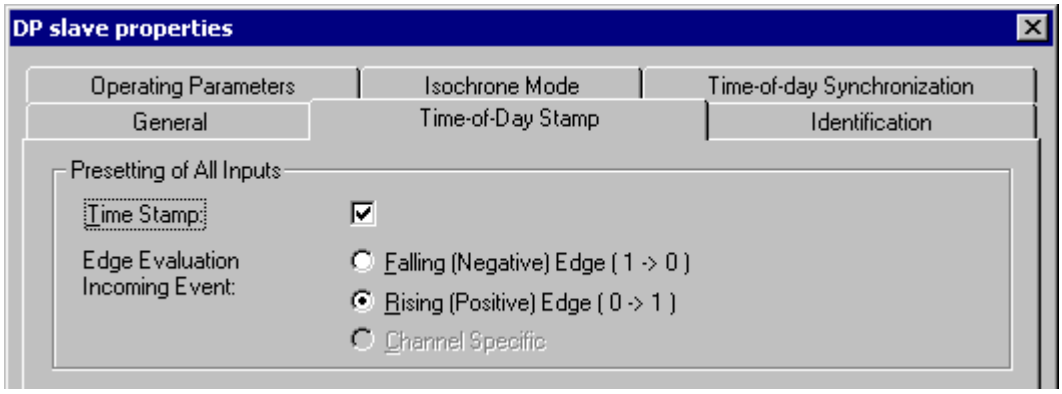
Note

The settings in the "DP Slave Properties" dialog box apply to all channels of the digital input modules with time stamping used in this ET 200 station. A change in the "Presetting of All Inputs" field affects the settings for **all** inputs of this ET 200 station.

5.3.3 Examples of settings for IM 153-2 interface module

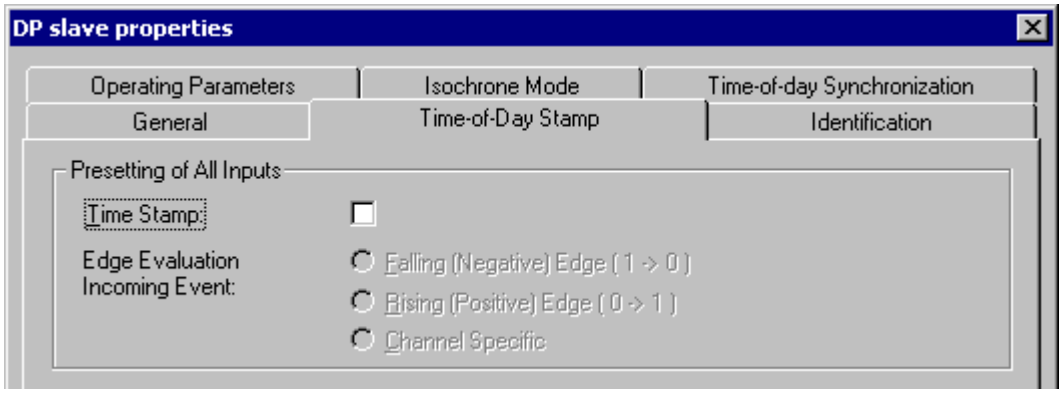
1. Example

IM 153-2 - time stamping enabled for the entire ET 200M station (or only one module with time stamping in this ET 200M station):



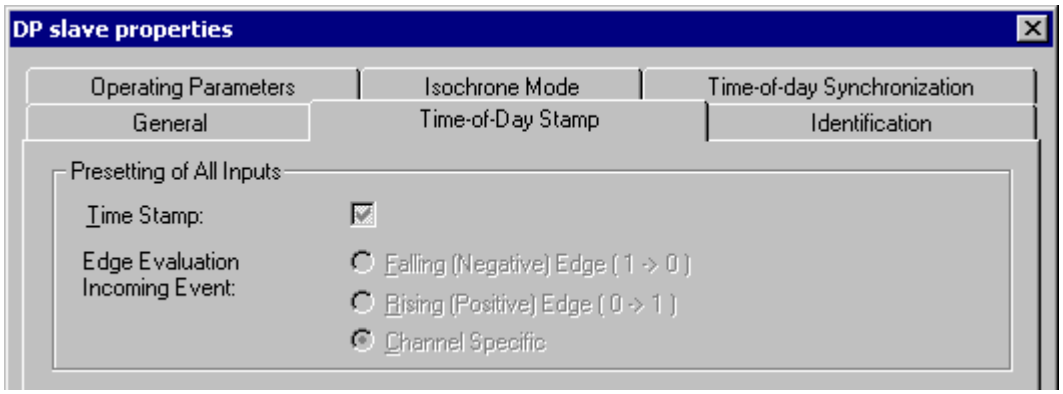
2. Example

IM 153-2 - time stamping disabled for the ET 200M station:



3. Example

IM 153-2 - time stamping enabled for (individual) modules or (individual) channels:



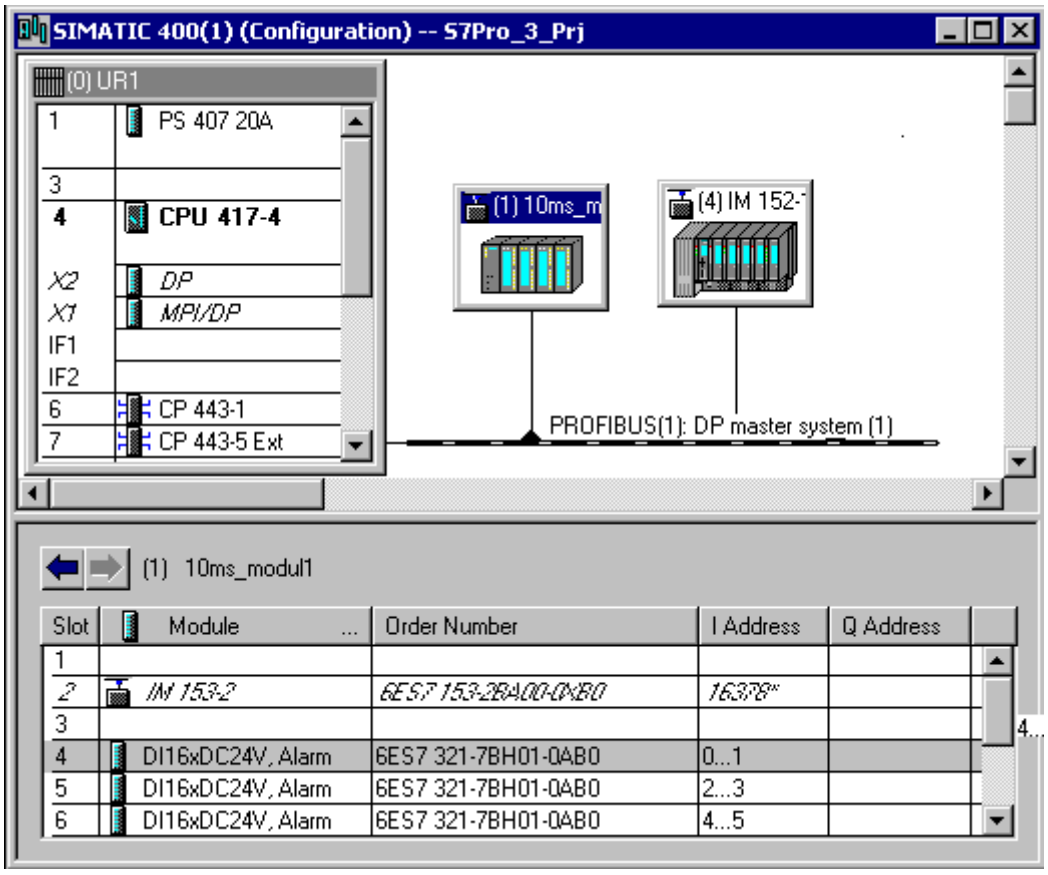
5.3.4 How to configure the SM 321 digital module

Note

You only need to read this section if you want to set time stamp for each digital input module separately.

Requirements

- At least one ET 200M station is configured in HW Config.
- A digital input module SM 321 is configured in at least one slot of the ET 200M station (IM 153-2) (type of digital input module: See section "Components and Systems > Distributed I/O (Page 26)").



Procedure

1. In the ET 200M station, select the SM 321 digital input module for which you want to make the settings.
2. Open the shortcut menu (right-click) and select the menu command **Object Properties**.
3. Activate the "Time stamp" check box in the "Time stamping" tab and activate the radio button you want for RLO edge detection.

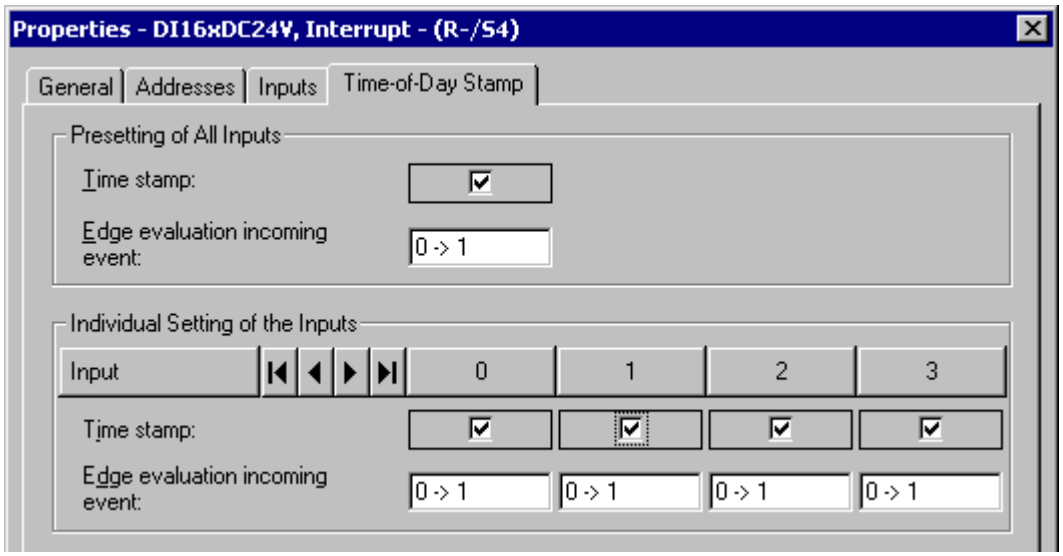
Additional information

- " Examples of settings on digital input module SM 321 (Page 46) " section
- Section "How to configure the interface module (Page 40)"

5.3.5 Examples of settings for SM 321 digital input module

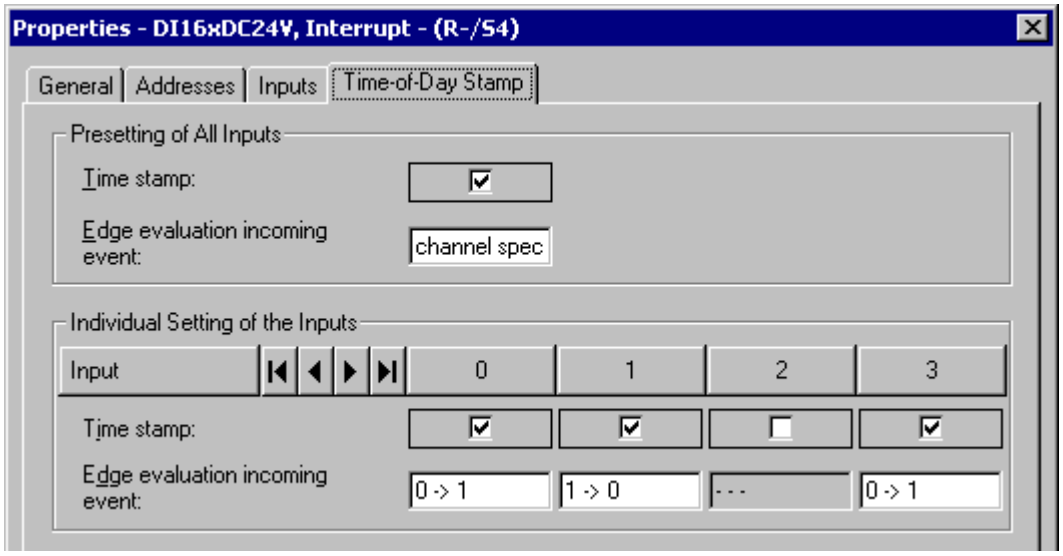
1. Example

Module setting "Presetting of all inputs" selected:



2. Example

Module setting "Individual setting of the inputs" (channel-specific) selected:



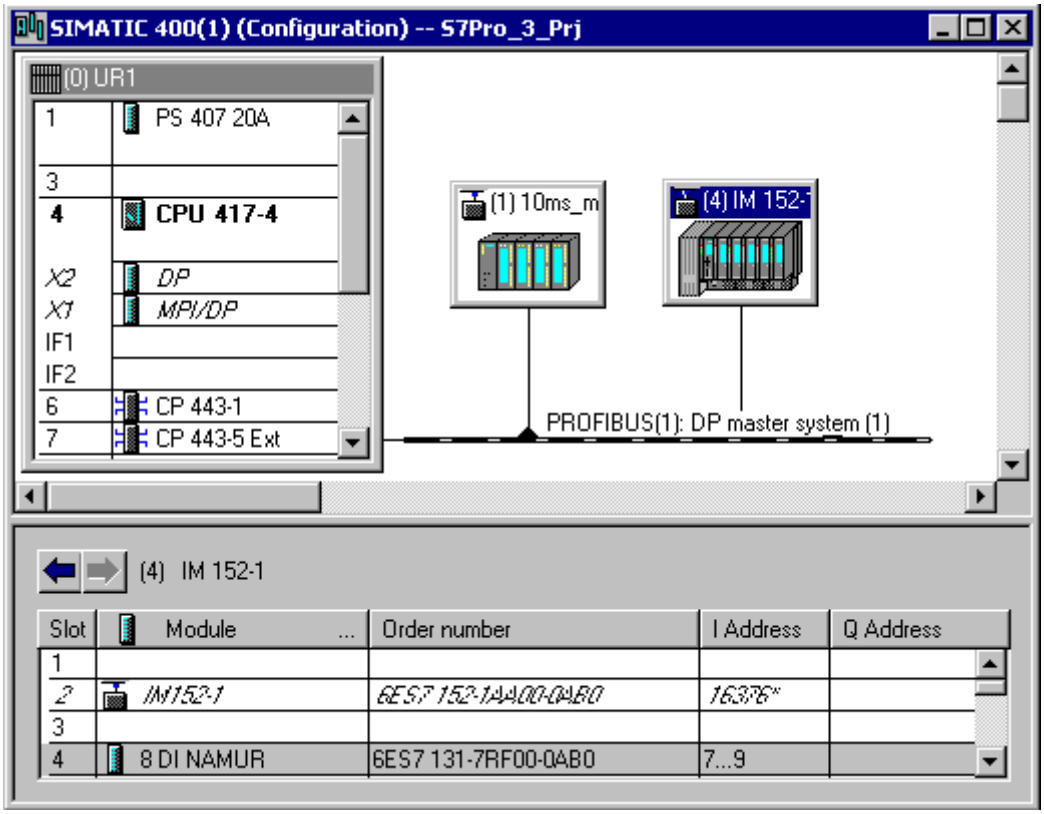
5.3.6 How to configure the SM 131 digital module

Note

You only need to read this section if you want to set time stamp for each digital input module separately.

Requirements

- An ET 200iSP station is configured in HW Config.
- A digital input module SM 131 (8 DI NAMUR) is configured in at least one slot of the ET 200iSP station (IM 152-1) (type of digital input module: See section "Components and Systems > Distributed I/O (Page 26)").



Procedure

1. In the ET 200iSP station, select the SM 131 digital input module for which you want to make the settings.
2. Open the shortcut menu (right-click) and select the menu command **Object Properties**.
3. Select the "Parameters" tab.
4. In the tree view, select the folder **Parameters > Time Stamp > Individual setting of the inputs**.

5. In the tree view, open the folder of the channel to be changed (for example, channel 0)
6. Open the "Time stamping" parameter in the tree view. Activate the check box in the "Value" column.
7. Open the "Edge Evaluation Incoming Event" parameter in the tree view. Select the direction of the edge evaluation from the drop-down list box in the "Value" column.

   Note

   You now need to configure each input separately.

   Configuration via the interface module affects all inputs of the digital input module in this ET 200iSP station.

8. Click "OK".
   The settings are applied.

Additional information

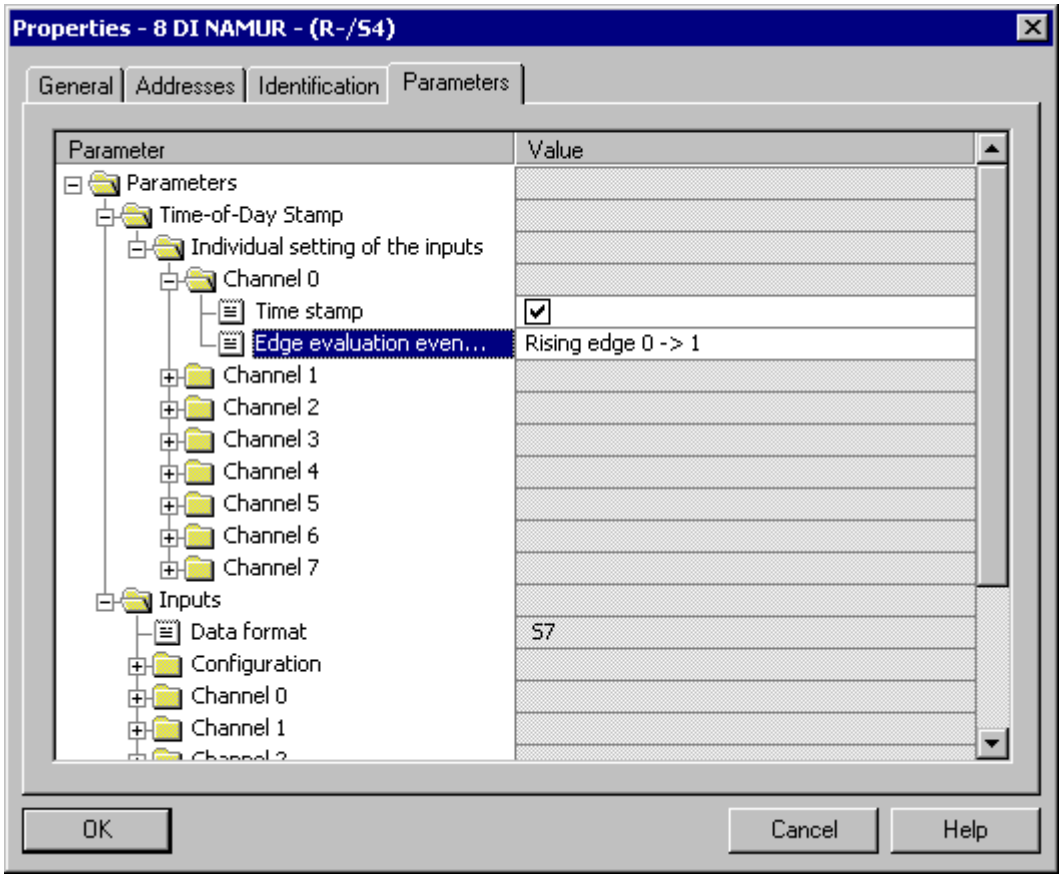
- " Example of setting on digital input module SM 131 (Page 48) " section
- Section "How to configure the interface module (Page 40)"

5.3.7 Example of settings on the SM 131 digital input module

The settings can be made for all modules or specific channels.

Example

Setting on the module:



5.3.8 How to configure the SM 326 digital input module

Note

You only need to read this section if you want to set time stamp for each digital input module separately.

Influence on a configured F system

Note

The activation of the high-precision time stamping has no effect on the operation of an F system if the required modules and inputs have already been configured.

Inputs available

The number of digital input module inputs available for time stamping depends on the following supplementary conditions:

- Version of the software package
  - *SIMATIC S7; S7 F systems*
  - *SIMATIC S7; FConfigPack*
- Type of interface module (IM 153-2)
  High-precision time stamping is only available in SIMATIC S7-300 single modules for IM 153-2 interface modules with the following order numbers:
  - 6ES7 153-2BA01-0XB0
  - 6ES7 153-2BA02-0XB0

Software packages	**Interface module 6ES7 153-2BA01-0XB0**	**Interface module 6ES7 153-2BA02-0XB0**
FConfigPack V5.4 SP1 to V5.5 (S7 F systems V5.2 SP4)	High-precision time stamp not available	
FConfigPack V5.5 SP1 and V5.5 SP2 (S7 F systems V5.2 SP4)	12 channels available (CH00 to CH11)	
FConfigPack as of V5.5 SP3 (S7 F systems V6.0)	12 channels available (CH00 to CH11)	24 channels available (CH00 to CH23)

Requirements

- An ET 200M station is configured in HW Config.
- A digital input module SM 326 is configured in a slot of the ET 200M station (IM 153-2) (type of digital input module: See section "Components and Systems > Distributed I/O (Page 26) ").

Procedure

1. In the ET 200M station, select the SM 326 digital input module for which you want to make the settings.
2. Open the shortcut menu (right-click) and select the menu command **Object Properties**.
3. Select the "Parameters" tab.
4. In the tree view, select the folder **Parameters > Time Stamping > Individual setting of the inputs**.
5. In the tree view, open the folder of the channel to be changed (for example, channel 0)
6. Open the "Time stamping" parameter in the tree view. Activate the check box in the "Value" column.

7. Open the "Edge Evaluation Incoming Event" parameter in the tree view. Select the direction of the edge evaluation from the drop-down list box in the "Value" column.

   Note

   You now need to configure each input separately.

   Configuration via the interface module affects all inputs of the digital input module in this ET 200M station.

8. Click "OK".
   The settings are applied.

Additional information

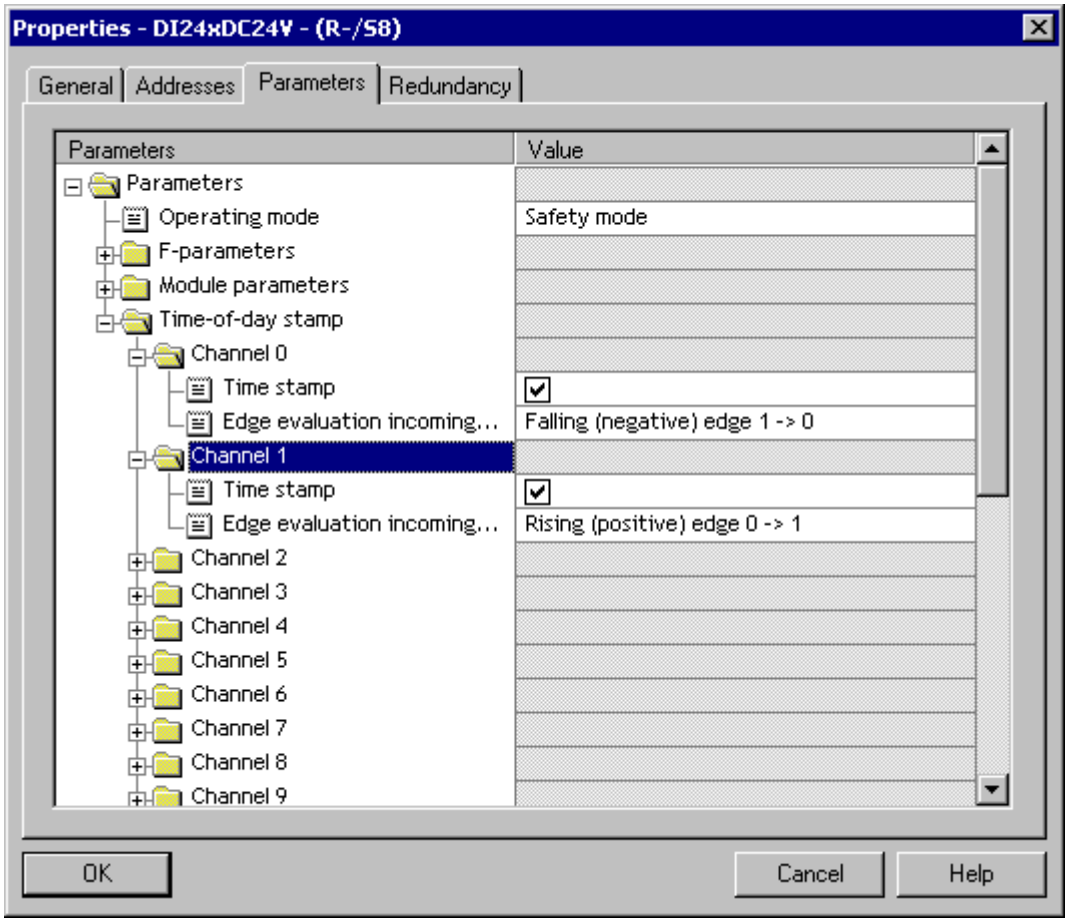
- Section "Examples of settings on digital input module SM 326 section (Page 51)"
- Section "How to configure the interface module (Page 40)"

5.3.9 Examples of settings on digital input module SM 326 section

The settings for each module must be made for specific channels.
Configuration via the interface module affects all inputs of the digital input module in this ET 200M station.

Example

Setting on the module:



5.4 Configuring symbolic names

5.4.1 How to configure symbolic names for signals

Introduction

You can assign symbolic names to signals. Simple identification of the signals makes the interconnection of the driver blocks easier.

Requirements

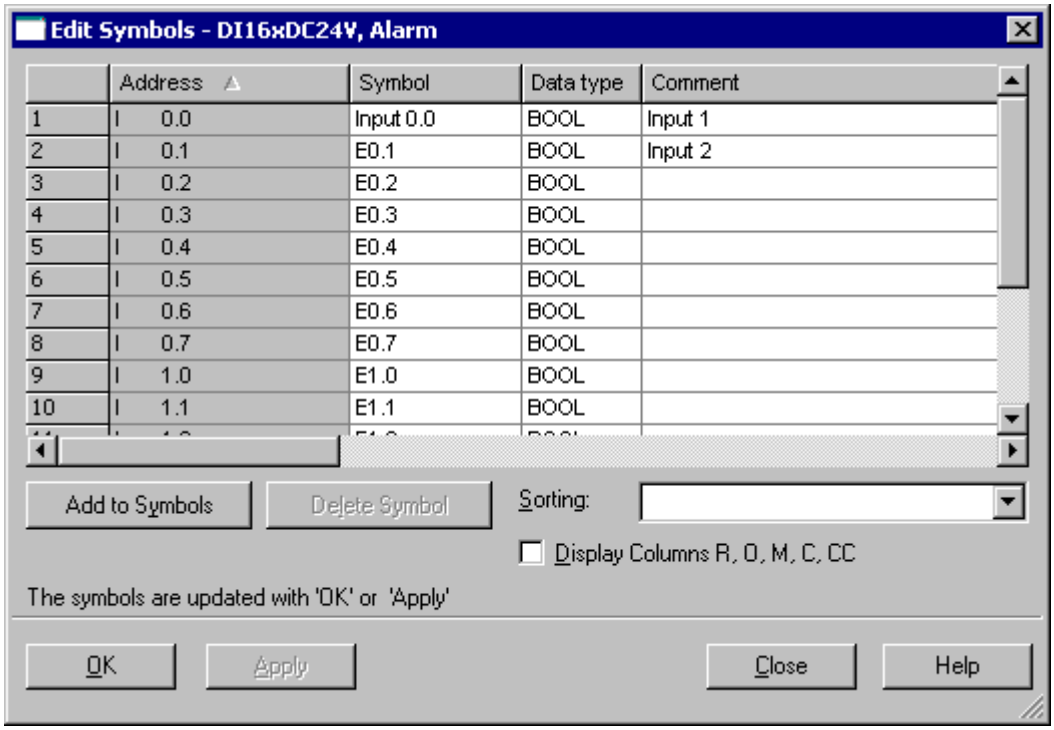
- The project is open in the **Component View** of SIMATIC Manager.
- The path to the AS is set.
- HW Config is open.

Procedure

Perform the following tasks for all digital input modules:

1. Select a digital input module in HW Config.
2. In the configuration table for the module, select a row in which an address of the process image is assigned.

3. Select the menu command **Edit > Edit Symbols**.
4. Enter the symbols (symbolic names) for the assigned inputs of modules with time stamping. You can apply the addresses as symbols by clicking the "Add to Symbol" button. You can change the symbol name in the "Edit Symbols" dialog box or in the symbol table (for example, Symbol = "Chart_Meas" - a maximum of 24 character are allowed).



5.5 Configuring the signaling block

5.5.1 How to prepare for message configuration

You must configure an EventTS block in CFC charts so that messages with high-precision time stamps can be displayed on the OS. The EventTS block can generate the messages for up to 8 digital inputs.

Procedure

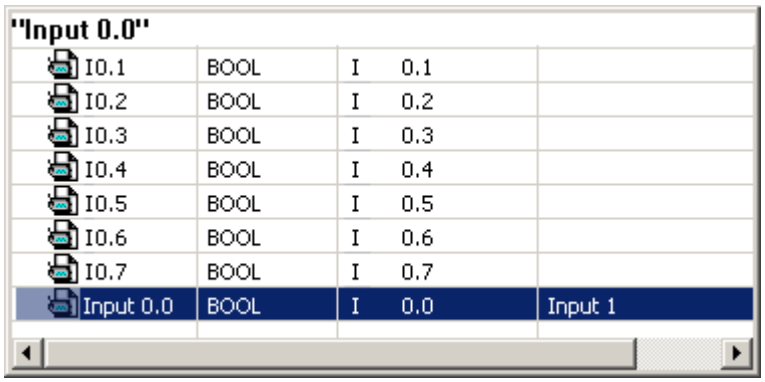
Create a CFC chart with a signaling block.

5.6 Configuring the input signals

5.6.1 How to configure the input signals

Procedure

1. Select the "PV_In" input of the channel driver block Pcs7DilTin the CFC chart.
2. Select the menu command **Insert > Interconnection to Address**.
   The "Insert Interconnection to Address" dialog box opens.
3. Select the row with the corresponding module input and double-click in the row.



4. Connect the blocks as shown for the connections in the following examples.

Note

You can configure messages assigned to the module input directly at the signaling block when you configure an input signal, or you can configure them later.
You can find additional information in the section " Configuring messages for high-precision time stamping (Page 60)").

Note

Configuration for an F system

Position the EventTS block in a CFC chart that is not in the runtime group of the F blocks. It is not possible to forward time stamps to technology blocks via the channel driver blocks of the F libraries.

Example of configuration with a technology block

Note

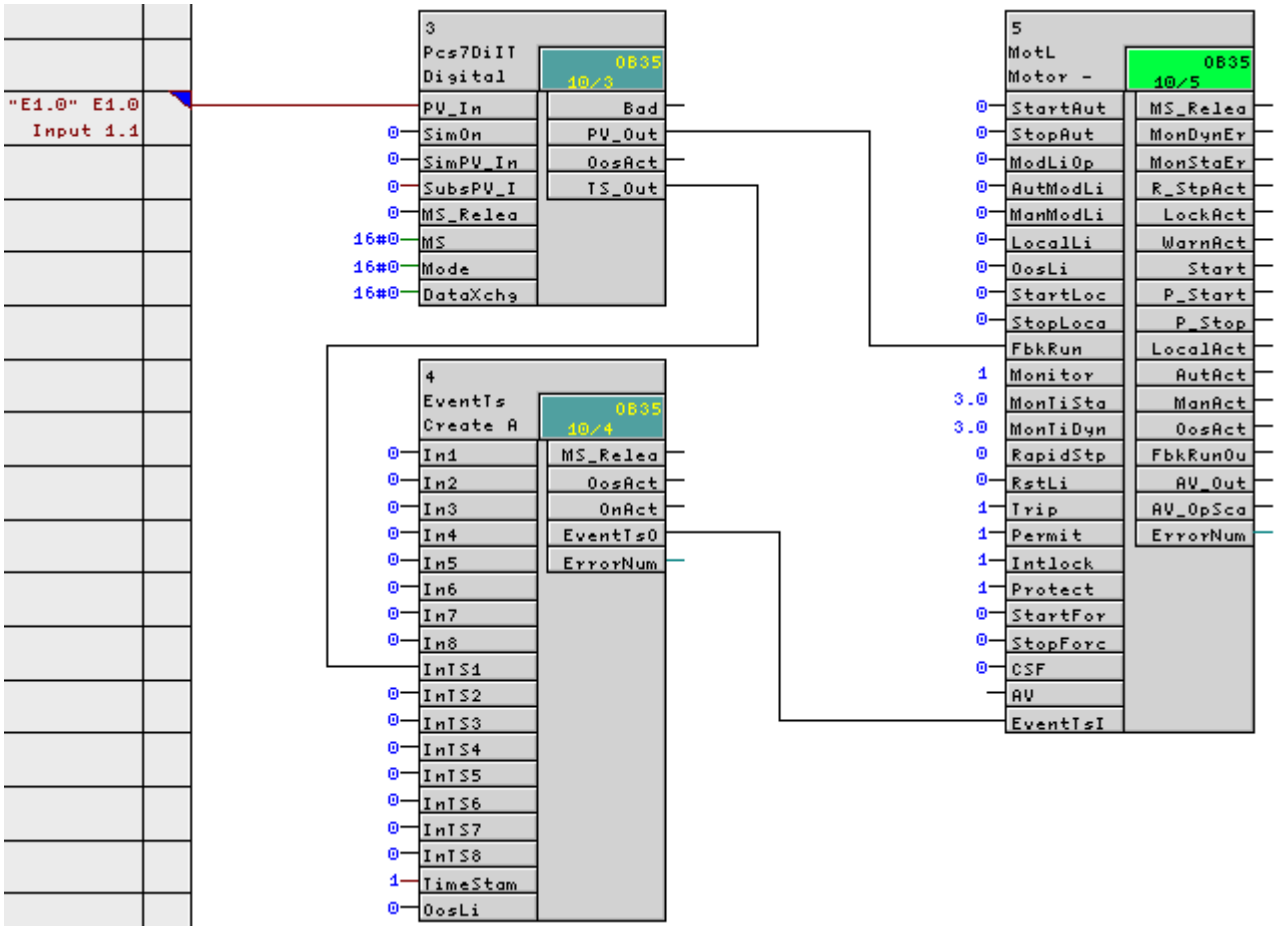
Making the inputs visible

You must make the following inputs of the technology blocks visible:

- EventTS block: "TimeStampOn" input
  This input activates the high-precision alarm inputs when the value = 1.
- Inputs "InTS1" to "InTS8"
  When technological blocks are used, these inputs additionally interconnect to the inputs of the technological blocks.

The following figure provides an example of high-precision time stamping for the "FbkRun" input of the "MotL" block.

- EventTS block: Input "TimeStampOn" = 1
- The following I/Os are interconnected:
  - Module, "I1.0" input with the "PV_In" input of the Pcs7DiIT channel driver block
  - "PV_Out" output of the Pcs7DiIT channel driver block with the "FbkRun" input of the MotL block.
  - "TS_Out" output of the Pcs7DiIT channel driver block with "InTS1" input of the EventTS block.
  - EventTS block: "EventTsOut" output with the MotL block, "EventTsIn" input.
    The message should be configured at the EventTS block. Replace the default text ($$BlockComment$$ **InTS1** Status 16#@1%x@) with a project-specific message text.
    Example: $$BlockComment$$ **<runtime error>** Status 16#@1%x@



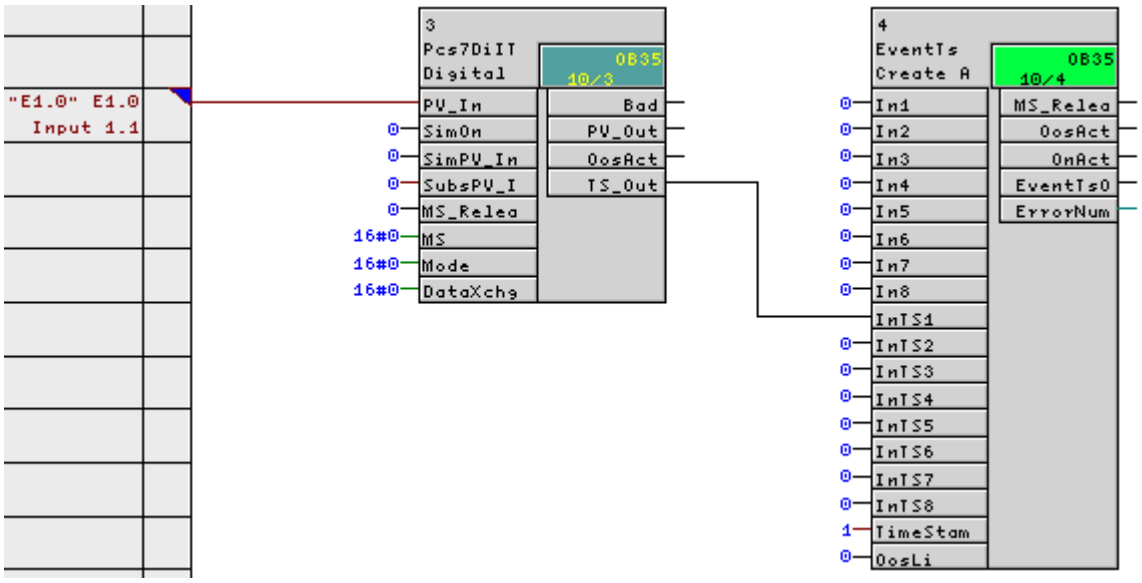
Example of configuration with the EventTS block

The following figure provides an example of high-precision time stamping for the "I1.0" of a digital input module.

- EventTS block: Input "TimeStampOn" = 1

The following I/Os are interconnected:

- "I1.0" input of the module with the "PV_In" input of the Pcs7DiIT block
- "TS_Out" output of the Pcs7DiIT block with the "InTS1" input EventTS block
- The message should be configured at the EventTS block. Replace the default text ($ $BlockComment$$ **InTS1** Status 16#@1%x@) with a project-specific message text. Example: $$BlockComment$$ **<temperature high>** Status 16#@1%x@



Notes on configuration with redundant signal acquisition

Take into account the following information for a configuration with redundant signal acquisition:

- It is possible to mix redundant and non-redundant DI signals.
- With redundant signal acquisition, a message is produced for the OS for each module input regardless of the module status (passivated, good status).

Additional information

You can find more information on configuration with redundant signal acquisition in the documentation *Process Control System PCS 7; Fault-Tolerant Process Control Systems*.

5.7 Configuring messages for high-precision time stamping

5.7.1 How to configure messages with blocks of the PCS 7 Advanced Process Library (APL)

Introduction

This section explains how to change the message texts at the APL block EventTS.

Procedure

1. Open the project in SIMATIC Manager and select the menu command **View > Component View**.
2. Select the chart folder of a S7 program in the tree: **Project\SIMATIC Station\CPU\S7 Program\Charts**.
3. Select the menu command **Options > Charts > Chart Reference Data**.
   The "Chart Ref: Display Chart Reference Data" dialog box opens.
4. Select the menu command **View > Block Types**.
   The "{S7 Program} (Block Types)" dialog box opens.
5. Click "Block type" in the table heading.
   The entries are sorted alphabetically.
6. Find the EventTS block with the associated entries in the list.
7. Double-click on the block type of the messaging block in the table row found.
   The CFC chart containing the block you are searching for opens. The relevant block is highlighted.
8. Select the menu command **Edit > Object Properties**.
   The "Properties – Block" dialog box opens.
9. Click "Messages" in the "Special Properties" group. The "PCS 7 Message Configuration" dialog box opens.
10. Select the message class of the message. Change the message text in the "Event" column of the table (see example).
11. Click "OK".

Example

Replace the default text ($$BlockComment$$ InTS1 Status 16#@1%x@) with the project-specific message text (for example, $$BlockComment$$ <temperature high> Status 16#@1%x@).

Additional information

You can find additional information about message configuration in the *STEP 7* online help under the topic "How to Create Block-Related Messages for the Project)".

5.8 Compiling and downloading the AS

5.8.1 How to compile and download the AS

Options

The following options are available for compiling and downloading programs:

- You can use the commands for a single SIMATIC station.
- You can compile and download multiple SIMATIC stations with a single command.

Additional information

You can find additional information and step-by-step instructions in the configuration manual *Process Control System PCS 7*; *Engineering System*.

5.9 Compiling and downloading the OS

5.9.1 How to compile and download the OS

Options

The following options are available for compiling and downloading the operator station(s):

- You can compile and download operator stations one-by-one.
- You can compile several operator stations at the same time and download them on their own.
- You can compile and download several operator stations at the same time.

Additional information

You can find additional information and step-by-step instructions in the configuration manual *Process Control System PCS 7*; *Operator Station*.

AS Process Control Messages for Time Stamp Faults 6

6.1 Time stamp faults

Introduction

This section describes the AS process control messages that are generated when faults occur in the time stamping.

Overview of AS process control messages

The following AS process control messages can be generated for time stamp faults:

- Startup data (Page 64)
- Time-of-day message frame error (Page 66)
- Time difference between the message frame time stamp and the real-time clock may cause inaccuracy (Page 67)
- STOP of the time stamp function (Page 68)
- Message loss at IM (buffer overflow) (Page 69)
- Redundant changeover (Page 70)
- Loss of information with redundancy (Page 71)

Additional information

Additional information about editing the message texts is available in the section "Configuring time stamping > Configuring messages for high-precision time stamping" > How to configure messages with blocks of the PCS 7 Advanced Process Library (APL) (Page 60)".

6.2 AS process control message "Startup data"

Meaning

The AS process control message "Startup data" indicates a start/restart of the interface modules (for example, IM 153-2).

Messages

- "Startup data" with the signal status "INCOMING"
- "Startup data" with the signal status "OUTGOING"

Description

1. After the start/restart, the interface module sends the signal for the AS process control message "Startup data" with the signal status "INCOMING" to the CPU.
2. The interface module then sends messages signaling the static state of all configured process signals.
   Based on the process signal, the interface module derives the signal to be sent according to the configuration (see following table).
3. Following this, the interface module sends the signal for the AS process control message "Startup data" with the signal status "OUTGOING".

Status process signal	Configured edge evaluation of incoming event:	Interface module (signal message from startup)
0	0 -> 1	OUTGOING
1	0 -> 1	INCOMING
1	1 -> 0	OUTGOING
0	1 -> 0	INCOMING

Message derived from the process signal (depending on configuration)

Message processing in PCS 7

1. The signal for "Startup data" with the signal status "INCOMING" is detected and the AS process control message "Startup data" is entered in the message list with the signal status "INCOMING".
2. In the CPU, the message block compares the signal messages representing the static state of the process signals with the last stored state of the signals.
   If there are signals whose states are different, messages are entered in the message list (see following table):
3. The OS identifies the signal for the startup data. The AS process control message "Startup data" is entered in the message list with the signal status "OUTGOING".

Interface module (signal message from startup)	Value stored in the CPU (message block)	Message in message list and archive
INCOMING	INCOMING	---
INCOMING	OUTGOING	OUTGOING
OUTGOING	OUTGOING	----
OUTGOING	INCOMING	INCOMING

Possible status of a message in the message list

6.3 AS process control message "Time-of-day message frame error"

Meaning

The AS process control message "Time-of-day message frame error" indicates an error in the time-of-day synchronization of the interface module (for example, IM 153-2).

Messages

- "Time-of-day message frame error" with the signal status "INCOMING"
- "Time-of-day message frame error" with the signal status "OUTGOING"

Description

The interface module expects a time-of-day frame from the time master within the configured interval (every second, for example).

If the time-of-day frame of the master is not received three times in succession, the interface module continues to operate with the internal time and sends the message "Time-of-day message frame error" with the signal status "INCOMING" to the operator station.

Once the next valid time-of-day frame arrives, the internal clock of the interface module is synchronized and the message "Time-of-day message frame error" with the signal status "OUTGOING" is triggered.

6.4 AS process control message "Time difference between the message frame time stamp and the real-time clock may cause inaccuracy"

Meaning

The AS process control message "Time difference between the message frame time stamp and the real-time clock may cause inaccuracy" indicates a time change or time difference in the interface module (for example, IM 153-2).

Messages

- "Time difference between the message frame time stamp and the real-time clock may cause inaccuracy" with the signal status "INCOMING"
- "Time difference between the message frame time stamp and the real-time clock may cause inaccuracy" with the signal status "OUTGOING"

Description

The two messages are sent one after the other in the following situation:

- When a signal arrives at the interface module, there is a difference between the synchronous time and the internal time of the interface module.
- The difference between the times is greater than half the accuracy of the time stamp.
  Example: The difference is > 5 ms with time stamping accuracy of 10 ms.
  The time of the interface module is then synchronized.
  - The message with the signal status "INCOMING" receives the time stamp before synchronization.
  - The message with the signal status "OUTGOING" receives the time stamp after synchronization.

  Based on these messages, you can check whether the internal clock of the interface module has been set forward or back.

6.5 AS process control message "STOP of the time stamp function"

Meaning

The AS process control message "STOP of the time stamp function" indicates a time stamp fault of the interface module (for example, IM 153-2).

Messages

- "STOP of the time stamp function“ with the signal status “INCOMING"
- "STOP of the time stamp function" with the signal status "OUTGOING"

Description

If the connection between the DP master and the interface module breaks down, signals are no longer given time stamps. The might occur, for example, following failure of the CP or a break on the bus cable. A message to this effect is entered in the internal message list.

- Signal time stamping is stopped from the moment the message with the signal status "INCOMING" is generated.
- Signal time stamping is reactivated once the message with the signal status "OUTGOING" is generated.
- Once the message "STOP of the time stamp function" with the signal status "OUTGOING" is generated, the interface module starts up again.

6.6 AS process control message "Message loss at IM (buffer overflow)"

Meaning

The AS process control message "Message loss at IM (buffer overflow)" indicates a loss of messages due to an overflow of the message buffer of the interface module .

Messages

- "Message loss at IM (buffer overflow)" with the signal status "INCOMING"
- "Message loss at IM (buffer overflow)" with the signal status "OUTGOING"

Description

The AS process control message is generated in the two following situations:

Buffer overflow due to external causes	Buffer overflow due to internal causes
Examples of potential causes: • Failure or overload of the plant or field bus • Failure or overload of the DP master (CPU) Remedy: Correct the source of the problem	Example of a potential cause: The signals in the I/O change so quickly that the signal transitions can no longer be entered in the message lists. Remedy: Distribute the signals over several interface modules or reduce the number of signals with time stamping.

A message to this effect is entered in the internal message list.

- Incoming messages cannot be saved from the moment the message with the signal status "INCOMING" is generated.
- Incoming messages can be saved again once the message with the signal status "OUTGOING" has been generated.

6.7 AS process control message "Redundant changeover"

Meaning

The AS process control message "Redundant changeover" is output when there is a changeover between active and passive interface modules (for example, IM 153-2) .

Messages

- "Redundant changeover" with the signal status "INCOMING"
- "Redundant changeover" with the signal status "OUTGOING"

Description

The AS process control message "Redundant changeover" indicates this period of interruption.

Time stamps are not applied during the period of the failover.

- Time stamping is deactivated from the moment the message with the signal status "INCOMING" is generated (start of the failover between the active and passive interface modules).
- Time stamping is reactivated once the message with the signal status "OUTGOING" is generated.

6.8 AS process control message "Loss of information with redundancy"

Meaning

The AS process control message "Loss of information with redundancy" indicates an error when signals are exchanged between the passive interface module (for example, IM 153-2) and the active interface module.

Messages

- "Loss of information with redundancy" with the "INCOMING" signal status
- "Loss of information with redundancy" with the "OUTGOING" signal status

Description

During error-free operation, the passive interface module receives information about the current state of the I/O from the active interface module:

- There is a signal exchange error from the moment the message with the signal status "INCOMING" is generated.
- As soon as the I/O state has been synchronized between the active and passive interface modules, the message with the signal status "OUTGOING" is output.

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