SIEMENS

SIMATIC

ET 200SP Open Controller CPU 1515SP PC3 (F/T/TF)

Operating Instructions

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ET 200SP Open Controller CPU 1515SP PC3 (F/T/TF)

Operating Instructions

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified persons are those who, because of their training and experience, are familiar with the installation, assembly, commissioning, operation, decommissioning and disassembly of the product and can recognize risks and avoid possible hazards.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the application described in the catalog and the associated usage information. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1

Purpose of the documentation

These operating instructions supplement the system manual ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/58649293). Functions that generally relate to the system are described in this system manual.

The information provided in these operating instructions and in the system/function manuals supports you in commissioning the CPU 1515SP PC3.

Basic knowledge required

The system must be operated and used by qualified staff only.

The following knowledge is required:

- Installation guideline for SIMATIC ET 200SP
- Totally Integrated Automation Portal, in particular:
  - Hardware configuration with *hardware and network editor*
  - Communication between CPUs
- PC-based automation with an S7-1500 Software Controller
- Basic knowledge of fail-safe automation systems
- Basic knowledge of PC technology
- Operating system Windows 11 IoT (Enterprise 2024 LTSC) or SIMATIC Industrial OS (operating system based on Debian GNU/Linux)

Conventions

STEP 7: In this documentation, "STEP 7" serves as a synonym for all versions of the configuring and programming software "STEP 7 (TIA Portal)".

"CPU 1515SP PC3 T" means that the respective section applies **only** to the "CPU 1515SP PC3 T".

"CPU 1515SP PC3 F" means that the respective section applies **only** to the "CPU 1515SP PC3 F".

"CPU 1515SP PC3 TF" means that the respective section applies **only** to the "CPU 1515SP PC3 TF".

"CPU 1515SP PC3" also includes "CPU 1515SP PC3 F", "CPU 1515SP PC3 T" and "CPU 1515SP PC3 TF".

Also observe notes marked as follows:

NOTE

A note contains important information on the product described in the documentation, on the handling of the product or on the section of the documentation to which particular attention should be paid.

1.1 Scope of validity of the documentation

Scope of validity of the documentation for version V40.1

This documentation is valid for the following products:

ET 200SP Open Controller, Version V40.1	Article number
Basic device	
• CPU 1515SP PC3	6ES7677-2DD40-0AA0
Bundles with standard CPU	
• CPU 1515SP PC3 (Win 11)	6ES7677-2DD44-0GB0
• CPU 1515SP PC3 (IndOS)	6ES7677-2DD43-0GB0
Bundles with fail-safe CPU	
• CPU 1515SP PC3 F (Win 11)	6ES7677-2SD44-0GB0
• CPU 1515SP PC3 F (IndOS)	6ES7677-2SD43-0GB0
Bundles with technology CPU	
• CPU 1515SP PC3 T (Win 11)	6ES7677-2VD44-0GB0
Bundles with fail-safe technology CPU	
• CPU 1515SP PC3 TF (Win 11)	6ES7677-2WD44-0GB0

Documentation for Open Controller, version V40.0

The following Operating Instructions apply to Open Controller version V40.0:

- Operating Instructions SIMATIC ET 200SP Open Controller CPU 1515SP PC3 (F), 08/2025 (https://support.industry.siemens.com/cs/ww/en/view/109989999)

1.2 Documentation CPU 1515SP PC3 (F/T/TF)

The following additional documentation is required to use the CPU 1515SP PC3 (F/T/TF):

- Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F), CPU 1508S (F/T/TF) V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109998256)
- Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F) and CPU 1508S (F) SIMATIC Industrial OS V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109989745)
- STEP 7 online help (TIA Portal)
- System Manual ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/58649293)
- Equipment Manual ET 200SP Server Module (https://support.industry.siemens.com/cs/ww/en/view/63257531)
- Programming and Operating Manual SIMATIC Safety - Configuration and Programming (https://support.industry.siemens.com/cs/ww/en/view/54110126)
- Product Information SIMATIC S7-1200/S7-1500 F-CPUs (https://support.industry.siemens.com/cs/ww/en/view/109478599)

1.3 ET 200SP Documentation Guide



The documentation for the SIMATIC ET 200SP distributed I/O system is arranged into three areas.

This arrangement enables you to access the specific content you require.

You can download the documentation free of charge from the Internet (https://support.industry.siemens.com/cs/ww/en/view/109742709).

Basic information



The System Manual describes in detail the configuration, installation, wiring and commissioning of the SIMATIC ET 200SP distributed I/O system.

The STEP 7 online help supports you in the configuration and programming.

Examples:

- ET 200SP System Manual
- System Manual ET 200SP HA/ET 200SP modules for devices used in a hazardous area
- Online help TIA Portal

Device information



Equipment manuals contain a compact description of the module-specific information, such as properties, wiring diagrams, characteristics and technical specifications.

Examples:

- Equipment Manuals CPUs
- Equipment Manuals Interface Modules
- Equipment Manuals Digital Modules
- Equipment Manuals Analog Modules
- Equipment Manuals Motor Starter
- BaseUnits Equipment Manuals
- Equipment Manual Server Module
- Equipment Manuals Communications Modules
- Equipment Manuals Technology Modules

General information



The function manuals contain detailed descriptions on general topics relating to the SIMATIC ET 200SP distributed I/O system.

Examples:

- Function Manual ET 200AL/ET 200SP Mixed Configuration
- Function Manual Diagnostics
- Function Manual Communication
- PROFINET Function Manual
- PROFIBUS Function Manual
- Function Manual Designing Interference-free Controllers
- MultiFieldbus Function Manual

Product Information

Changes and supplements to the manuals are documented in a Product Information. The Product Information takes precedence over the device and system manuals.

You can find the latest Product Information on the ET 200SP distributed I/O system on the Internet. (https://support.industry.siemens.com/cs/de/en/view/73021864)

Manual Collection ET 200SP

The Manual Collection contains the complete documentation on the SIMATIC ET 200SP distributed I/O system gathered together in one file.

You can find the Manual Collection on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/84133942)

Manual Collection fail-safe modules

The Manual Collection contains the complete documentation on the fail-safe SIMATIC modules, gathered together in one file.

You can find the Manual Collection on the Internet.

1.3.1 SIMATIC Technical Documentation

Additional SIMATIC documents will complete your information. You can find these documents and their use at the following links and QR codes.

The Industry Online Support gives you the option to get information on all topics. Application examples support you in solving your automation tasks.

Overview of the SIMATIC Technical Documentation

Here you will find an overview of the SIMATIC documentation available in Siemens Industry Online Support:



Industry Online Support International (https://support.industry.siemens.com/cs/ww/en/view/109742705)

Watch this short video to find out where you can find the overview directly in Siemens Industry Online Support and how to use Siemens Industry Online Support on your mobile device:



Quick introduction to the technical documentation of automation products per video (https://support.industry.siemens.com/cs/us/en/view/109780491)



YouTube video: Siemens Automation Products - Technical Documentation at a Glance (https://youtu.be/TwLSxxRQQsA)

Retention of the documentation

Retain the documentation for later use.

For documentation provided in digital form:

1. Download the associated documentation after receiving your product and before initial installation/commissioning. Use the following download options:
   - Industry Online Support International: (https://support.industry.siemens.com)

     The article number is used to assign the documentation to the product. The article number is specified on the product and on the packaging label. Products with new, non-compatible functions are provided with a new article number and documentation.
   - ID link:

     Your product may have an ID link. The ID link is a QR code with a frame and a black frame corner at the bottom right. The ID link takes you to the digital nameplate of your product. Scan the QR code on the product or on the packaging label with a smartphone camera, barcode scanner, or reader app. Call up the ID link.
2. Retain this version of the documentation.

Updating the documentation

The documentation of the product is updated in digital form. In particular in the case of function extensions, the new performance features are provided in an updated version.

1. Download the current version as described above via the Industry Online Support or the ID link.
2. Also retain this version of the documentation.

mySupport

With "mySupport" you can get the most out of your Industry Online Support.

Registration	You must register once to use the full functionality of "mySupport". After registration, you can create filters, favorites and tabs in your personal workspace.
Support requests	Your data is already filled out in support requests, and you can get an overview of your current requests at any time.
Documentation	In the Documentation area you can build your personal library.
Favorites	You can use the "Add to mySupport favorites" to flag especially interesting or frequently needed content. Under "Favorites", you will find a list of your flagged entries.
Recently viewed articles	The most recently viewed pages in mySupport are available under "Recently viewed articles".
CAx data	The CAx data area gives you access to the latest product data for your CAx or CAe system. You configure your own download package with a few clicks: • Product images, 2D dimension drawings, 3D models, internal circuit diagrams, EPLAN macro files • Manuals, characteristics, operating manuals, certificates • Product master data

You can find "mySupport" on the Internet. (https://support.industry.siemens.com/My/ww/en)

Application examples

The application examples support you with various tools and examples for solving your automation tasks. Solutions are shown in interplay with multiple components in the system - separated from the focus on individual products.

You can find the application examples on the Internet.
(https://support.industry.siemens.com/cs/ww/en/ps/ae)

AI-powered online support chat

The "AskSUPport" function is an advanced AI-controlled platform that gives you access to the powerful knowledge base of the Siemens Support Portal (https://sieportal.siemens.com/en-de/support). You do not just receive mechanical answers to your questions, but precise, interactive informational material. This allows you to effectively speed up your research and decision processes.

The following link (https://support.industry.siemens.com/cs/ww/en/view/109974274) provides current information on the availability of AskSUPport:

You can also access the entry by means of the "AI powered Online Support Chat" command in the "Help" menu in TIA Portal.

1.3.2 Tool support

The tools described below support you in all steps: from planning, over commissioning, all the way to analysis of your system.

TIA Selection Tool

The TIA Selection Tool tool supports you in the selection, configuration, and ordering of devices for Totally Integrated Automation (TIA).

As successor of the SIMATIC Selection Tools , the TIA Selection Tool assembles the already known configurators for automation technology into a single tool.

With the TIA Selection Tool , you can generate a complete order list from your product selection or product configuration.

You can find the TIA Selection Tool on the Internet.
(https://support.industry.siemens.com/cs/ww/en/view/109767888)

SINETPLAN

SINETPLAN, the Siemens Network Planner, supports you in planning automation systems and networks based on PROFINET. The tool facilitates professional and predictive dimensioning of your PROFINET installation as early as in the planning stage. In addition, SINETPLAN supports you during network optimization and helps you to exploit network resources optimally and to plan reserves. This helps to prevent problems in commissioning or failures during productive operation even in advance of a planned operation. This increases the availability of the production plant and helps improve operational safety.

The advantages at a glance

- Network optimization thanks to port-specific calculation of the network load
- Increased production availability thanks to online scan and verification of existing systems
- Transparency before commissioning through importing and simulation of existing STEP 7 projects
- Efficiency through securing existing investments in the long term and the optimal use of resources

You can find SINETPLAN on the Internet (https://new.siemens.com/global/en/products/automation/industrial-communication/profinet/sinetplan.html).

1.4 Information about third-party software updates

This product contains third-party software. Siemens accepts liability with respect to updates/patches for the third-party software only when these are distributed by Siemens in the context of a Software Update Service contract or officially approved by Siemens. Otherwise, only perform updates/patches at your own risk. You can find more information about our software update service offer on the Internet (https://www.siemens.com/us/en/entry.html).

We recommend that you regularly update the installed software.

More information

You can find more information about third-party software in the following sections:

- BIOS update (Page 70)
- Updating the Software Controller (Page 67)

1.5 Notes on protecting administrator accounts

A user with administrator rights has extensive access and manipulation possibilities.

Therefore, to prevent unauthorized changes, make sure that the Administrator account is adequately protected. Use secure passwords and a standard user account for regular operation. If necessary, implement additional measures, e.g. use security policies.

1.6 Security solutions (antivirus, firewall and others)

The operating system (Windows and IndOS) comes with built-in, pre-installed or ready-to-install security solutions. We recommend activating and using these solutions when the device is directly connected to the Internet.

Windows

The Windows operating system comes with integrated, continuously running, real-time security solutions; see Windows Security (https://www.microsoft.com/en-us/windows/comprehensive-security):

- Windows Defender
- Microsoft Defender SmartScreen
- Windows Firewall

NOTE

The Windows operating system offers regular updates to keep the system secure and up-to-date. An Internet connection is required to receive these updates.

IndOS (Linux)

The operating system comes with several preinstalled security solutions:

- Mandatory Access Control (MAC): SELinux
  - Wiki guide for setup (https://wiki.debian.org/SELinux/Setup)
  - Default state: Enabled/Permissive
- Network filter user space utility (firewall): Iptables
  - Configurable with mel-setup

The operating system comes with available security solutions that are not installed by default:

- Malware Defense/antivirus: ClamAV
  - Documentation for the configuration (https://docs.clamav.net/)

NOTE

You can install ClamAV offline with the Debian package manager.

⚠ WARNING

An Internet connection is required to obtain an up-to-date virus database.

Safety information 2

2.1 General safety instructions

You can find a detailed description of the safety instructions in the ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

2.2 Notes on use

⚠ WARNING

Hazards at an unprotected machine or plant

According to the results of a risk analysis, hazards can occur at an unprotected machine. The hazards may lead to personal injury.

According to the risk analysis, the risk of injury to persons can be countered with the following measures:

- Additional protective equipment at the machine or plant. In particular, you must implement the programming, parameterization and wiring of the I/Os used in accordance with the safety performance (SIL, PL or Cat.) determined by the required risk analysis.
- Use of the device for its intended purpose, which can be established by performing a function monitoring test on the plant. This allows you to detect programming, parameterization and wiring errors.
- Documentation of the test results which you can record in the relevant safety documents, if required.

NOTICE

Ambient conditions

Ambient conditions for which the device is not suitable can lead to faults or damage the device.

Follow the instructions below:

- Only operate the device in enclosed areas. If you do not comply with this instruction, the warranty becomes void.
- Only operate the device in accordance with the ambient conditions specified in the section Technical specifications (Page 99).
- Protect the device from dust, moisture and heat.
- Do not expose the device to direct sunlight or other strong sources of light.
- Without additional protective measures, e.g. the supply of clean air, the device cannot be used in locations with harsh operating conditions due to corrosive vapors or gases.

2.3 Open Source Software

This product, solution or service ("Product") contains third-party software components. These are either open source software licensed under a license recognized by the Open Source Initiative (https://opensource.com/) or a license defined by Siemens as comparable ("OSS") and/or commercial software or freeware. With respect to the OSS components, the applicable OSS license conditions prevail over any other terms and conditions covering the Product. The OSS portions of this Product are provided royalty-free and can be used at no charge.

You can download the OSS sources via SIOS.

The Readme_OSS and the OSS sources are always available for download on the SIOS page together with the firmware update.

This product contains software developed by the University of California, Berkeley, and its contributors.

If SIEMENS has combined or linked certain components of the Product with/to OSS components licensed under the GNU LGPL version 2 or later as per the definition of the applicable license, and if use of the corresponding object file is not unrestricted ("LGPL Licensed Module", whereas the LGPL Licensed Module and the components that the LGPL Licensed Module is combined with or linked to is the "Combined Product"), the following additional rights apply, if the relevant LGPL license criteria are met: (i) you are entitled to modify the Combined Product for your own use, including but not limited to the right to modify the Combined Product to relink modified versions of the LGPL Licensed Module, and (ii) you may reverse-engineer the Combined Product, but only to debug your modifications. The modification right does not include the right to distribute such modifications and you shall maintain in confidence any information resulting from such reverse-engineering of a Combined Product.

Certain OSS licenses require SIEMENS to make source code available, for example, the GNU General Public License, the GNU Lesser General Public License and the Mozilla Public License. If such licenses are applicable and this Product is not shipped with the required source code, a copy of this source code can be obtained by anyone in receipt of this information during the period required by the applicable OSS licenses by contacting the following address:

Siemens Aktiengesellschaft
Attn: Software Licensing
LC TEC IT&SL
Hertha-Sponer-Weg 3
91058 Erlangen
Germany

Keyword: Open Source Request (please specify Product name and version, if applicable)

SIEMENS may charge a processing fee for the fulfillment of the request.

Warranty regarding further use of the Open Source Software

SIEMENS' warranty obligations are set forth in your agreement with SIEMENS. If you modify the product or the OSS components or use them in a way other than that specified by SIEMENS, the warranty will be voided and no technical support will be provided. The following license terms may contain limitations of liability that apply between you and the respective licensor. For the avoidance of doubt, SIEMENS does not make any warranty commitment on behalf of or binding upon any third-party licensor. The Open Source software used in the product and the license agreements concerning this software can be found in the Readme_OSS.

Industrial Cybersecurity

3

Due to the digitalization and increasing networking of machines and industrial plants, the risk of cyber attacks is also growing. Appropriate protective measures are therefore mandatory, particularly in the case of critical infrastructure facilities.

Refer to the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293) for general information and measures regarding industrial cybersecurity.

This section provides an overview of security-relevant information pertaining to your SIEMENS device.

3.1 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://www.siemens.com/cert.

3.2 Cybersecurity-relevant information

Observe all cybersecurity-relevant information.

Topics with relevant cybersecurity information	Reference
Operational application environment and security assumptions	
Requirements for the operational application environment of the system and security assumptions	You can find this section in the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).

Topics with relevant cybersecurity information	Reference
Security properties of the product	
Password protection You can protect the CPU with a password. Password categories: • Password to protect confidential configuration data • Password in the context of user management (UMAC)	Also read the information on access protection in the Protection section of the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).
Integrated protection functions • The CPUs have integrated protection functions.	You can find information on the protection functions in the "Overview of protection functions" section of the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).
PROFINET Security Class 1 • The device supports PROFINET Security Class 1. • With the introduction of PROFINET Security Class 1, additional security settings have been integrated into the PROFINET communication.	You can find detailed information about PROFINET Security Class 1 and the additional security settings in the PROFINET with STEP 7 Function Manual (https://support.industry.siemens.com/cs/us/en/view/49948856).
Reading out and verifying signatures	You can find detailed information on reading and verifying signatures in the STEP 7 online help (TIA Portal).
Supported Ethernet services	Information on supported services can be found in section Technical specifications (Page 99). You can find detailed information about supported Ethernet services in the Communication Function Manual (https://support.industry.siemens.com/cs/us/en/view/59192925).
Interfaces, ports, protocols and services	
Information on the following is relevant for security: • Communications layer and communication role • Default states • Enabling/disabling ports and services	You can find detailed information on these topics in the Communication Function Manual (https://support.industry.siemens.com/cs/us/en/view/59192925).
Secure operation	
Corrective measures for known risks	Corrective measures for known risks are described on the Siemens ProductCERT (https://siemens.com/productcert) Web page. You can find additional information on SIEMENS ProductCERT in the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).
Security checks	Application-specific security measures such as cyclic checks of the configuration via checksums are described in the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).
Recording Security events	You can find information on recording security events in the "Safe operation of CPUs" section of the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).
Secure decommissioning Products that contain security-relevant data must be safely decommissioned before disposal or resale.	You can find information on safe decommissioning in the Safe operation of the system section of the System Manual (https://support.industry.siemens.com/cs/us/en/view/58649293).

Field of application

4

Field of application

The areas of use and application of the CPUs are:

- Process automation
- Production automation
- Building automation
- Transportation and logistics systems
- Energy and utility companies

NOTE

Use only in a secure environment

Only operate the Open Controller in an environment where you can prevent unauthorized access by third parties.

4.1 Areas of application of fail-safe CPUs

Areas of application

F-CPUs are mainly designed for personal and machine protection. In addition to the safety program, you can also program standard applications. You can operate the F-CPUs in safety mode or in standard mode.

Reference

You can find information on using the F-CPUs in safety mode in the following manual:

- Programming and Operating Manual SIMATIC Safety - Configuration and Programming (https://support.industry.siemens.com/cs/ww/en/view/54110126).

You can find information on using the CPU 1505SP (F/T/TF) Software Controller in the following manuals:

- Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F), CPU 1508S (F/T/TF) V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109998256)
- Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F) and CPU 1508S (F) SIMATIC Industrial OS V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109989745)
- F product information (https://support.industry.siemens.com/cs/ww/en/view/109478599)

4.2 Areas of application of technology CPUs

Areas of application

Main areas of application of T-CPUs are motion control applications, such as gearing and camming or the control of kinematics. Due to the supported technology functions, the S7-1500T CPUs are suitable for controlling packaging machines, conversion applications, assembly automation, etc.

You can operate the TF-CPUs in safety mode or in standard mode.

Reference

You can find information on using the T-CPUs in the following manuals:

- Function Manual SIMATIC S7-1500T Motion Control (https://support.industry.siemens.com/cs/ww/en/view/109990072)
- Function Manual SIMATIC S7-1500T Kinematics functions (https://support.industry.siemens.com/cs/ww/en/view/109990073)

You can find information on using the F- and TF-CPUs in safety mode in the following manual:

- Product Information on SIMATIC S7-1200/S7-1500 F-CPUs (https://support.industry.siemens.com/cs/ww/en/view/109478599).

Product overview

5

5.1 CPU 1515SP PC3 Open Controller 3

CPU 1515SP PC3 Open Controller 3 is a PC-based programmable controller in the design of an ET 200SP. It is used for control and visualization purposes.

Article number

The article number depends on the preinstalled S7-1500 Software Controller and the HMI Runtime.

You can find an overview of the article numbers in the section Scope of validity of the documentation (Page 9).

View of the module

The following figure shows the CPU 1515SP PC3 Open Controller 3:

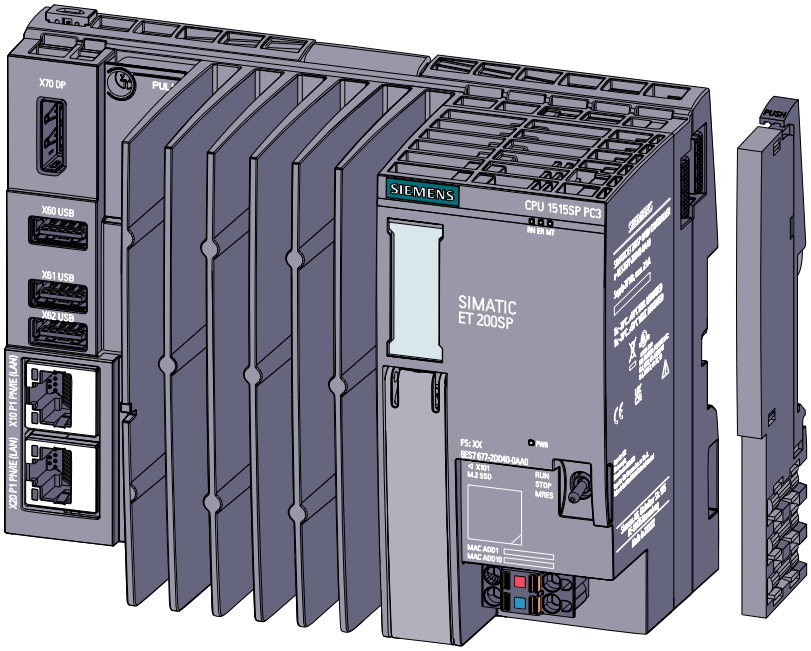


Figure 5-1 CPU 1515SP PC3 Open Controller 3

General characteristics

- The storage medium is a plug-in M.2 SATA SSD with the following pre-installations:
  - Operating system Windows 11 IoT (Enterprise 2024 LTSC) or SIMATIC Industrial OS V4.2 (based on Debian 12)
  - S7-1500 Software Controller: CPU 1505SP (F/T/TF)
- Interfaces:
  - An interface for the interchangeable ET 200SP BusAdapter for connecting PROFINET IO RT/IRT (2 ports) Accessories/spare parts (Page 115) to the S7-1500 Software Controller
  - A 1 Gigabit Ethernet interface that is permanently assigned to the operating system
  - An Ethernet interface that is assigned to the operating system (1 Gigabit) or the Software Controller (100 Mb, PROFINET IO RT) using a configuration file
  - Three interfaces for USB devices (3 x USB 3.1 Gen 1)
  - A DisplayPort interface (DP) for a monitor DP 1.4
  - One slot for the M.2 SATA SSD
- Supply voltage 1L+ 24 V DC (SELV/PELV). The connection plug is included in the scope of delivery.
- The Open Controller is suitable for use in industrial environments:
  - Compact design
  - Fan-less operation
  - Highly rugged
- The Open Controller complies with degree of protection IP20 and is intended for installation in a control cabinet.

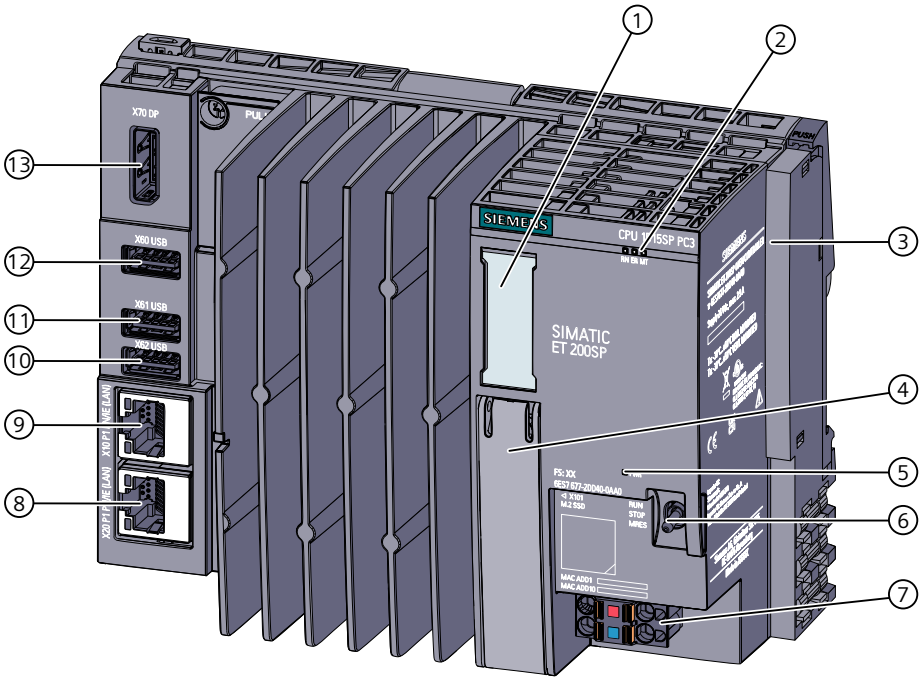
More information

You can find more information on the system versions and order options in the section Scope of validity of the documentation (Page 9).

5.2 Operator controls and connection elements

View of the module

The following figure shows the operator controls and connection elements of the CPU 1515SP PC3:



①	Labeling strips	
②	LEDs for the current operating state and diagnostic status of the CPU 1505SP	
③	Server module	
④	**X101:**	Slot for the M.2 SATA SSD
⑤	Power LED	
⑥	Mode selector	
⑦	**X80:**	Connector for 24 V DC supply voltage
⑧	**X20:**	1 GbE Ethernet connection
⑨	**X10:**	1 GbE Ethernet connection You assign the interface to the operating system or the Software Controller using a configuration file.
⑩	**X62:**	USB 3.1 Gen 1 interface
⑪	**X61:**	USB 3.1 Gen 1 interface
⑫	**X60:**	USB 3.1 Gen 1 interface
⑬	**X70:**	DisplayPort interface (DP) V1.4

Figure 5-2 View of the CPU 1515SP PC3

DisplayPort V1.4

DisplayPort V1.4 (DDI1), DP connector, SMD reflow, 180°straight (X70) supports 4K DP displays / monitors.

Slot for the M.2 SATA SSD

The operating system and the Software Controller are installed on the supplied SIMATIC M.2 SATA SSD. The M.2 SATA SSD is the only mass storage device of the CPU 1515SP PC3 and is also used to store user data.

USB connections

3 x USB 3.1 Gen 1 with I_{max} = 900 mA per interface

MAC addresses

The MAC address consists of a 3-byte manufacturer ID and a 3-byte device ID (consecutive number).

Each device is assigned 10 MAC addresses at the factory. The front of the CPU 1515SP PC3 is labeled with the first and last MAC address. With the MAC addresses 1 and 10, the consecutive number is incremented. If, for example, the first MAC address is 08-00-06-6B-80-C0, the second MAC address is 08-00-06-6B-80-C1.

Table 5-1 Assignment of the MAC addresses

	Assignment
MAC address 1	X10 PN/IE (LAN) • Visible in STEP 7 for accessible devices • Lasered on the front of the CPU (start of the number range)
MAC address 2	X20 PN/IE (LAN) • Visible in STEP 7 in accessible devices
MAC address 3	X1 PROFINET (LAN) • Visible in STEP 7 for accessible devices
MAC address 4	X10 (additional MAC address)
MAC address 5	X1 / Port 1 (upper port of the BusAdapter)
MAC address 6	X1 / Port 2 (lower port of the BusAdapter)
MAC address 7	GPOS VNIC
MAC address 8	SWCPU VNIC
MAC address 9	Not used
MAC address 10	Not used

Connector for supply voltage

CPU 1515SP PC3 has a 2-pole connection terminal for the power supply.

The connection plug for the supply voltage is plugged in when the CPU is shipped from the factory.

Mode selector

Use the mode selector to set the CPU operating mode.

Table 5-2 Mode selector positions

Position	Meaning	Description
RUN	Operating mode RUN[1]	The CPU is processing the user program.
STOP	Operating mode STOP[1]	The CPU does not process the user program. The outputs are set to a "safe" state.
MRES	Memory reset	**For active S7-1500 Software Controller only**[2]: Memory reset of the CPU

1 RUN and STOP indicate the **selected** operating state. The RUN and STOP LEDs indicate the **actual** operating state of the CPU 1515SP PC3.

2 See Operating Instructions CPU 1505SP (F), CPU 1507S (F), CPU 1508S (F) Version 40.1.

5.3 Scope of delivery

When you order the hardware with the article number "6ES7677-2DD40-0AA0", you only receive the basic device, consisting of hardware of the
CPU 1515SP PC3 Open Controller, **without** M.2 SATA SSD and software.

The hardware **always** has the article number "6ES7677-2DD40-0AA0" and **always** has the designation "CPU 1515SP PC3".

The bundles that can be ordered have their own article numbers. The bundles consist of the basic device, M.2 SATA SSD with installed software, and certificates with product information.

NOTE

To order the different bundles, use the article number provided in the Scope of validity of the documentation (Page 9) and Spare parts/accessories (Page 115) sections.

The scope of delivery of the CPU 1515SP PC3 Open Controller does not include a BusAdapter. You must order the BusAdapter separately.

The ET 200SP Open Controller is delivered with the following accessories:

- CPU 1515SP PC3 basic device 6ES7677-2DD40-0AA0
- Server module with the article number 6ES7193-6PA00-0AA0
- Strain relief with fixing screws
- Plug, 24 V DC, 2x2-pin

- M.2 SATA SSD with 128 GB memory and with the following pre-installations:
  - Operating system Windows 11 IoT (Enterprise 2024 LTSC) or SIMATIC Industrial OS (IndOS)
  - S7-1500 Software Controller CPU 1505SP (F/T/TF)
- "Certificate of Authenticity" label
- "Certificate of License" (CoL)
- Product information

NOTE

The scope of delivery does not include a USB Restore flash drive.

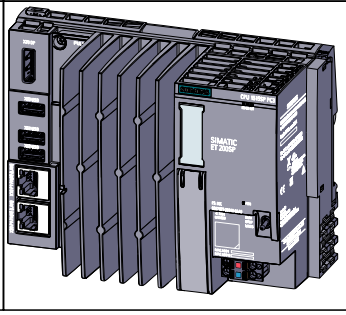
We therefore strongly recommend that you create a USB Restore flash drive before using the Open Controller CPU 1515SP PC3. Additional information on this is available in section Backing up data (Page 76).

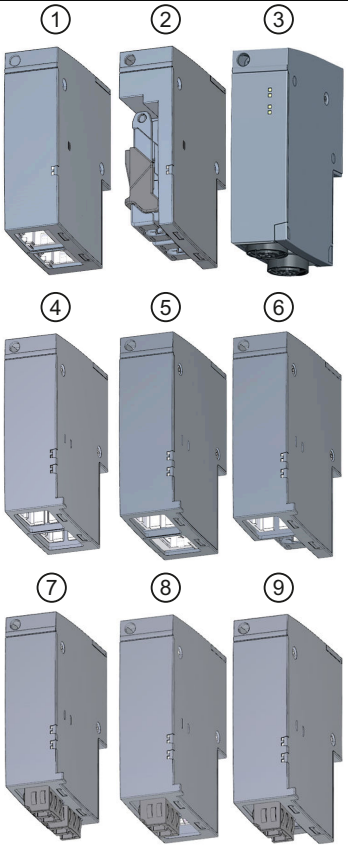
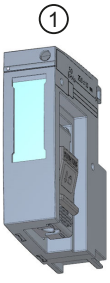
5.4 Available components

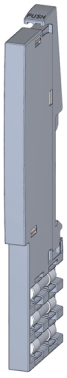
Available components for CPU 1515SP PC3

The following table contains an overview of the components available for the CPU 1515SP PC3:

Table 5-3 Available components for CPU 1515SP PC3

Component	Function	Figure
Mounting rail in accordance with EN 60715	The mounting rail is the module rack for the CPU 1515SP PC3.	
CPU 1515SP PC3	CPU with strain relief and white reference labels	

Component	Function	Figure
BusAdapter	The BusAdapter allows free selection of the connection technology for PROFINET IO. The following versions are available for CPU 1515SP PC2: • For standard RJ45 connector (BA 2×RJ45) ① • For direct connection of the bus cable (BA 2×FC) ② • For standard M12 connector (D-coded) with screw-type terminal or plug-in push-pull version (BA 2xM12) ③ • For POF/PCF fiber-optic cable (BA 2xSCRJ) ④ • As media converter for POF/PCF fiber-optic cable ⇔ standard RJ45 plug (BA SCRJ/RJ45) ⑤ • As media converter for POF/PCF fiber-optic cable ⇔ direct connection of the bus cable (BA SCRJ/FC) ⑥ • For glass fiber-optic cable (BA 2xLC) ⑦ • As media converter for glass fiber-optic cable ⇔ standard RJ45 plug (BA LC/RJ45) ⑧ • As media converter for glass fiber-optic cable ⇔ direct connection of the bus cable (BA LC/FC) ⑨	
	For mixed configuration with an ET 200AL , you require the BusAdapter BA-Send 1xFC ① (plugged into the BaseUnit BU-Send). Connect the bus cable for ET-Connection to the BusAdapter BA-Send 1xFC.	

Component	Function	Figure
Server module	The server module completes the configuration of the CPU 1515SP PC3 with I/O modules. The server module is included in the CPU's scope of delivery. If your server module has a firmware version lower than V1.2, you can update the firmware. Download the firmware from the Siemens SiePortal (https://support.industry.siemens.com/cs/ww/en/view/91481825).	

Application planning

6

6.1 Unpacking the device

When unpacking

Observe the following points when unpacking:

- Check packaging and contents for visible damage from transport. Do not put damaged or incomplete devices into operation under any circumstances.
- Check that your delivery is correct and complete.
  Please inform your Siemens contact partner should you notice any irregularities.
- Keep the supplied documentation and licenses. They belong to the device and are the proof that you have purchased the software preinstalled on the M.2 SATA SSD. Documentation and licenses are required for initial commissioning and for any questions that arise.
- Keep the original packaging in case the device needs to be transported again.
- Note the identification data (Page 32) of the device.

NOTICE
Damage to the SSD due to electrostatic discharge You must not touch the contacts of the M.2 SATA SSD. Electrostatic discharge can damage the SSD.

NOTICE
Damage to the device during transport and storage If a device is transported or stored without packaging, it is unprotected from shocks, vibrations, pressure and moisture. Damaged packaging indicates that environmental conditions have already had a significant impact on the device. The device might be damaged. Do not dispose of the original packaging. Pack the device for transport and storage.

NOTICE

Damage to the device caused by condensation

If the device was exposed to low temperatures or extreme variations in temperature during transport, this may cause moisture to build up on or in the device (condensation). Adhere to the specified mechanical and climatic ambient conditions (Page 106).

Moisture can cause short-circuits in the electrical circuits and damage the device.

Proceed as follows to avoid damage:

- Store the device in dry conditions.
- Let the device adapt to the room temperature before commissioning.
- Do not expose the device to direct heat radiation from a heater.
- If condensation has developed, wait until the device is completely dry before you switch it on.

⚠ WARNING

Electric shock and fire hazard from damaged device

A damaged device can carry dangerous voltage and trigger a fire in the machine or plant. A damaged device has unpredictable properties and states.

Death or severe injury could occur.

Make sure that the damaged device is not installed and commissioned accidentally. Label the damaged device correspondingly and keep it locked up. Have the device repaired without delay.

6.2 Identification data

The identification data can be used to clearly identify the device when a repair is necessary.

The activation code for Windows is already integrated in the supplied image.

Note the following data:

- The following information is printed on the nameplate of the device:
  - Article number
  - Serial number
  - The first and the last MAC address
- Depending on the scope of delivery, the "Certificate-of-License" is enclosed.
  Valid for the following products:
  - S7-1500 Software Controller CPU 1505SP
  - S7-1500 Software Controller CPU 1505SP F
  - S7-1500 Software Controller CPU 1505SP T
  - S7-1500 Software Controller CPU 1505SP TF
- The "Microsoft Windows Product Key" can be found on the "Certificate of Authenticity" label.

6.3 Installation location

CPU 1515SP PC3 is open equipment. You may only set up the CPU in enclosures, cabinets or electrical equipment rooms and in a dry environment (degree of protection IP20). The requirements regarding mechanical stability must also be met. The enclosures, cabinets or electrical operating rooms must only be accessible using a key or a tool. Access must only be possible for instructed or authorized personnel.

Install the CPU 1515SP PC3 in a suitable enclosure/control cabinet with sufficient mechanical stability, fire protection and at least degree of protection IP30 in accordance with EN 60529. Take into account the ambient conditions for operating the devices.

Installation position

You can install the ET 200SP distributed I/O system in any position. The preferred mounting position is horizontal mounting on a vertical wall.

NOTICE
Damage to the modules Modules can be damaged if exposed to ambient temperatures higher than permitted. You can find additional **important information** on the permissible ambient temperatures in section Mechanical and climatic ambient conditions (Page 106).

Temperature limits

At temperatures under 5 °C, the device remains in the BIOS phase and heats the printed circuit board to 8 °C. The device then reboots and starts as usual.

The heating phase can take some time (several minutes), depending on the temperature.

Mounting rail

You must ground the mounting rail separately in the control cabinet. Exception: If you install the mounting rail on grounded, zinc-plated mounting plates, there is no need to ground the rail separately.

NOTE

If the ET 200SP distributed I/O system is exposed to vibration and shock loads, both ends of the ET 200SP system assembly must be mechanically fixed to the mounting rail (e.g using 8WA1010-1PH01 ground terminals). This measure prevents the ET 200SP from shifting to the side.

NOTE

If the ET 200SP distributed I/O system is exposed to high vibration and shock load, we recommend that you screw the mounting rail to the mounting surface at intervals of approx. 200 mm.

Suitable surface finishes are:

- Steel strip in accordance with Appendix A of EN 60715 or
- Tinned steel strip

  We recommend the mounting rails described in the section Accessories/spare parts (Page 115).

NOTE

Mounting rails of other manufacturers

If you use mounting rails from other manufacturers, check that they have the properties required for your climatic and mechanical environmental conditions.

Minimum clearances

Make sure to maintain the following minimum clearances when installing the CPU 1515SP PC3.

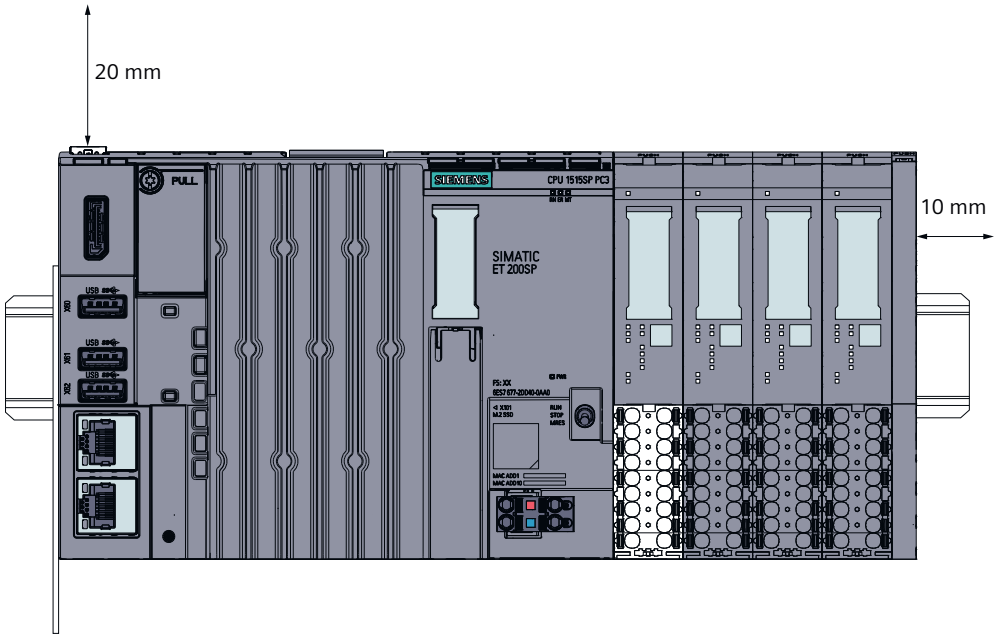


Figure 6-1 Minimum clearances for CPU 1515SP PC3

Installation rules

- After the CPU 1515SP PC3, there is a BaseUnit BU..D with incoming supply voltage L+ (light-colored terminal box).
- This is followed by BaseUnits BU..B (with dark-colored terminal box).
- The respective corresponding I/O modules can be connected to the BaseUnits.
- The server module completes the installation.

NOTE

You can find the description and designation of BaseUnits and suitable combinations of BaseUnits and I/O modules in the ET 200SP System Manual (https://support.industry.siemens.com/cs/ww/en/view/84133942).

⚠ WARNING

Injury to persons and damage to the machine if the supply voltage is switched on

Install the CPU 1515SP PC3 only with disconnected supply voltage.

If you install the CPU 1515SP PC3 with the power supply switched on, injury to persons and damage to the machine or plant can result.

6.4 Hardware configuration

Maximum mechanical configuration

Backplane bus length: Maximum 1 m mounting width (without CPU 1515SP PC3, including server module)

Maximum electrical configuration

NOTE

Cascading (supplying additional modules via this terminal) at terminal X80 is not permitted.

USB load

For maximum configuration with the CPU 1515SP PC3, also take the USB load into account:

- **Horizontal mounting:**
  - Ambient temperature of 50 °C or higher with max. 32 ET 200SP modules:
    3 x 0.3 A USB load; M.2 SATA SSD, max. 10% load
    Programs with 3D graphics are disabled.
- **Vertical mounting:**
  - Ambient temperature of 40 °C or higher with max. 32 ET 200SP modules:
    3 x 0.3 A USB load; M.2 SATA SSD, max. 10% load
    Programs with 3D graphics are disabled.

6.5 Sample configuration

Configuration

CPU 1515SP PC3 is installed on a mounting rail in accordance with EN 60715. A modular system is formed with ET 200SP modules in the central rack. You can also expand the CPU 1515SP PC3 F with fail-safe I/O modules.

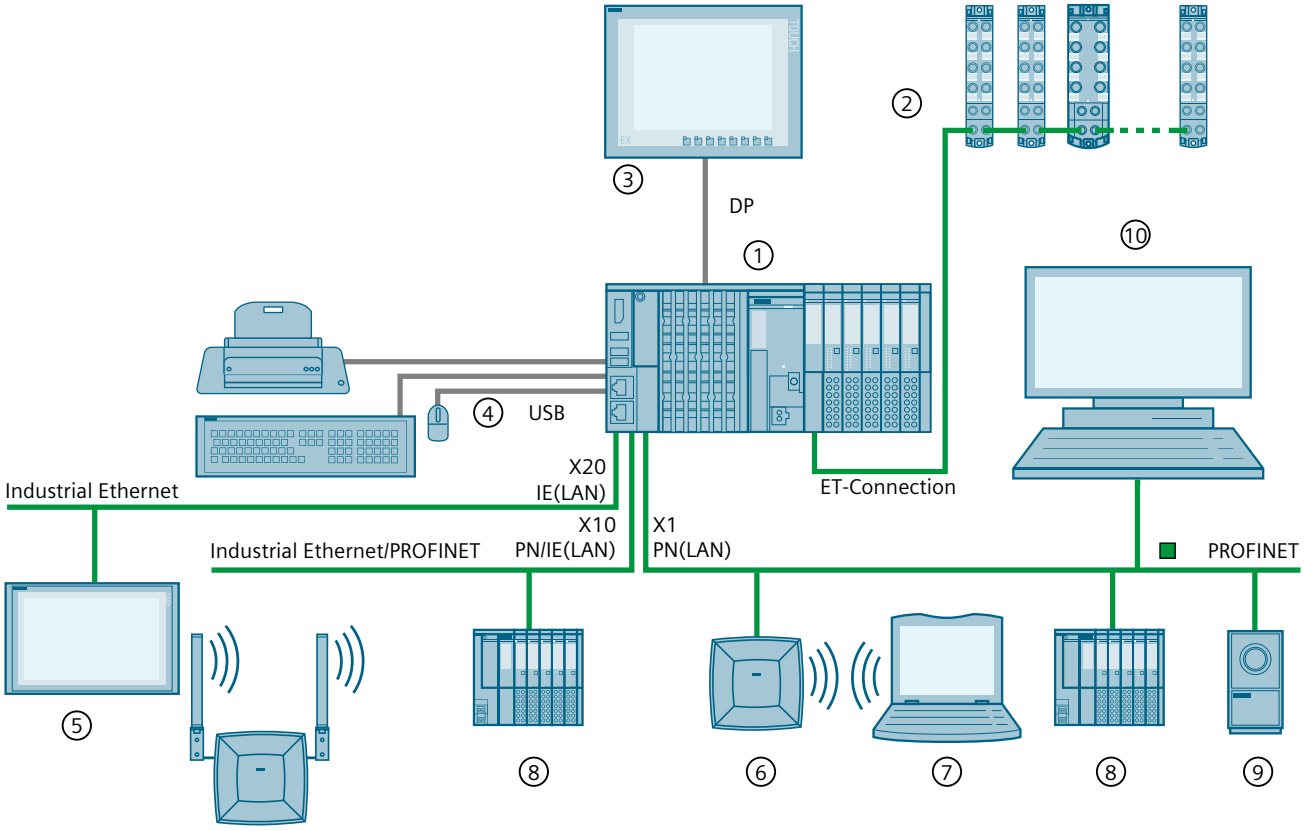
You can use the CPU 1515SP PC3 as PROFINET IO controller. The PROFINET IO devices are connected via the ports of the X1 PN(LAN) interface using a SIMATIC BusAdapter.

Devices can be connected via Industrial Ethernet using the integrated interface X10 or X20 PN/IE (LAN):

- X10: SW CPU with a PROFINET interface in the delivery state
- X20: Operating system in the delivery state

Example configuration of the plant

The following figure shows an example configuration of a plant with the CPU 1515SP PC3:



① CPU 1515SP PC3, I/O modules, server module, BusAdapter
② ET 200AL modules with ET-Connection
③ Flat Panel - Wide Screen Display
④ USB devices: Keyboard, mouse, printer ...
⑤ Industrial Thin Client ITC
⑥ SCALANCE W786
⑦ Field PG
⑧ PROFINET IO device
⑨ Camera
⑩ PC/Programming device

Figure 6-2 Example configuration of the plant

Reference

You can find more information about configuring the ET 200AL modules in the system manual ET 200AL distributed I/O system (https://support.industry.siemens.com/cs/ww/en/view/89254965).

Installation

7

7.1 Requirements

Requirements

The mounting rail is fitted.

Required tools

3 to 3.5 mm slotted screwdriver (to fix the strain relief and remove the BusAdapter)

Fixing strain relief

Fix the strain relief to the top and bottom of the left-hand side of the CPU 1515SP PC3 with the supplied screws.

7.2 Installing CPU 1515SP PC3

1. Install the CPU 1515SP PC3 on the mounting rail.
2. Swivel the CPU 1515SP PC3 back until you hear the mounting rail release click into place
3. To check that the CPU 1515SP PC3 has correctly clicked into place, pull on the underside of the enclosure.

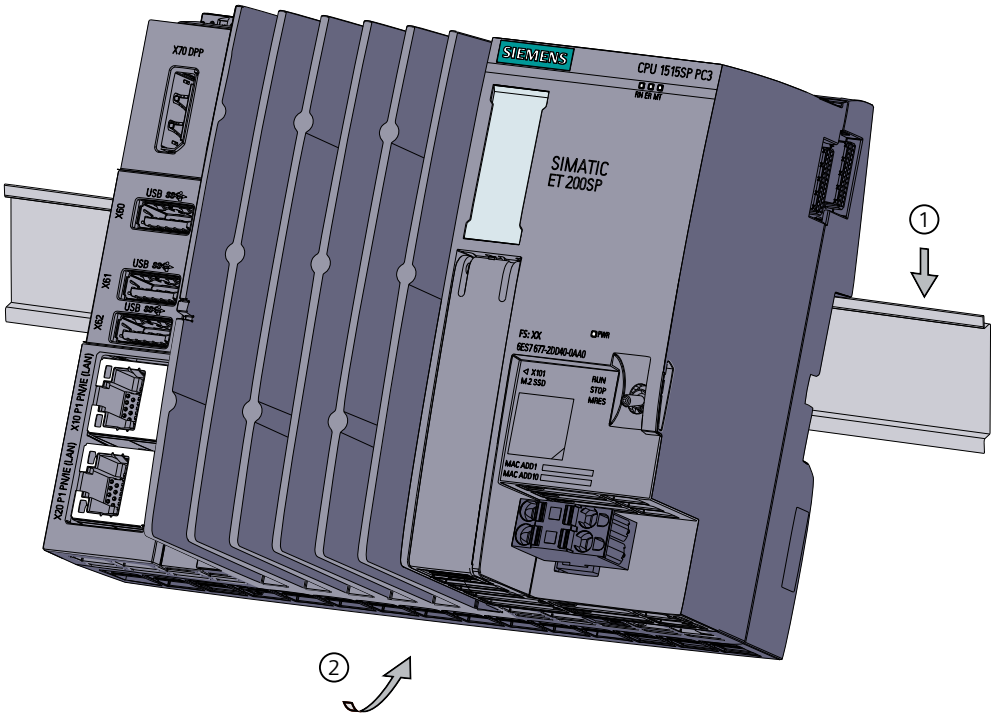


Figure 7-1 Installing CPU 1515SP PC3

7.3 Uninstalling CPU 1515SP PC3

1. Switch off the supply voltage on the CPU 1515SP PC3.
2. Press the mounting rail release button on the first BaseUnit and, at the same time, move the CPU 1515SP PC3 parallel to the left until it comes off the rest of the module group. The mounting rail release button is located above the CPU 1515SP PC3.
3. While pressing the mounting rail release button on the CPU 1515SP PC3, swivel the CPU 1515SP PC3 out of the mounting rail.

NOTE

It is not necessary to remove the BusAdapter from the CPU 1515SP PC3.

Removing and inserting the M.2 SATA SSD

For information on how to remove and insert the M.2 SATA SSD, refer to the section Removing and inserting the M.2 SATA SSD (Page 97).

7.4 More information

You can find more information on installing and removing the I/O modules in the SIMATIC ET 200SP Distributed I/O system System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

See also

Removing and inserting the M.2 SATA SSD (Page 97)

Wiring

8

8.1 Notes on connection

NOTE

Rules and regulations for operation

Read the information contained in the Wiring section in the system manual ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/84133942) and in the function manual Designing interference-free controllers function manual (https://support.industry.siemens.com/cs/ww/en/view/59193566).

⚠ WARNING

Injury to persons and dangerous plant states possible

If you remove and insert I/O devices with the supply voltage switched on, this can result in hazardous system states.

Injury to persons and damage to the machine or plant could result.

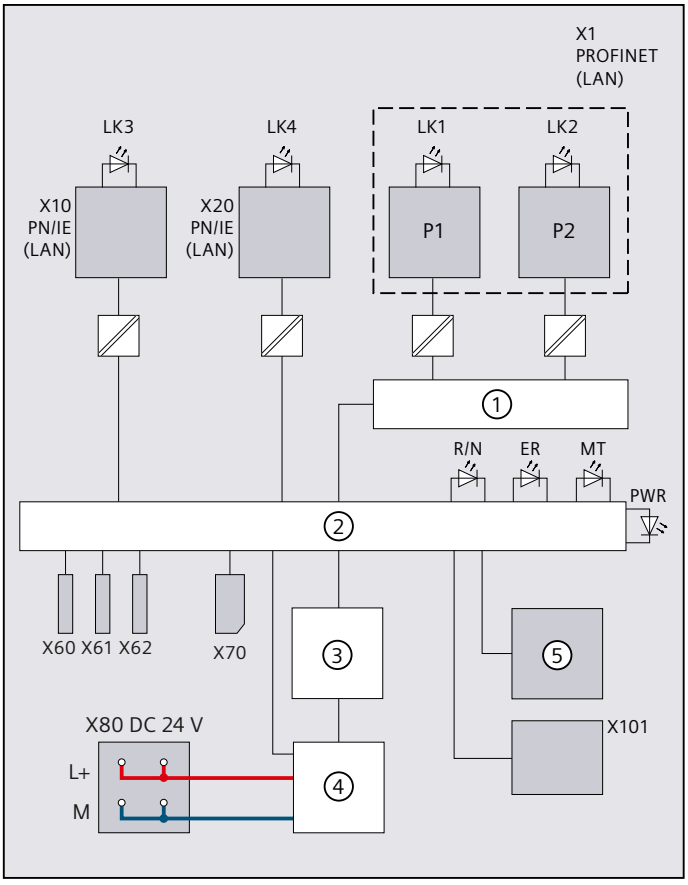
Therefore, I/O devices can only be inserted and removed when the supply voltage is switched off.

Only connect I/O devices which are suitable for use in industrial environments according to EN 61000-6-2 / IEC 61000-6-2.

8.2 Terminal and block diagram

Block diagram

The following figure shows the block diagram for the CPU 1515SP PC3.



①	Switch	P1	PROFINET interface X1 Port 1
②	Electronics	P2	PROFINET interface X1 Port 2
③	Backplane bus interface	L+	24 V DC supply voltage
④	Internal supply voltage	M	Ground
⑤	Mode selector	LK1, LK2	LED Link TX/RX
X50	M.2 SATA SSD	LK3	LED Link
X60, X61, X62	USB 3.1 interfaces, max. 0.9 A	RN	RUN/STOP LED (yellow/green)
X70	DP interface	ER	ERROR LED (red)
X80 24 V DC	Infeed of supply voltage	MT	MAINT LED (yellow)
X10/X20 PN/IE(LAN)	Ethernet interfaces X10 and X20	PWR	POWER LED (green)
X1 PN(LAN)	PROFINET interface X1		

Figure 8-1 Block diagram for the CPU 1515SP PC3

8.3 Electrical configuration

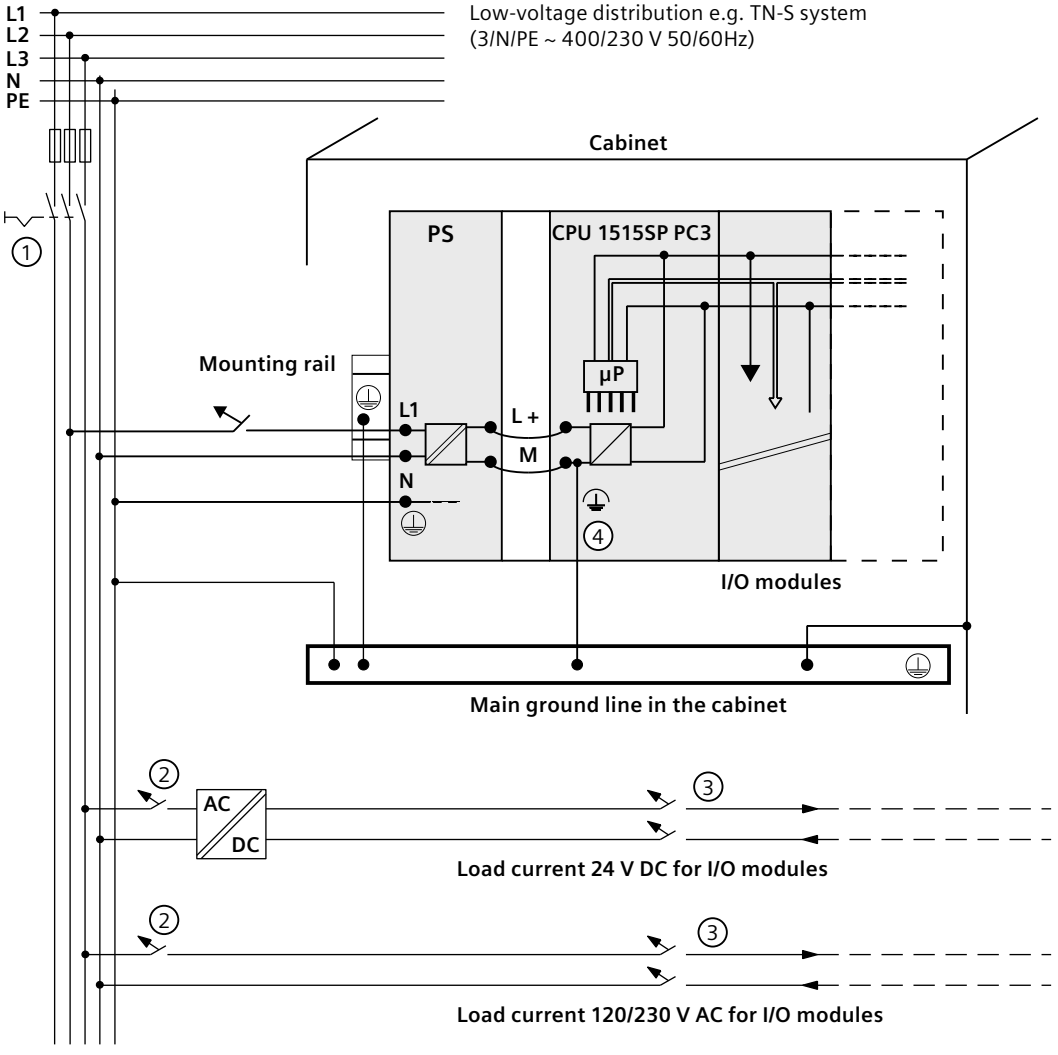
Non-isolated configuration

NOTE

Unlike the ET 200SP distributed I/O system, the CPU 1515SP PC3 can only be operated with a non-isolated configuration.

The following figure shows the overall configuration of a CPU 1515SP PC3 with power supply from a TN-S system. The power supply supplies the CPU 1515SP PC3 and the load circuit for the 24 V DC modules.

For the CPU 1515SP PC3, there is a fixed connection between the ground infeed terminal and the contact springs to the mounting rail. You must ground the mounting rail separately in the control cabinet.



① Master switch
② Short-circuit and overload protection
③ Load current supply (galvanic isolation)
④ This connection is established automatically with the CPU 1515SP PC3.

The arrangement of the supply connections shown does not correspond to the actual arrangement. It was chosen for reasons of clarity.

Figure 8-2 Connecting the load voltage reference potential

8.4 Connecting devices to networks

The following options are available for integrating devices into existing or planned system environments and networks.

Ethernet

The two integrated Ethernet interfaces X10 PN/IE(LAN) (10/100/1000 Mbps) and X20 PN/IE(LAN) (10/100/1000 Mbps) can be used for communication and data exchange with programmable controllers, e.g. SIMATIC S7.

The names of the interfaces X10 and X20 PN/IE(LAN) may only contain ASCII characters in TIA Portal, e.g. PROFINET_2.

You need suitable software to do this: STEP 7, WinCC or SIMATIC NET

NOTE

Use a Category 5e Ethernet cable (Cat-5e cable) for operation with 1000 Mbps.

PROFINET

PROFINET operation is possible via the X1 PN(LAN) interface and the approved BusAdapter.

PROFINET operation is also possible via the X10 PN/IE (LAN) interface. If you are not using this interface for the Software Controller, you need to configure it again. The procedure is described in the Software Controller Operating Instructions (https://support.industry.siemens.com/cs/ww/en/view/109998256).

PROFIBUS DP

The PROFIBUS DP interface is used to connect distributed I/O (via CPU 1515SP PC3 and CM DP or IE/PB-Link). With PROFIBUS DP for example, you can set up extended subnets.

NOTE

Support for PROFIBUS DP

Note that PROFIBUS DP is only supported for older applications with CPU 1515SP PC3.

Properties of the PROFIBUS DP interface

The PROFIBUS DP interface has the following properties and functions:

- PROFIBUS DP master and device
- S7 services

8.5 Securing cables

The strain relief for connecting cables prevents the USB cables and PROFINET connectors detaching from the CPU 1515SP PC3. The strain relief is included in the scope of delivery.

⚠ WARNING
Flying sparks due to loose cables
Risk of explosion in hazardous areas.
USB cables and PROFINET connectors may detach from the device in the case of strong oscillation and high vibrating loads.
Attach these cables to the strain relief of the device using cable ties.

Requirements

- The strain relief is fixed to the CPU.
- The CPU is installed.

Procedure

Secure the following cables to the strain relief using cable ties:

- USB cables
- PROFINET cables
- DisplayPort connecting cable



Figure 8-3 Secured cables

Cables for use in hazardous areas

When using devices with Ex approval in explosive areas, note that the plugs need to be secured at the interfaces in a captive manner.

DANGER

Risk of explosion due to sparks if plugs come loose

If a plug-in connector comes loose from the associated interface of the device, a spark jumping across the interface could cause an explosion. Death or serious bodily injury as well as damage to property can be the result.

When used in hazardous areas, it must be ensured that the plug-in connectors of the cables are connected fully to the respective interface and cannot come loose from them under any circumstances.

Secure all connected USB cables directly to the transition between plug and cable using a cable tie to the nearest securing element. Tighten all cable ties so that they completely enclose the cables without damaging them.

Commissioning

9

⚠ WARNING

Improper commissioning in hazardous areas

Device failure or risk of explosion in hazardous areas.

- Do not put the device into operation unless it is fully mounted and connected according to the specifications in the section Wiring (Page 41).
- Before commissioning, consider the effects on other devices in the plant.

NOTICE

Condensation in the device

Damage to the device due to condensation if the temperature between transport or storage and the installation point differs.

Leave the device until it is dry. Only then do you put the device into operation.

NOTICE

Data loss

Data loss may occur if write filters are used incorrectly.

The following configurable write filter is available under Windows 11: UWF

You can find more information on write filters and data loss on unexpected shutdown in the section Data loss in the event of an unexpected shutdown (Page 92).

You can find the description of the Open Controller CPU 1515SP PC3 (F/T/TF) V40.1 with Windows in section Commissioning for Windows (Page 47).

You can find the description of the Open Controller CPU 1515SP PC3 (F) V40.1 with SIMATIC Industrial OS in the section Commissioning for Industrial OS (Page 55).

9.1 Commissioning for Windows

9.1.1 Requirements

Requirements

The following requirements must be met before commissioning the Open Controller for the first time:

- CPU 1515SP PC3 is installed.
- The supplied M.2 SATA SSD is plugged in.

Operation with two monitors

Use only one monitor. If several monitors are used simultaneously, undefined states might occur in the system.

DisplayPort connecting cable

Use **only** the following connecting cables for the DisplayPort:

- DisplayPort cable, length: 5 m, E74020-C AWM Style 20276, 80 °C, 30 V, VW-1 (with integrated ferrite cores at both ends)
- DisplayPort cable, length: 3 m, 6AV7860-0DH30-0AA0
- DisplayPort cable, length: 5 m, 6AV7860-0DH50-0AA0

9.1.2 Windows OOBE (Out-of-Box Experience)

When your Open Controller boots up for the first time, you will be prompted for the basic settings and administrator password. The device is then automatically set up for the operating system that is preinstalled on the M.2 SATA SSD. It is not necessary to reboot the device manually after commissioning.

Procedure

When the requirements in the Requirements (Page 47) section are met, proceed as follows with the commissioning:

1. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
2. Connect the power supply.
   - The Power LED lights up green.
   - The device carries out the hardware initialization.
   - The following image appears on the screen:



Figure 9-1 Coreboot logo

3. Wait until the Coreboot logo disappears from the screen.
4. The Featherboot Manager starts. You will see the boot options on the screen:

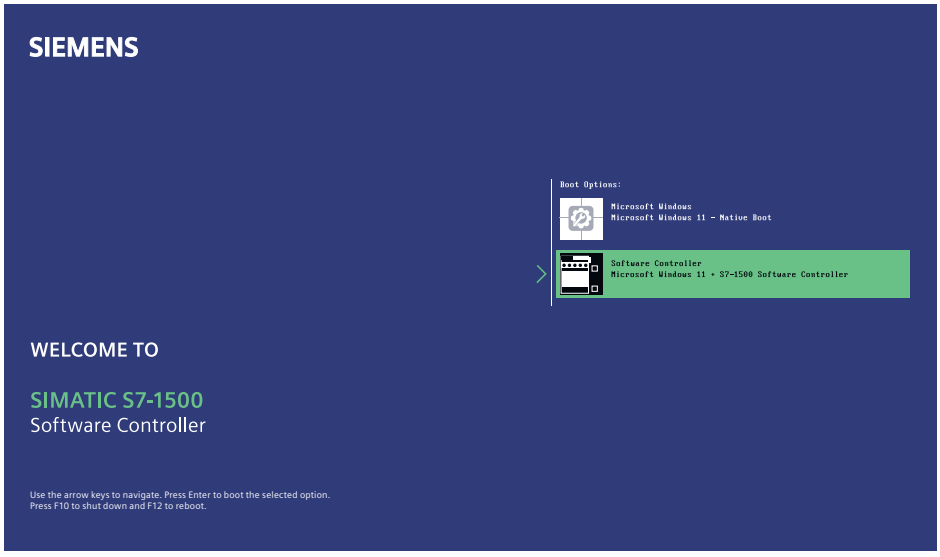


Figure 9-2 Featherboot Manager

5. Windows OOBE (Out of Box Experience) appears on the screen:

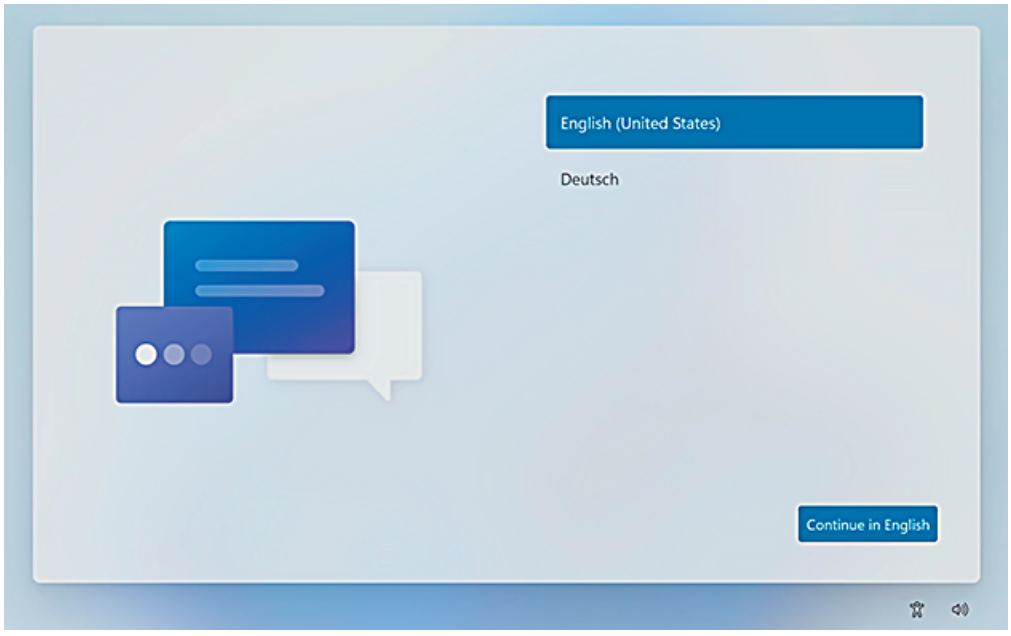


Figure 9-3 Out of Box Experience

6. Follow the instructions on the screen to configure the device. During this process, the basic system configuration is performed and user accounts are created.
7. Wait until the Windows Desktop appears on the screen.
8. The Open Controller is ready to use.

NOTICE
Incorrect installation when switching off the Open Controller If you shut down the Open Controller during installation, the installation will be disrupted and the operating system will not be installed correctly. The operational reliability of the device and the plant is endangered. Do **not** switch off the Open Controller at any time during the entire installation process.

Result

- The operating system Windows 11 IoT (Enterprise 2024 LTSC) is installed.
- The "Operator" user is logged in automatically. You can find information on users and user groups in the section Users/user groups in Windows (Page 52).
- The Software Controller is ready to use.
- The operating system's start screen is displayed after each startup.

NOTE

For administrative purposes, we recommend that you log in directly with the administrator account that was created during commissioning.

9.1.3 Additional Windows configuration

9.1.3.1 Windows languages

In its delivery state, the system has only two system languages (English and German).

If you want to switch to a different system language, connect the device to the Internet and select the language in the Windows settings.

You can find more information in the Microsoft Support (http://www.windows.com/).

9.1.3.2 Windows updates

You can install additional updates later. You can find current information on the operating system at Windows (http://www.windows.com).

NOTE

Ensure that there is sufficient free space available on the disk C: (Windows System Partition) for the installation of updates.

You can find additional information in the section Partitions for the Windows version (Page 110).

9.1.3.3 Automatic changeover to daylight saving time

In the operating system settings, you can specify whether the time setting is automatically changed to daylight saving time.

Changeover to daylight saving time when the device is switched off

If you have enabled automatic changeover to daylight saving time and the device is switched off during the changeover to daylight saving time, the correct time setting is not guaranteed. Check the time setting and adjust the time if necessary.

9.1.3.4 Power options

A power plan with the name SIMATIC S7 is set as default on the CPU 1515SP PC3. This ensures that the CPU does not deviate from its maximum clock rate in order not to endanger the real-time capability of the Software Controller.

9.1.3.5 Users/user groups in Windows

An "Operator" user with standard user rights is already created on the Windows system.

The user is in a user group "SIEMENS TIA Engineer". This grants the user the rights to use the installed SIMATIC software products.

The Windows "Autologon" function is activated for the "Operator" user in order to immediately use the Open Controller. No password is preset.

NOTE

When you assign a password, change the entry for the "Autologon" function accordingly using the Windows user administration.

For security reasons, some functions of the CPU 1505SP Software Controller installed on the CPU 1515SP PC3 are not activated for the "Operator" without additional user groups. This includes, for example, controlling the CPU 1505SP Software Controller via a command line tool.

The user groups "Software Controller Operators" and/or "Failsafe Operators" (only applies to fail-safe CPUs) are available by default. The administrator created during the installation is automatically a member of these two user groups.

With standard versions of the Open Controller, the users of the "Software Controller Operators" user group have the right to control the CPU 1505SP Software Controller with the command line tool.

With fail-safe versions of the Open Controller, the users of the "Failsafe Operators" user group have the right to control the CPU 1505SP (F/T/TF) Software Controller with the command line tool.

9.1.3.6 Wake On LAN

To enable the Wake On LAN functionality, follow these steps:

1. In Windows, open the Device Manager with administrator privileges.
2. Search for the network adapter "Intel(R) EC1000S 1.0GbE Connection and EC2500S 2.5 GbE Connection".
3. Right-click on the adapter.
4. Select the "Properties" menu command.
   The window "Intel(R) EC1000S 1.0GbE Connection and EC2500S 2.5 GbE Connection" opens.
5. Navigate to the "Advanced" tab.
6. In the scrollable "Properties" window, search for "Wake On Magic Packet" and click on it so that it is selected and highlighted.

7. The "Value" drop-down menu is shown next to the scrollable "Properties" menu. Select "Enabled".
8. Also select the "Energy management" tab. Select the check boxes for "Allow this device to wake the computer" and "Only allow a magic packet to wake the computer".
9. Press the "OK" key. The settings are applied and the "Properties" window is closed.
10. Restart Windows.

The Wake On LAN functionality is activated.

9.1.4 Transferring license keys

Licensing the software

For the following products, you need to transfer the product-specific license key with the *Automation License Manager (ALM)* before commissioning:

- WinCC Unified PC RT incl. PowerTag
- CPU 1505SP T/TF

NOTE

No license key is required to operate the S7-1500 Software Controller CPU 1505SP T/TF.

Requirements

- Initial commissioning was successfully completed.
- Windows 11 IoT (Enterprise 2024 LTSC) has been started.
- The extended write filter **UWF must be deactivated** on the CPU 1515SP PC3.

Transferring license keys with local configuration

The *Automation License Manager* is preinstalled on the CPU 1515SP PC3.

Open the software using the icon on the desktop or a menu command.

1. In the Windows start bar, select **Start > Siemens Automation > Automation License Manager**.
2. Follow the instructions of the *Automation License Manager*.

Transferring license keys via programming device/PC

The *Automation License Manager* is preinstalled on a PG/PC with STEP 7 and the CPU 1515SP PC3.

1. Connect the CPU 1515SP PC3 to a PG/PC.
2. Connect the supplied USB flash drive to the PG/PC.
3. Select the menu command **Start > Siemens Automation > Automation License Manager**.
4. Select the menu command **Edit > Connect computer** and enter the IP address of the CPU 1515SP PC3.
5. If the option "Forbid license keys transfer from local computer" is disabled on the source computer, drag the license keys from the USB flash drive to the system partition C: of CPU 1515SP PC3.

Backing up license keys for restore and repair

NOTE

Loss of license keys

A SIMATIC license key cannot be copied or duplicated. No more license key copies exist on the USB flash drive once you have dragged the license keys from the USB flash drive to your CPU 1515SP PC3.

Secure your purchased license keys **before** restoring the delivery state (Restore) or in the case of repair. To do this, move the license keys to a USB flash drive and store it.

If an error occurs on your license keys on the CPU 1515SP PC3, please contact your Siemens representative. Make sure to have the "Certificate of License" (CoL) to hand.

Reference

For additional information on licenses, refer to the *Automation License Manager* manual. You can find the manual on the CPU 1515SP PC3 under **Start > All Programs > Siemens Automation > Documentation** and in the Siemens SiePortal (https://support.industry.siemens.com/cs/ww/en/view/56956174).

You can find additional information on the UWF write filter in the section Data loss in the event of an unexpected shutdown (Page 92).

9.2 Commissioning for Industrial OS

9.2.1 Requirements

Requirements

The following requirements must be met before commissioning the Open Controller for the first time:

- CPU 1515SP PC3 is installed.
- The supplied M.2 SATA SSD is plugged in.

Operation with two monitors

Use only one monitor. If several monitors are used simultaneously, undefined states might occur in the system.

DisplayPort connecting cable

Use **only** the following connecting cables for the DisplayPort:

- DisplayPort cable, length: 5 m, E74020-C AWM Style 20276, 80 °C, 30 V, VW-1 (with integrated ferrite cores at both ends)
- DisplayPort cable, length: 3 m, 6AV7860-0DH30-0AA0
- DisplayPort cable, length: 5 m, 6AV7860-0DH50-0AA0

9.2.2 IndOS Mel-Setup

When your Open Controller boots up for the first time, you will be prompted for the basic settings and administrator password. The device is then automatically set up for the operating system that is preinstalled on the M.2 SATA SSD. It is not necessary to reboot the device manually after commissioning.

Procedure

When the requirements in the Requirements (Page 55) section are met, proceed as follows with the commissioning:

1. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
2. Connect the power supply.
   - The Power LED lights up green.
   - The device carries out the hardware initialization.
   - The following image appears on the screen:



Figure 9-4 Coreboot logo

3. Wait until the following Coreboot logo disappears from the screen.
4. The Featherboot Manager starts. You will see the boot options on the screen:



Figure 9-5 Featherboot Manager

5. Follow the instructions on the screen and complete the IndOS Mel-Setup. During this process, the basic system configuration is performed and user accounts are created.
6. Wait until the graphical user interface or the terminal with the login window appears on the screen.
7. The device is ready to use.

You can find more information about installation and operation of the Software Controller in the Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F) and CPU 1508S (F) SIMATIC Industrial OS.
(https://support.industry.siemens.com/cs/ww/en/view/109989745)

9.2.3 Additional IndOS configuration

Changing system time and date

To change the system time and date, use the following Linux commands: "timedatectl set-time" or "mel-setup".

9.3 Initial configuration of the Software Controller

9.3.1 Requirements

Requirements

The following requirements must be met before you create the Open Controller configuration:

- TIA Portal ≥ V21 must be installed.
- You have started the TIA Portal and created a new project.

Creating the configuration

To create the configuration in the TIA Portal, follow these steps:

1. Double-click "Add new device" in the project tree.
2. Select "PC systems > SIMATIC S7 Open Controller > ET 200SP Open Controller >".
3. Select the desired device.
4. Select the desired version and click "OK".
   The configured Open Controller is displayed in the device view.
5. The following interfaces can be seen in the Open Controller:
   - Onboard interface X10 (Gigabit Ethernet Windows interfaces) which is directly assigned to the Software Controller.
   - Onboard interface X20 (Gigabit Ethernet Windows interfaces) which is directly assigned to the operating system.
   - Exchangeable BusAdapter that is assigned directly to the Software Controller (2 ports).
6. The following preconfigured components can be seen in the device view:
   - **CPU 1515SP PC3 (F/T/TF):** The Software Controller CPU 1505SP (F/T/TF)
7. Insert all required I/O modules from the hardware catalog.
8. Insert the server module from the hardware catalog.
   The server module forms the end of the CPU with the I/O modules. If no server module has been configured, the server module is automatically added during compiling.

9.3.2 Configuring IP addresses of the Open Controller

In a system that manages two parallel operating systems using a hypervisor – the operating system of the Software Controller and the general-purpose operating system (GPOS) – network configuration is performed using specific IP address assignments and interface configurations. The system offers two integrated network connections as well as an optional additional BusAdapter interface.

Interface overview

Below is an overview of the available interfaces and the required configuration steps:

- BusAdapter [X1]

  X1 is always assigned to the Software Controller. You configure the IP address of the interface in TIA Portal. After the download to the Open Controller, the IP address is applied.

- Onboard interface [X10]

  X10 is assigned to the Software Controller by default. Alternatively, you can assign X10 to the general-purpose operating system (GPOS) of the Open Controller.

  – When you assign X10 to the Software Controller, configure the IP address in the TIA Portal.

  – When you assign X10 to the GPOS, configure the IP settings directly in the GPOS environment.

  You can find detailed instructions for assigning X10 in the section "Onboard interface [X10]" further below.

- Onboard interface [X20]

  X20 is always assigned to the GPOS. Configure the IP settings directly in the GPOS environment.

Onboard interface [X10]

How to assign X10 either to the Software Controller or the GPOS:

1. Open your TIA Portal project.
2. Select the X10 interface.
3. Navigate to the "General" tab, "Interface assignment" category and select:
   – "None, or a different Windows setting" to assign X10 to the GPOS
   – "Software PLC_1" or the specific name of your Software Controller to assign X10 to the Software Controller

9.3.3 Exporting the hardware configuration

Exporting the hardware configuration

How to export the hardware configuration of your Software Controller as a .json file:

1. Open your TIA Portal project.
2. Select the Software Controller used.
3. Open the "General" tab and navigate to "Advanced configuration > Export".
4. Click "Export to .json".
5. Transfer the exported .json file to the Open Controller.
6. Click "Export to .json".
7. Use the Resource Configurator of the Open Controller to load the file and apply the changes.

More information

You can find detailed information on exporting/importing files and on using the Resource Configurator in the following operating instructions:

- Software Controller CPU 1505SP (F), CPU 1507S (F), CPU 1508S (F/T/TF) V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109998256)
- Software Controller CPU 1505SP (F), CPU 1507S (F) and CPU 1508S (F) SIMATIC Industrial OS V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109989745)

9.3.4 Downloading a project to the target system

To set up your automation system, you need to download the project data you generated offline to the connected devices. This project data is generated, for example when configuring hardware, networks, and connections or when programming the user program or when creating recipes. The first time you download, the entire project data is downloaded. During later download operations, only changes are downloaded.

Downloading a project

Proceed as follows to load the configuration:

1. Select the complete PC system in the device view.
2. Right-click on the PLC software under the PC system.
3. Select the option you require in the "Download to device" menu command.

NOTE

Note that the options available to you always depend on the selected device.

4. Select the interfaces with which you want to establish the online connection to the device. You have the option of showing all compatible devices by selecting the corresponding option and clicking the "Start search" command.

NOTE

For the Open Controller V40.1, the TIA Portal download must be performed via the "X1" or "X10" interface.

Only ASCII characters are permitted in the name of the X1, X10 or X20 interface in the TIA Portal, e.g. PROFINET_2.

5. Download and compile the project.

Reference

Additional information on the possible options for downloading is available in the online help of the TIA Portal.

9.4 Switching the Open Controller on/off

Switching on the Open Controller

To switch on the Open Controller, follow these steps:

1. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
2. Switch on the power supply of the Open Controller. The following image appears on the screen:

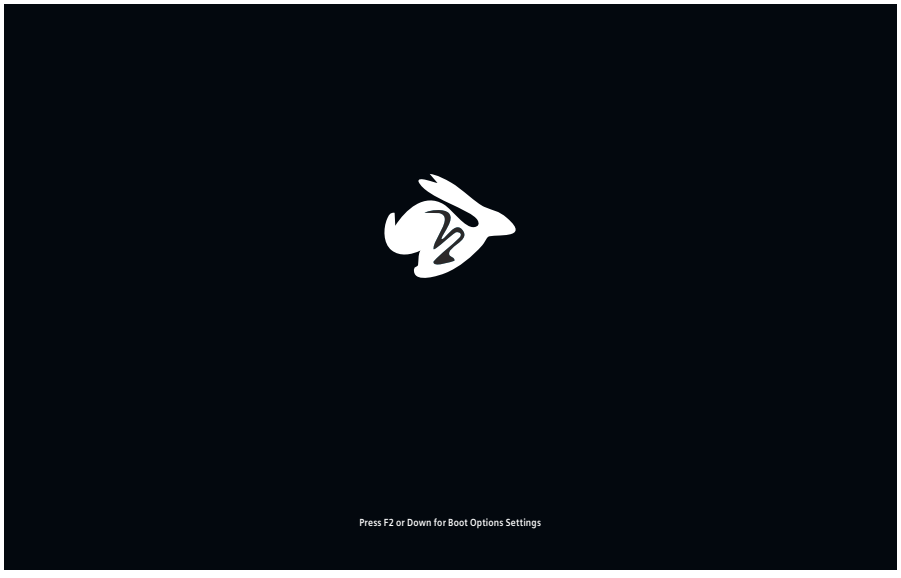


Figure 9-6 Coreboot logo

Wait until the image disappears.

3. The Featherboot Manager starts. You will see the boot options on the screen:

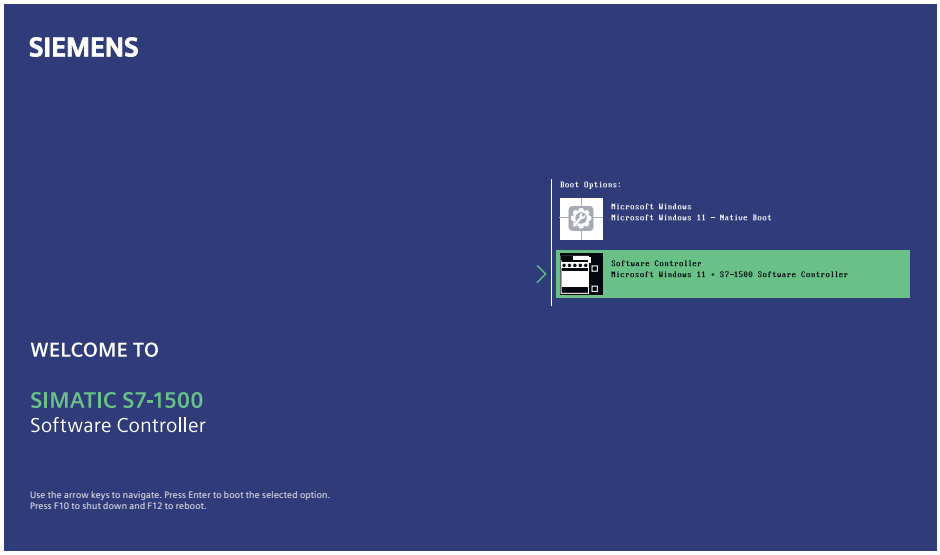


Figure 9-7 Featherboot Manager

4. Select the mode in which the Open Controller should start:
   - Default: with the Windows operating system and the S7-1500 Software Controller
   - Only with the Windows operating system (Native Boot)

Switching off the Open Controller

To switch off the Open Controller, follow these steps:

1. To switch off, use the Windows function **Start > Power > Shut down**.

   The Windows function terminates the operating system and the S7-1500 Software Controller.

2. If the device will not be used for a longer period after the shutdown, de-energize the device.

BIOS setup

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BIOS setup

You can set or change the device configuration via the BIOS setup.

Follow these steps:

1. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
2. Switch on the power supply of the Open Controller. The following image appears on the screen:



Figure 10-1 Coreboot logo

3. As soon as you see the image from the previous step on the screen, press the "F2" or "Down" key within two seconds to access the boot menu.
   If you do not press a key, the procedure aborts at this point and the system boots from the M.2 SATA SSD as the default primary "Boot device".

4. Wait briefly until the boot menu is displayed:

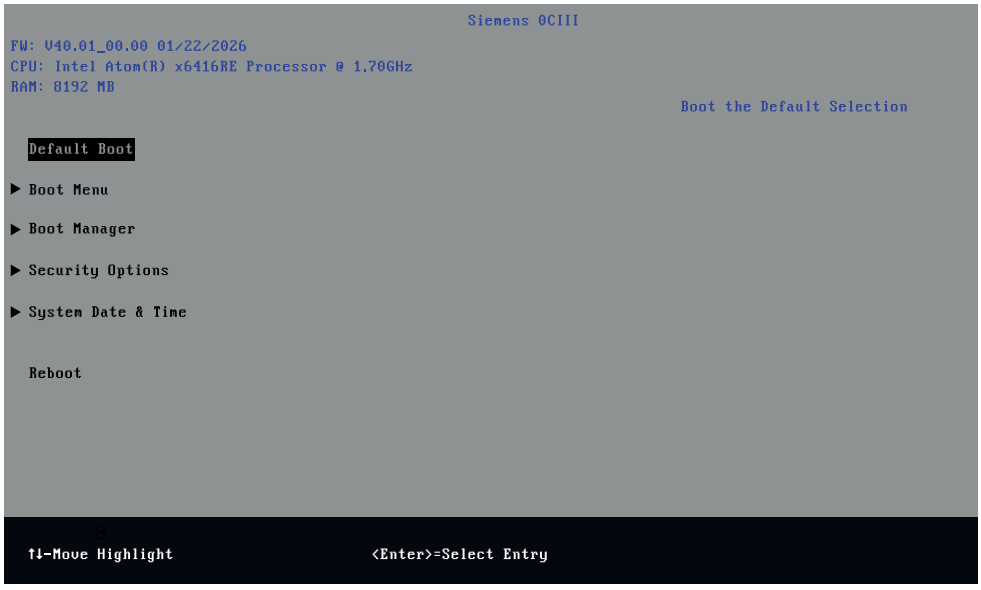


Figure 10-2 Boot menu

5. Select the option you want to use from the list, change the values and close the settings.
6. Each change via the BIOS menu is saved permanently. However, a system reboot is required for this purpose.
   For some settings, you must save the change with the F10 key and confirm the question "Save configuration changes?" with "Y" (Yes).
7. The system is reset and automatically boots from the new boot drive.

NOTE

If no prepared boot medium is inserted in the boot drive and the "Security Options" and "Boot Only From SATA" parameters are disabled, the system attempts to boot other options (PXE for X10 or PXE for X20) for three seconds each. If both fail and no bootable device is found, the user is redirected to the BIOS main menu page after 10 seconds.

Device configuration options

The device configuration is preset for working with the supplied software.

Only change the set values if you have made technical changes to your device.

You can set the following options:

Boot Menu

You can manually select an option to boot only once. The order of the boot options remains identical when booting from this menu.

Boot Manager

- **Change Boot Order:** Use this option to change the boot order.
- **Add Boot Option:** Use this option to specify a boot option manually, e.g. boot from a specified system path.
- **Delete Boot Option:** Use this option to delete the manually set boot option. If the Open Controller does not successfully attempt to start from a manually created boot option, this entry is deleted automatically.
- **Boot From File:** Use this option to select a file from which Open Controller will only start once.

Security Options

NOTE

Password protection

We recommend that you protect the BIOS with a password. This prevents unauthorized access to the device.

- **Secure Boot Configuration:** The default value is: Disabled. Do not change this value; otherwise, the operating system will not start.
- **Password Management:** With this parameter, you assign a permanent password for access to the BIOS menu. Password requests are shown directly next to the option as infotext. A reboot is required after setting the password.

  NOTE

  All subsequent accesses to the BIOS menu from this point is only possible by entering the assigned password.

- **Boot Only From SATA:** This parameter allows the boot medium to be fixed exclusively to the M.2 SATA SSD. Every other interface (e.g. PXE, USB) is ignored during the automatic boot operation. The default value is: Enabled. Do not change this setting.

System Date & Time

In this menu, you can manually change the system time/date of the external real-time clock. The real-time clock is saved for a certain period, even when there is no line voltage.

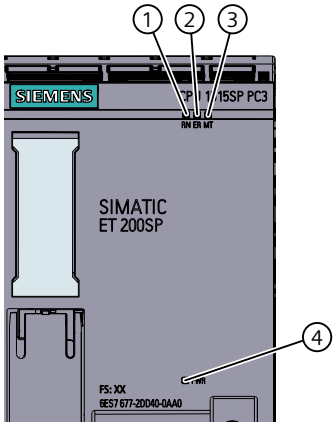
Status of system LEDs

11

11.1 Status of system LEDs

LED display

The following figure shows the LED displays of the CPU 1515SP PC3.



① RUN/STOP LED (yellow/green LED)
② ERROR LED (red LED)
③ MAINT LED (yellow LED)
④ POWER LED (green LED)

Figure 11-1 LEDs of the CPU 1515SP PC3

Meaning of the LED displays with active S7-1500 Software Controller

CPU 1515SP PC3 has three LEDs to display the current operating mode and the diagnostic status.

The following table shows the meaning of the color combinations of the LED displays for the S7-1500 Software Controller.

Table 11-1 Meaning of the LED displays

RUN/STOP LED	ERROR LED	MAINT LED	Meaning
LED off	LED off	LED off	POWER OFF Start the CPU 1515SP PC3 in "Windows only" mode (Native Boot). No power supply. Software Controller of the CPU 1515SP PC3: • is not downloaded • is in the operating state Power OFF Use of the hardware LEDs was disabled (configuration via TIA Portal).

RUN/STOP LED	ERROR LED	MAINT LED	Meaning
LED off	LED flashes red	LED off	An error has occurred.
LED green	LED off	LED off	Software Controller of the CPU 1515SP PC3 is in RUN mode.
LED green	LED flashes red	LED off	A diagnostics event is pending.
LED green	LED off	LED lights up yellow	Maintenance demanded for the plant. The affected hardware must be exchanged within a short period.
LED green	LED off	LED flashes yellow	Maintenance required for the plant. You must exchange the affected hardware within a foreseeable period.
			Firmware update successfully completed.
LED lights up yellow	LED off	LED off	Software Controller of the CPU is in the operating state STOP.
LED lights up yellow	LED flashes red	LED flashes yellow	The user program is causing an error.
LED flashes yellow	LED off	LED off	CPU is performing internal activities during STOP, e.g. ramp-up after STOP.
			Loading the user program
LED flashes yellow/green	LED off	LED off	Startup (transition from STOP → RUN)
LED flashes yellow/green	LED flashes red	LED flashes yellow	Startup (CPU booting)
			Test of LEDs during startup, inserting a module
			LED flashing test
LED flashes green	LED flashes red	LED flashes red	CPU defective

POWER LED

Table 11-2 POWER LED

POWER LED	Meaning
LED off	No supply voltage or supply voltage too low; operating system is shut down
LED green	Supply voltage present; Booting or operation of the operating system

Maintenance 12

12.1 Updating software

12.1.1 Updating the Software Controller

We recommend that you update the installed software regularly.

You can find information on updating software for the respective product in the Siemens SiePortal (https://sieportal.siemens.com/en-ww/support).

Uninstalling the Software Controller

When you install a newer version of the Software Controller, it may be necessary to uninstall the previous version first.

The BusAdapter in the Open Controller is no longer controlled by the Software Controller after the uninstallation and therefore can no longer provide any network functions.

NOTICE
Network functionality during installation/uninstallation When installing/uninstalling the Software Controller, the system may not work correctly or may stop due to a lack of network functionality.

HMI devices

During the installation, make sure that you always use the latest drivers for the HMI devices used (SIMATIC Flat Panels).

Before you install a new driver version, you must uninstall the old driver version in order to ensure proper operation.

You can download the current driver software from Siemens SiePortal (https://sieportal.siemens.com/en-ww/support).

Reference

You can find more information about updating in the section BIOS update (Page 70).

12.1.2 Security updates for Industrial OS

For updates of the software packages available in the Industrial OS, we recommend setting a regular interval for installing security updates in the "Apt Update" dialog.

The "Apt Update" function is described in Industrial OS - Getting Started, Section 2.4.12 (https://support.industry.siemens.com/cs/ww/en/view/109795683). The call of the setup settings with the "mel-setup" command is described in section 2.6.

You can find up-to-date security information on the installed packages on the Internet (https://www.debian.org/security/).

You can find up-to-date security information on the Linux kernel and BIOS used on the Internet (https://www.siemens.com/global/en/products/services/cert.html).

NOTICE
Only install kernel updates provided by Siemens For updates of the Linux kernel, **only** use SIMATIC Industrial OS versions provided by SIEMENS. Updates that are not provided by Siemens can result in security, stability and compatibility problems. Ensure the consistency and integrity of the downloaded files.

12.2 Create USB flash drive with OC3MToolkit on Windows PC

You will need a USB flash drive for a BIOS update and for backing up and restoring CPU data. You must first prepare the USB flash drive in the PC.

Prepare USB flash drive

1. To run the process in the PC, you need administrator rights for your PC.
2. Connect a USB flash drive with a minimum size of 16 GB to the PC.
3. Download the latest version of Rufus (standard or portable) from this address (https://rufus.ie/en/) and start the program.
4. Select the "List USB Hard Drives" check box.
5. Under "Devices", select the USB flash drive you want to use.
6. Under "File system", select NTFS.
7. Download the OC3MToolkit.iso file from this address (https://support.industry.siemens.com/cs/ww/en/view/109988353) and save this file on your PC.
8. Click the SELECT button and select the OC3MToolkit.iso file.

9. Accept the setting in the following figure and click on the START button.

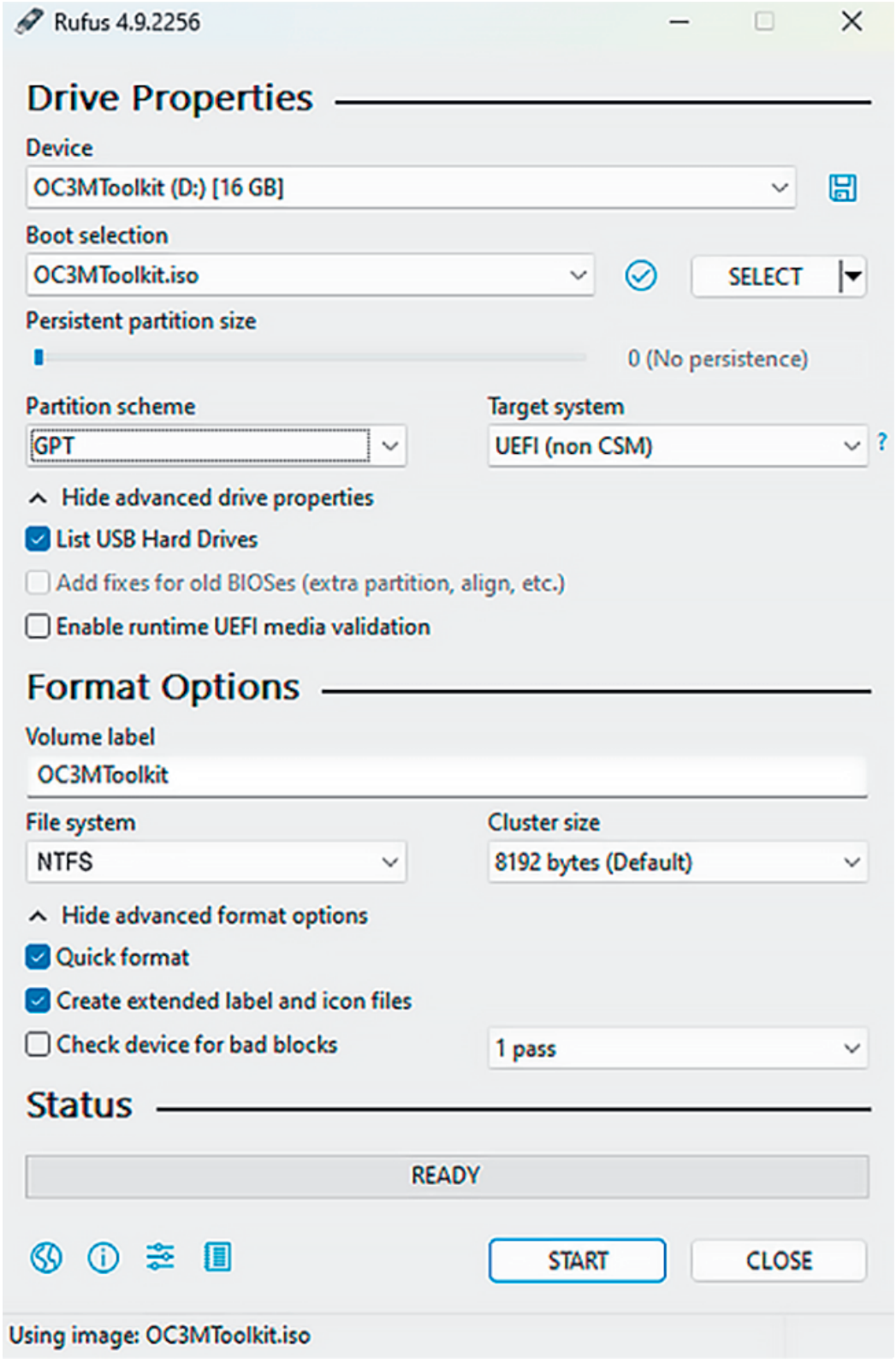


Figure 12-1 Set Rufus options

10. Confirm "Write in ISO Image mode (Recommended)" with "OK"

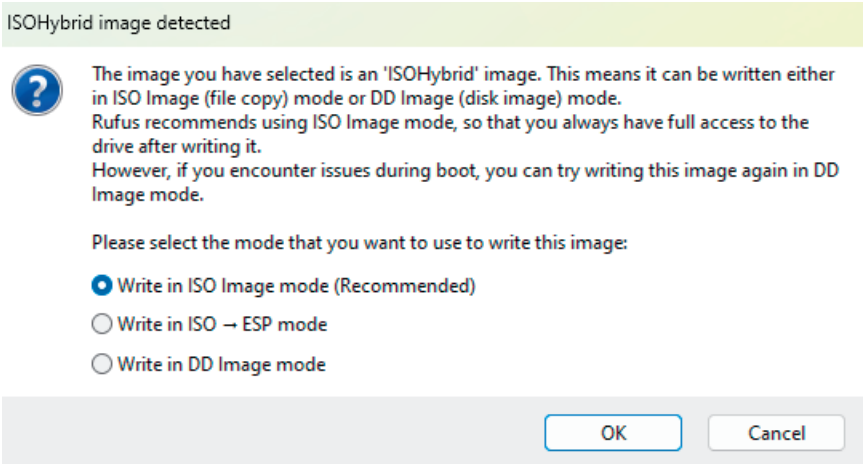


Figure 12-2 ISO Image mode

11. Confirm the following message with "OK".

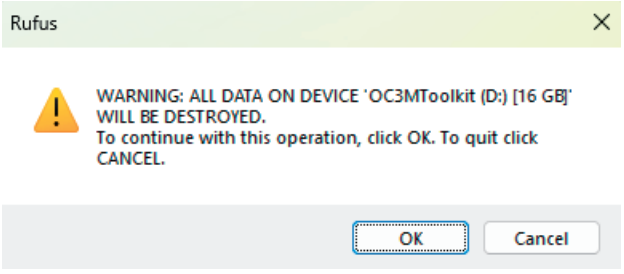


Figure 12-3 Warning

The USB flash drive is ready for use with the Open Controller.

12.3 BIOS update

NOTE

Root Chain Of Trust

Open Controller 3 uses the Intel Bootguard (BtG) technology, which requires signature verification with an OEM hash.

Only officially signed BIOS binary files are accepted and start the system. Manipulated or unsigned binary files do not start the device. The POWER LED goes out as soon as the signature check has failed.

Prepare USB flash drive

You need a USB flash drive for the BIOS update. You must first prepare the USB flash drive on a Windows PC.

The preparation is described in the section Create USB flash drive with OC3MToolkit on Windows PC (Page 68).

BIOS update procedure

1. Download the BIOS file V40.01_00.01.tar.gz from Siemens SiePortal (https://support.industry.siemens.com/cs/ww/en/view/109743969).
2. Copy this BIOS file to the "BIOS" folder on the USB flash drive.

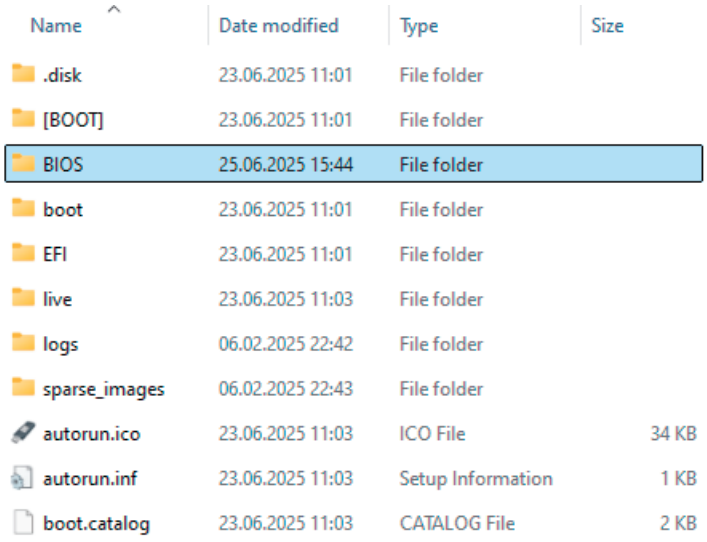


Figure 12-4 "BIOS" folder

3. Insert the USB flash drive into one of the three USB ports on the Open Controller.
4. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
5. Switch on the power supply of the Open Controller. The following image appears on the screen:

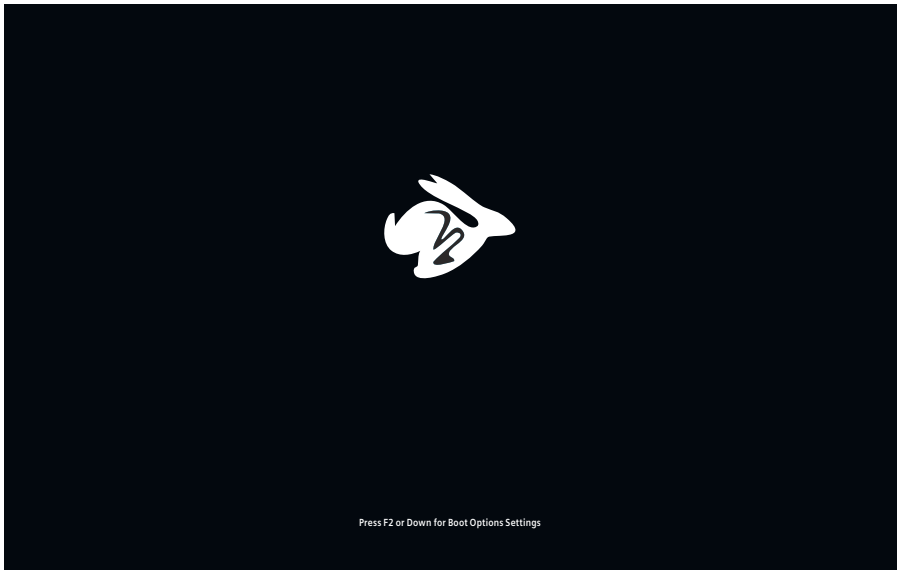


Figure 12-5 Coreboot logo

6. As soon as you see the image from the previous step on the screen, press the "F2" or "Down" key within two seconds to access the boot menu.
   If you do not press a key, the procedure aborts at this point and the system boots from the M.2 SATA SSD as the default primary "Boot device".
7. Wait briefly until the BIOS menu is displayed:

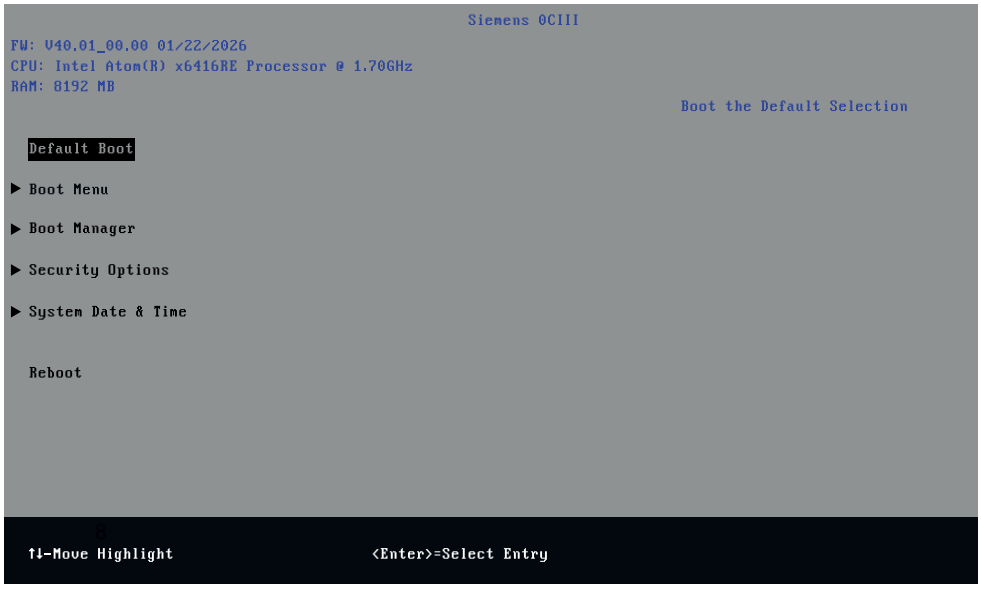


Figure 12-6 BIOS menu

8. Select "Boot Menu".
9. Select the USB flash drive "USB: ...".

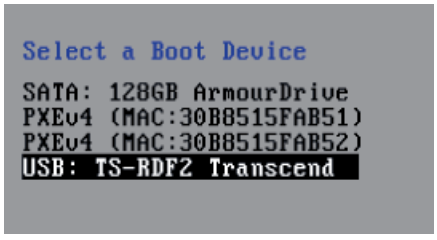


Figure 12-7 Select boot device

If you do not see "USB: ..." in the list, select "Security Options", change the "Boot Only From SATA" parameter to "Disabled" and repeat the selection. You can find a detailed description under "Security Options" in the section BIOS setup (Page 62).

10. The Open Controller boots from the USB flash drive. The Siemens logo and the menu appear on the screen as shown in the figure below.

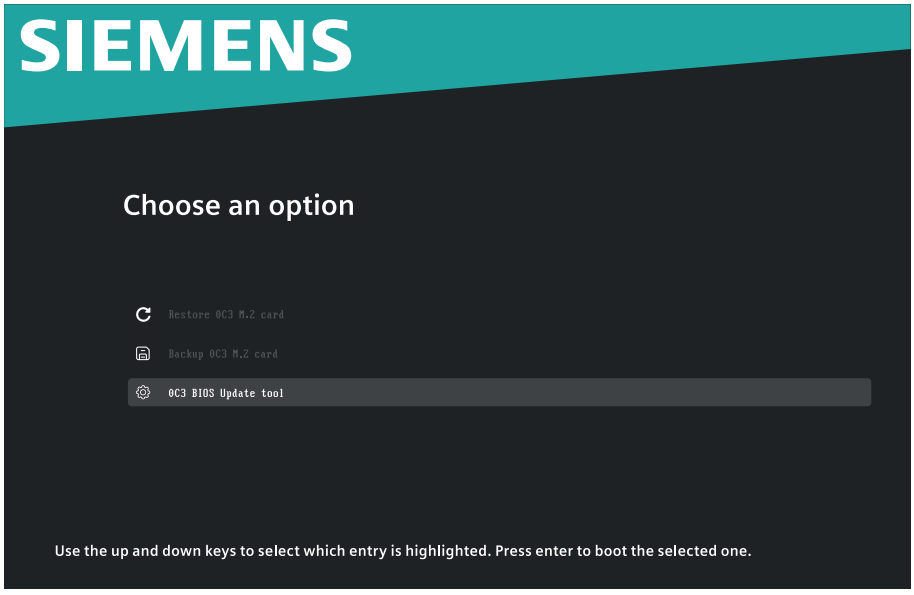


Figure 12-8 BIOS functions

11. Select the menu item "OC3 BIOS Update tool".

12. Confirm the following information about third-party software.

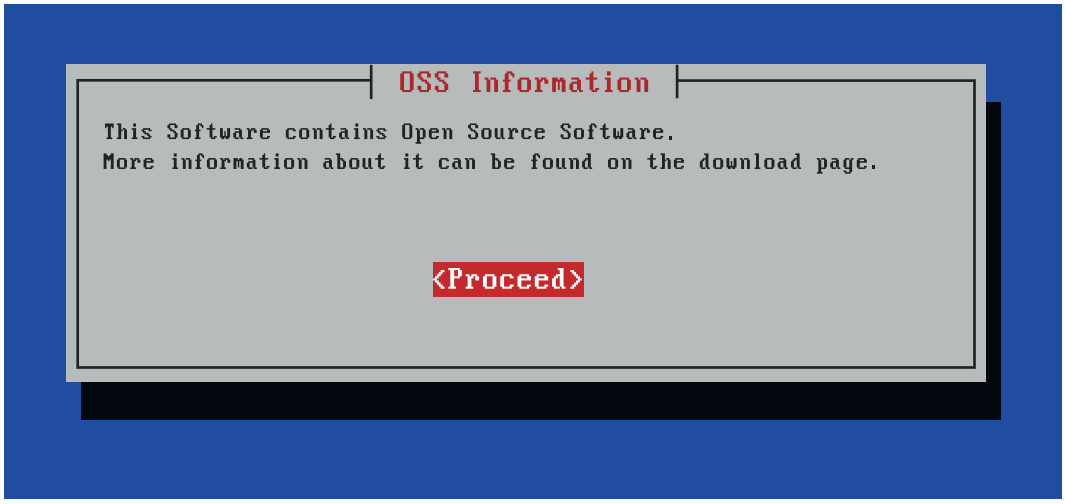


Figure 12-9 OSS information

13. Select the *.tar.gz file and press <Ok>.

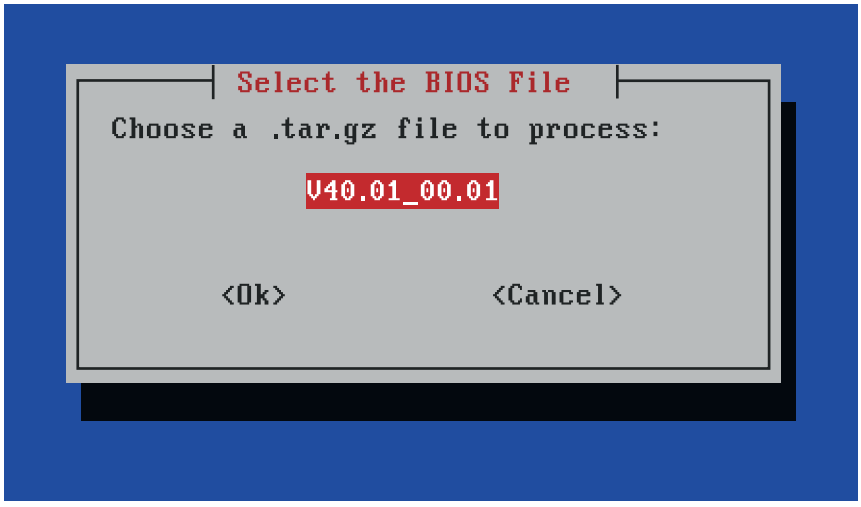


Figure 12-10 Select BIOS file

14. Confirm the following window with <Ok>.

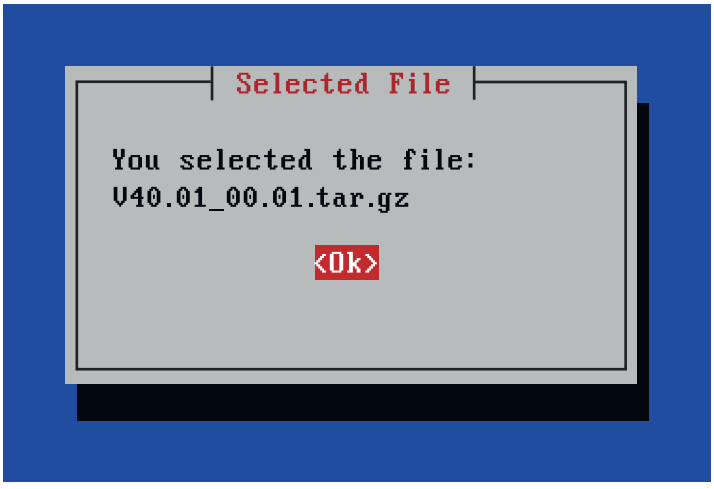


Figure 12-11 Confirm file name

NOTICE
Do not switch the device off after this point. If this is ignored, there is a risk that the Open Controller will be bricked.

15. Confirm the next question "Do you want to continue? [Y/n]" with "Y".

16. Wait until BIOS is flashed. The following screen is displayed:



Figure 12-12 BIOS update

17. The device restarts. The BIOS is now updated.

NOTE

The first start after the BIOS update takes longer, at least 20 seconds. Do not disconnect the power supply.

12.4 Backing up and restoring data

12.4.1 Backing up data

First, prepare a USB flash drive with the required data before you back up the device data.

The procedure is described in the section Create USB flash drive with OC3MToolkit on Windows PC (Page 68).

Introduction

The provided M.2 SATA SSD contains the operating system, the Runtime software and the restore section.

To prevent loss of data and be able to restore the contents of the M.2 SATA SSD at any time, create a USB Restore flash drive.

Data backup

1. Insert the USB flash drive into one of the three USB ports on the Open Controller.
2. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
3. Switch on the power supply of the Open Controller. The following image appears on the screen:



Figure 12-13 Coreboot logo

4. As soon as you see the image from the previous step on the screen, press the "F2" or "Down" key within two seconds to access the boot menu.
   If you do not press a key, the procedure aborts at this point and the system boots from the M.2 SATA SSD as the default primary "Boot device".

5. Wait briefly until the BIOS menu is displayed:

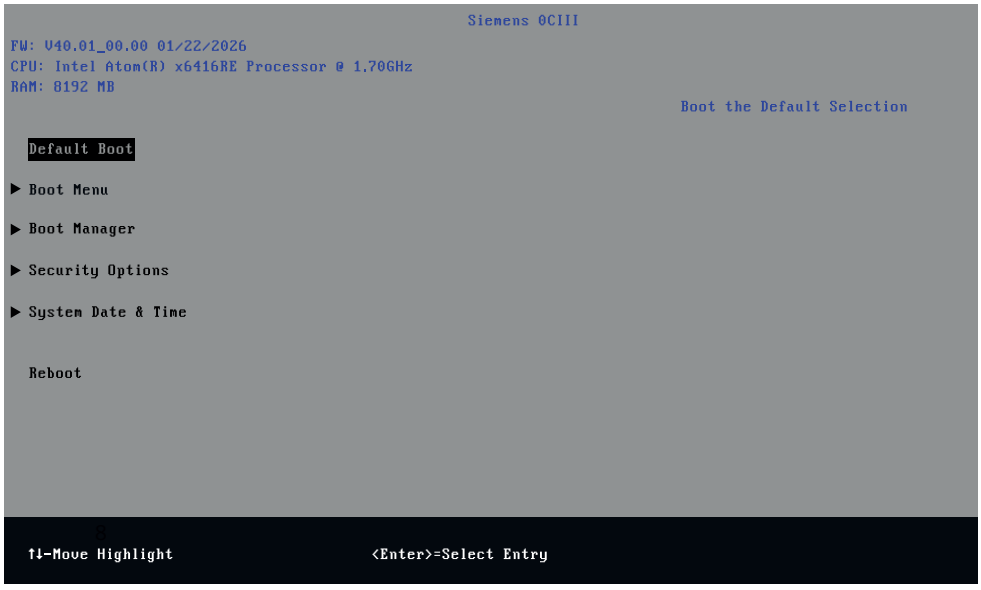


Figure 12-14 BIOS menu

6. Select "Boot Menu".
7. Select the USB flash drive "USB: ...".



Figure 12-15 Select boot device

If you do not see "USB: ..." in the list, select "Security Options", change the "Boot Only From SATA" parameter to "Disabled" and repeat the selection. You can find a detailed description under "Security Options" in the section BIOS setup (Page 62).

8. The Open Controller boots from the USB flash drive. The Siemens logo and the menu appear on the screen as shown in the figure below.

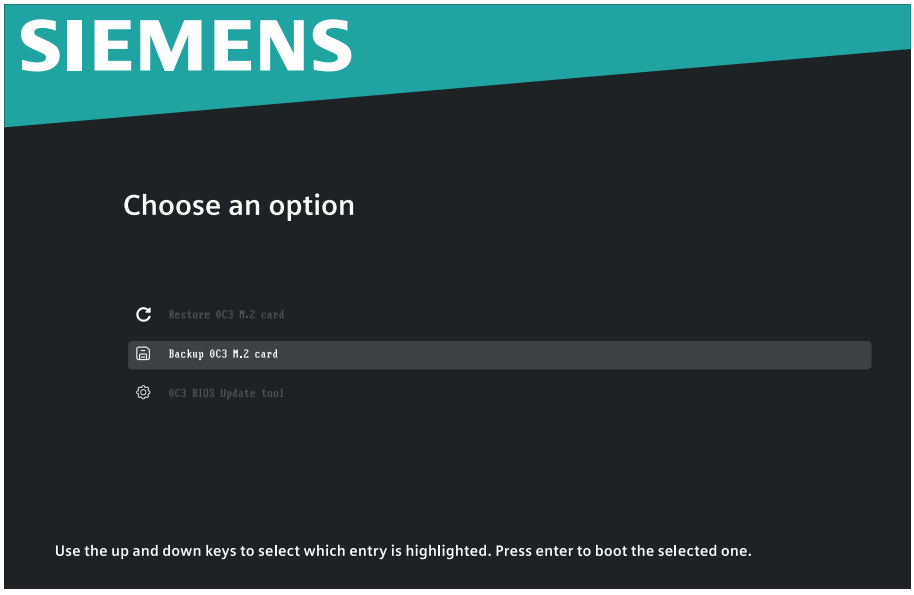


Figure 12-16 BIOS functions

9. Select the menu item "Backup OC3 M.2 card".
10. Enter the desired file name and press <Ok>.

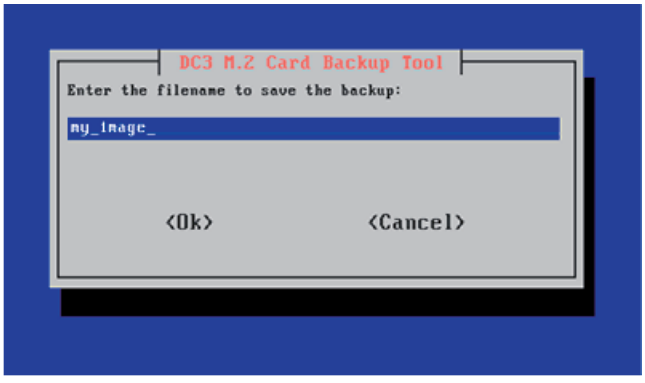


Figure 12-17 Assign file name

11. Confirm the message with <Ok>.

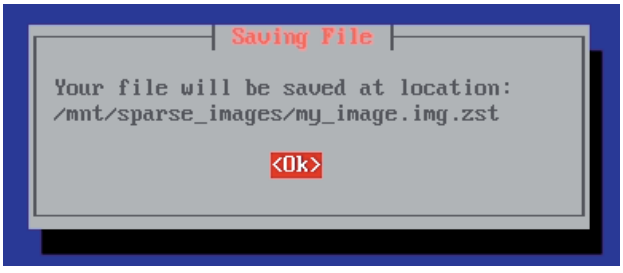


Figure 12-18 Confirm message

12. Wait until the data is backed up. A confirmation screen appears.

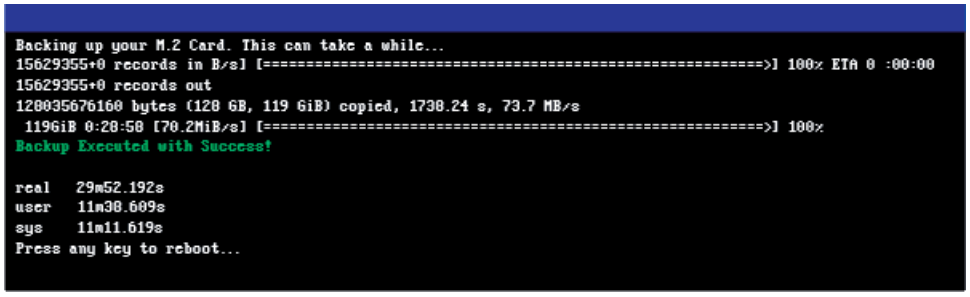


Figure 12-19 Backing up data

13. Press any key and wait 15 to 20 seconds until the start screen is displayed.

The backed up data is now saved to the "sparse_images" folder on the USB flash drive as a zst file, e.g. "my_image.img.zst". You can continue to use the data on your PC. We recommend that you save this file in a safe place.

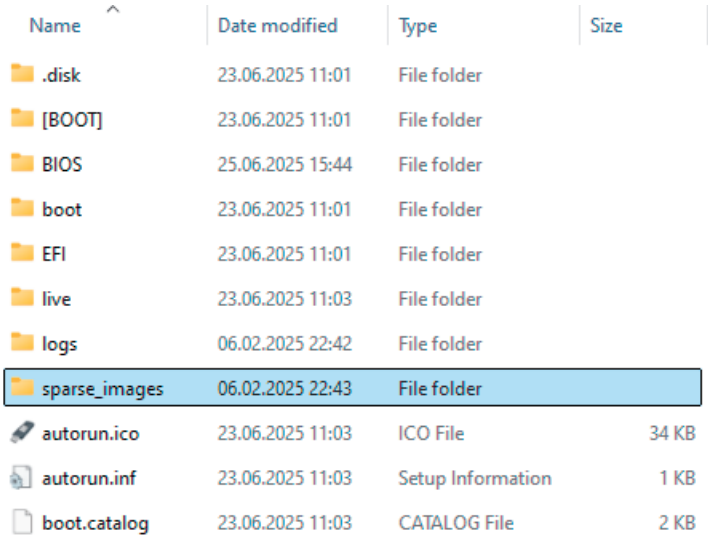


Figure 12-20 "sparse_images" folder

12.4.2 Restoring data

First, prepare a USB flash drive with the required data before you restore the device data.

The procedure is described in the section Create USB flash drive with OC3MToolkit on Windows PC (Page 68).

NOTE

When the USB flash drive is created with the OC3MToolkit, all data on the USB flash drive is deleted. Keep the data ready for recovery on your PC.

NOTE

Network driver is not activated

The network driver is not activated by default when the system is started from the USB Restore flash drive.

Therefore, we recommend that you do not activate the network driver and that you perform the process offline.

Restoring data

1. Have the image file on your PC ready, e.g. img.zst.
2. Copy the img.zst file on your PC to the "sparse_images" folder of the USB flash drive.

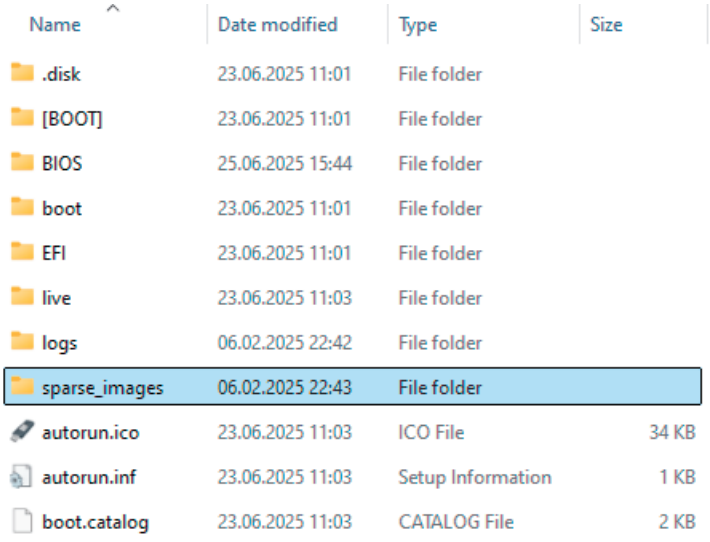


Figure 12-21 "sparse_images" folder

3. Switch off the power supply of the CPU 1515SP PC3.
4. Ensure that the M.2 SATA SSD is plugged into the Open Controller.

NOTICE

Avoiding damage to the USB flash drive

To avoid damage to the USB flash drive, do not start the process without an inserted M.2 SATA SSD.

5. Insert the USB flash drive into one of the three USB ports on the Open Controller.
6. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.

7. Switch on the power supply of the Open Controller. The following image appears on the screen:



Figure 12-22 Coreboot logo

8. As soon as you see the image from the previous step on the screen, press the "F2" or "Down" key within two seconds to access the boot menu.
If you do not press a key, the procedure aborts at this point and the system boots from the M.2 SATA SSD as the default primary "Boot device".

9. Wait briefly until the BIOS menu is displayed:

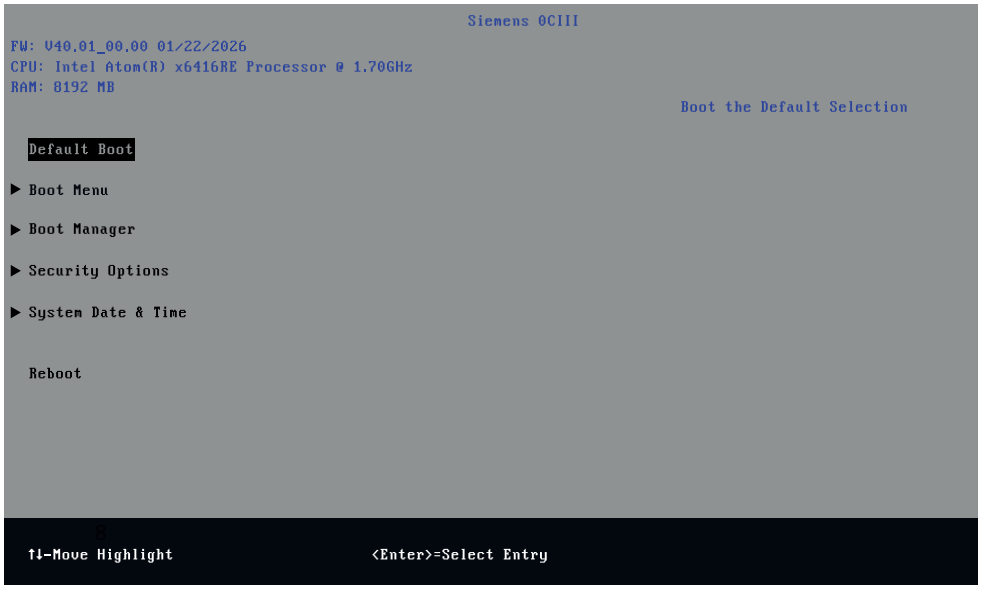


Figure 12-23 BIOS menu

10. Select "Boot Menu".

11. Select the USB flash drive "USB: ...".

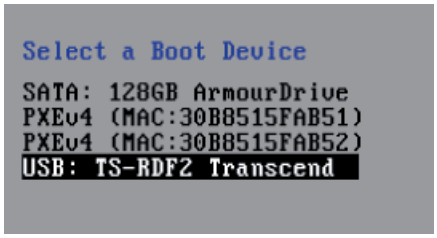


Figure 12-24 Select boot device

If you do not see "USB: ..." in the list, select "Security Options", change the "Boot Only From SATA" parameter to "Disabled" and repeat the selection. You can find a detailed description under "Security Options" in the section BIOS setup (Page 62).

12. The Open Controller boots from the USB flash drive. The Siemens logo and the menu appear on the screen as shown in the figure below.

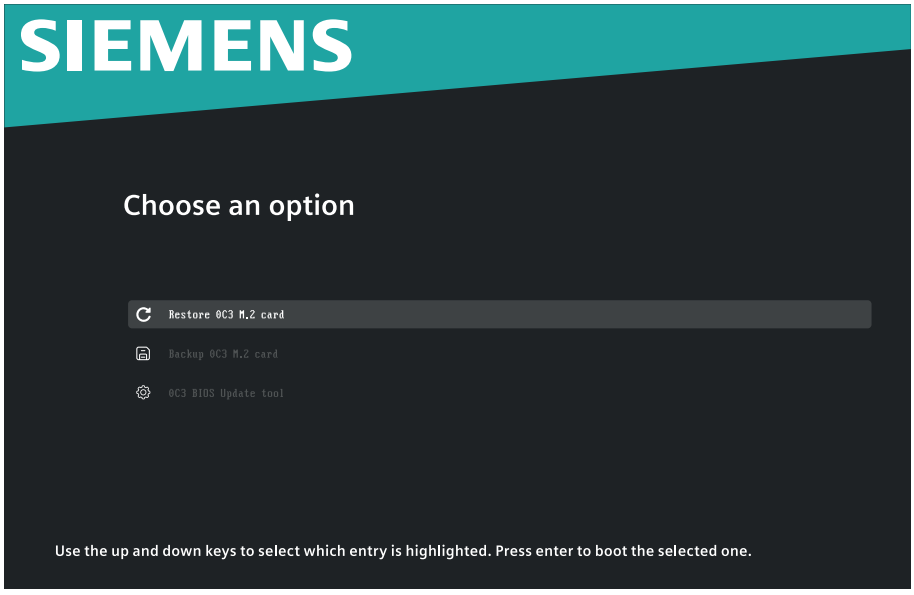


Figure 12-25 BIOS functions

13. Select the menu item "Restore OC3 M.2 card".

14. Wait until the following dialog appears.

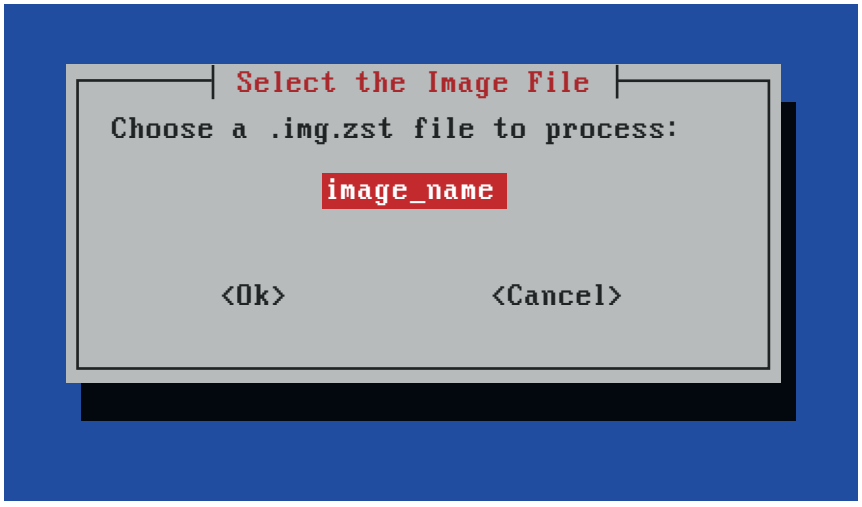


Figure 12-26 Select image file

15. Select the image for deployment. Confirm the following message with <Ok>.



Figure 12-27 Confirm image file

16. Optionally, you can check the checksum of the provided image and the correct deployment of the hard disk. The hard disk verification dialog is only displayed if the image is verified. Answer both questions with <Yes>. Note that this will additionally prolong the process.

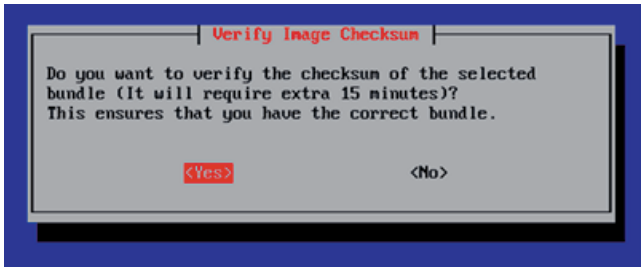


Figure 12-28 Check checksum

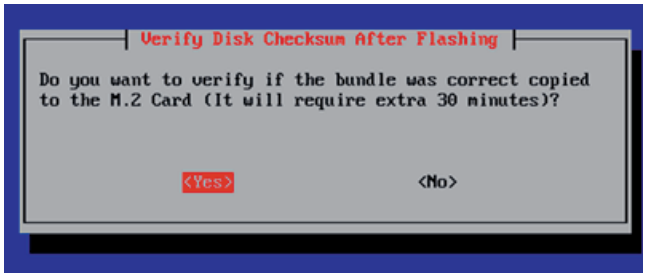


Figure 12-29 Check hard disk

17. Press any button to restart the device as soon as the deployment is complete. The screen displayed should look like the one shown below. If the error message "SG_IO: bad/missing sense data error" is displayed, restart the process.

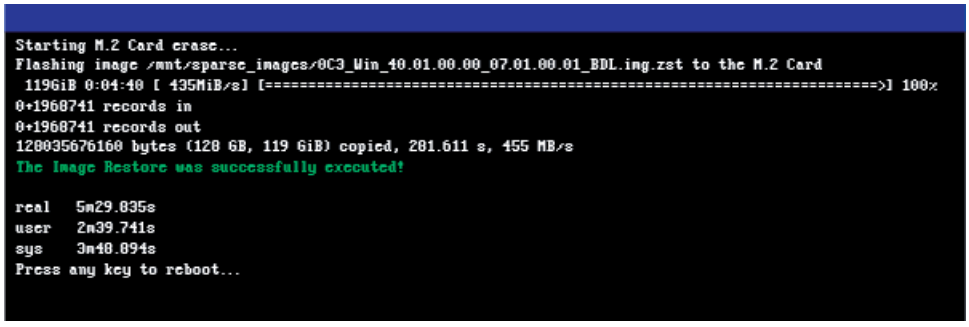


Figure 12-30 Restoring data

18. The system boots from the M.2 SATA SSD.

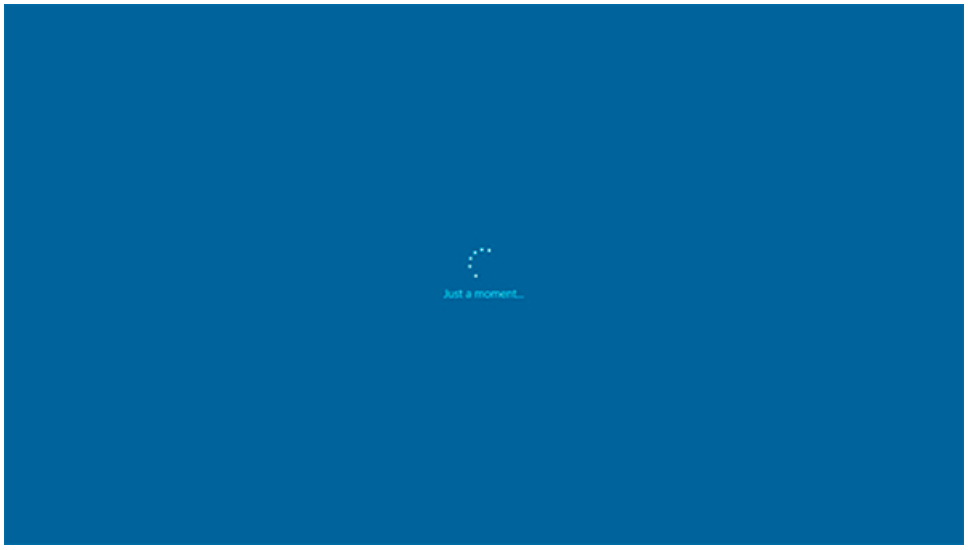


Figure 12-31 System boot

12.5 Restoring the delivery state

First, prepare a USB flash drive with the required data before you back up or restore the device data.

The procedure is described in the section Create USB flash drive with OC3MToolkit on Windows PC (Page 68).

NOTICE
When the USB flash drive is created with the OC3MToolkit, all data on the USB flash drive is deleted.

NOTE

Using multi-touch panels

The restoration of the original software is not possible with a multi-touch panel, because the multi-touch drivers are not available until after the installation of the operating system.

NOTICE
Data loss During restoration of the system to delivery state, the M.2 SATA SSD is completely erased and re-formatted and loaded with the original software. All subsequently changed or added data, programs, license keys and partitions on the M.2 SATA SSD are lost. Back up the data of the CPU 1515SP PC3 after you have assigned parameters to the modules and if you have made changes to the configuration.

NOTICE
Loss of license keys Back up the license keys before the restore by dragging them to a USB flash drive using the *Automation License Manager*. After restoring the CPU 1515SP PC3, transfer the license keys back to the device via the *Automation License Manager*.

Procedure to restore the delivery state

To restore the delivery state using the USB Restore flash drive, proceed as follows.

NOTE

The restore process writes **all** the data stored on the USB flash drive to the restore partition.

Backup of the Restore image file

The Restore image file, e.g. "OC3_Win_40.01.00.00_13.01.00.01_BDL.img.zst" ("OC3_Win_40.01.00.00_13.01.00.01_BDL_F.img.zst" for the fail-safe CPU) is saved in the `D:\OC3_Extras\BundleImages\` folder on CPU 1515SP PC3.

1. Insert the USB flash drive into one of the three USB ports on the Open Controller.
2. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
3. Copy the Restore image file from the `D:\OC3_Extras\BundleImages\` folder on the CPU 1515SP PC3 to the "sparse_images" folder on the USB flash drive.

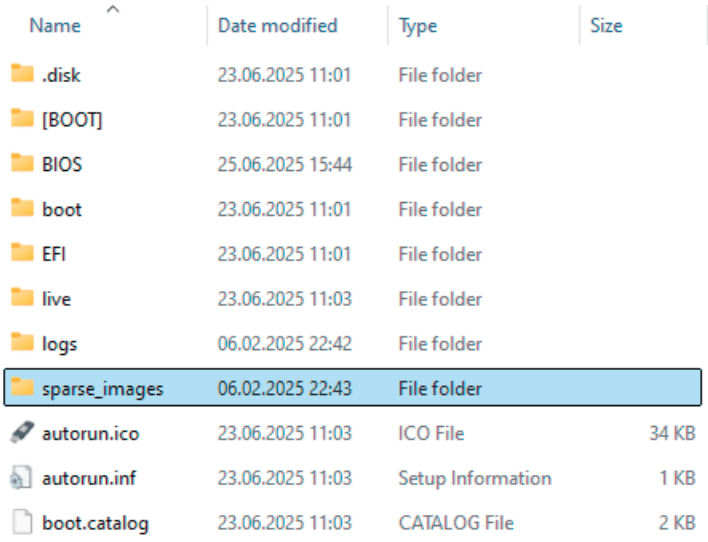


Figure 12-32 "sparse_images" folder

4. Save the Restore image file to your PC or store it on a USB flash drive. Keep the USB flash drive in a secure location so that you can use it later to restore the factory settings.

Restoring the delivery state

1. Have the Restore image file ready on your PC.
2. On your PC, copy the Restore image file to the "sparse_images" folder on the USB flash drive.

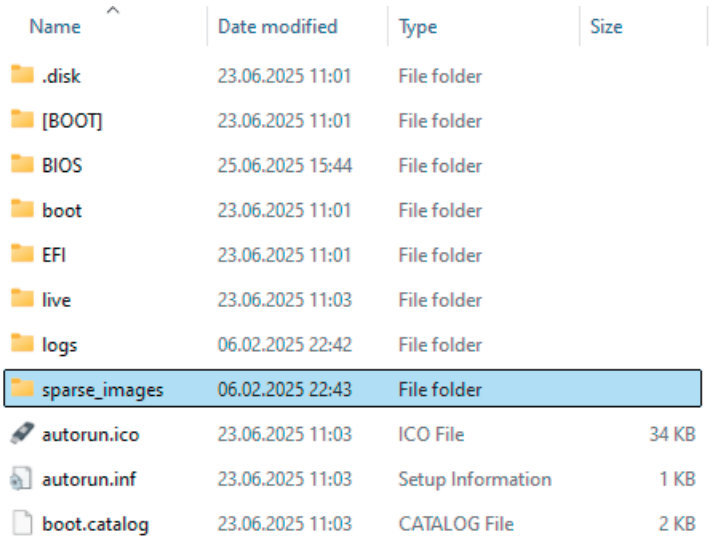


Figure 12-33 "sparse_images" folder

3. Switch off the power supply of the CPU 1515SP PC3.
4. Insert the USB flash drive into one of the three USB ports on the Open Controller.
5. Connect a monitor via the DisplayPort interface and a USB keyboard via one of the three USB ports on the Open Controller.
6. Switch on the power supply of the Open Controller. The following image appears on the screen:

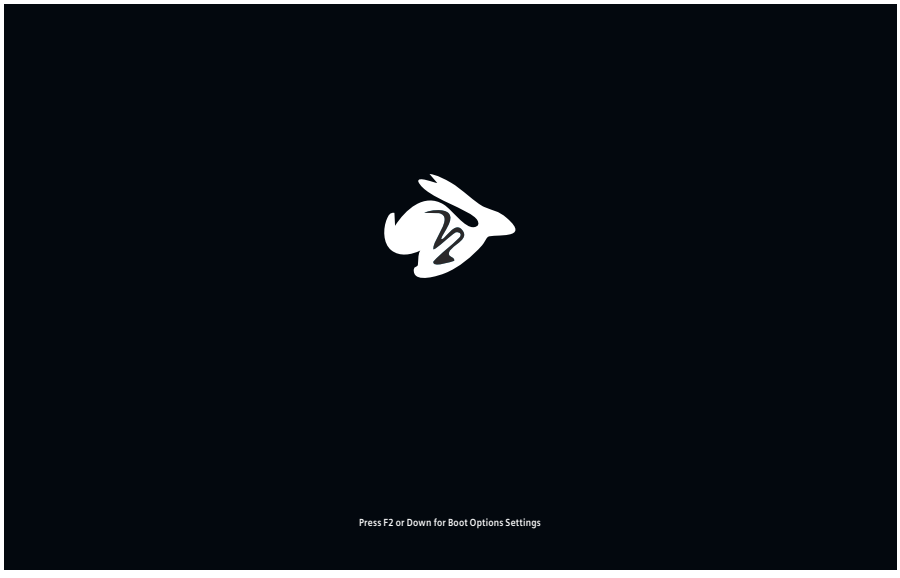


Figure 12-34 Coreboot logo

7. As soon as you see the image from the previous step on the screen, press the "F2" or "Down" key within two seconds to access the boot menu.
   If you do not press a key, the procedure aborts at this point and the system boots from the M.2 SATA SSD as the default primary "Boot device".
8. Wait briefly until the BIOS menu is displayed:

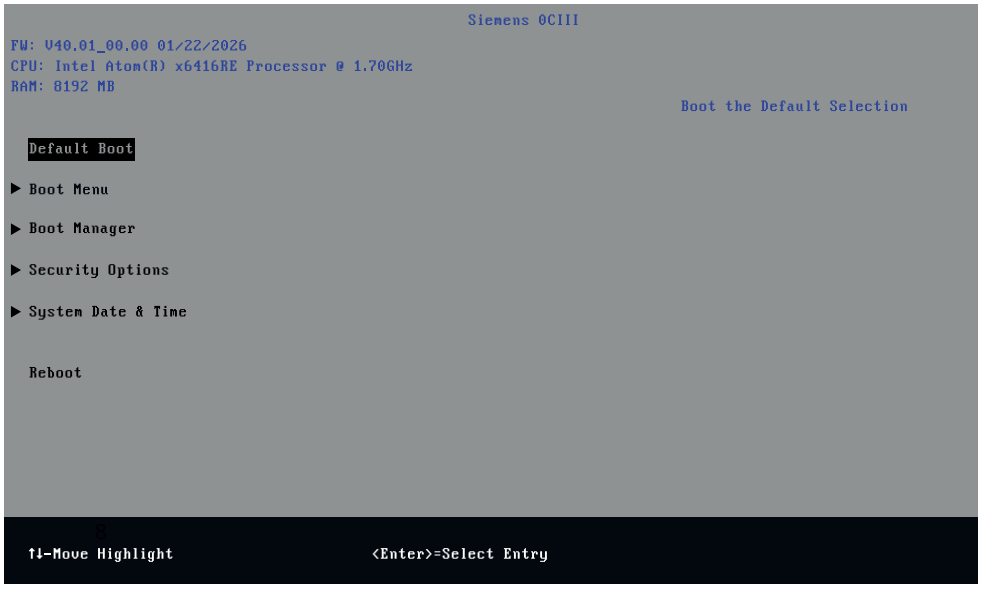


Figure 12-35 BIOS menu

9. Select "Boot Menu".
10. Select the USB flash drive "USB: ...".

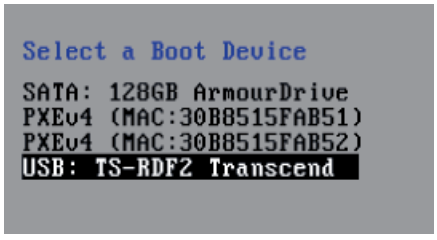


Figure 12-36 Select boot device

If you do not see "USB: ..." in the list, select "Security Options", change the "Boot Only From SATA" parameter to "Disabled" and repeat the selection. You can find a detailed description under "Security Options" in the section BIOS setup (Page 62).

11. The Open Controller boots from the USB flash drive. The Siemens logo and the menu appear on the screen as shown in the figure below.

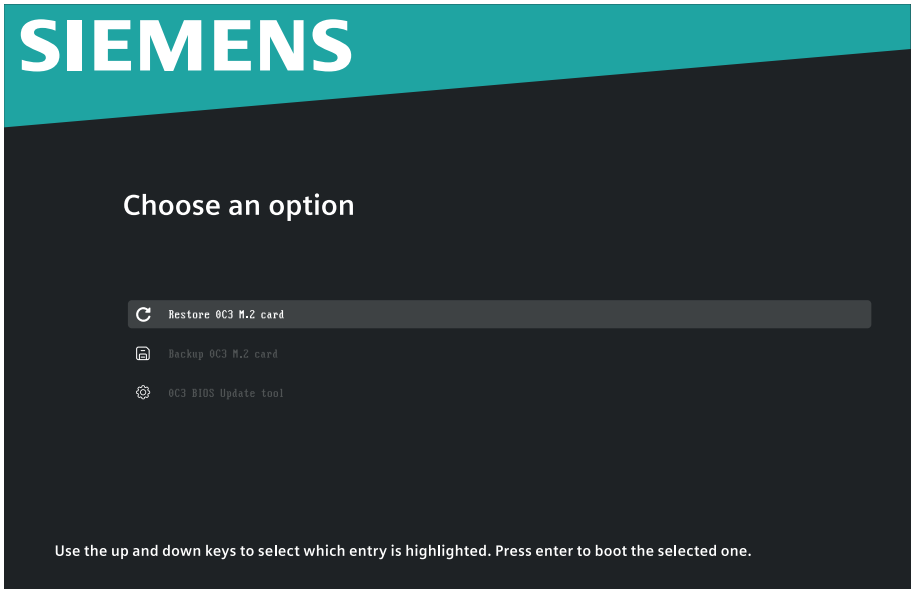


Figure 12-37 BIOS functions

12. Select the menu item "Restore OC3 M.2 card".

13. Wait until the following dialog appears.

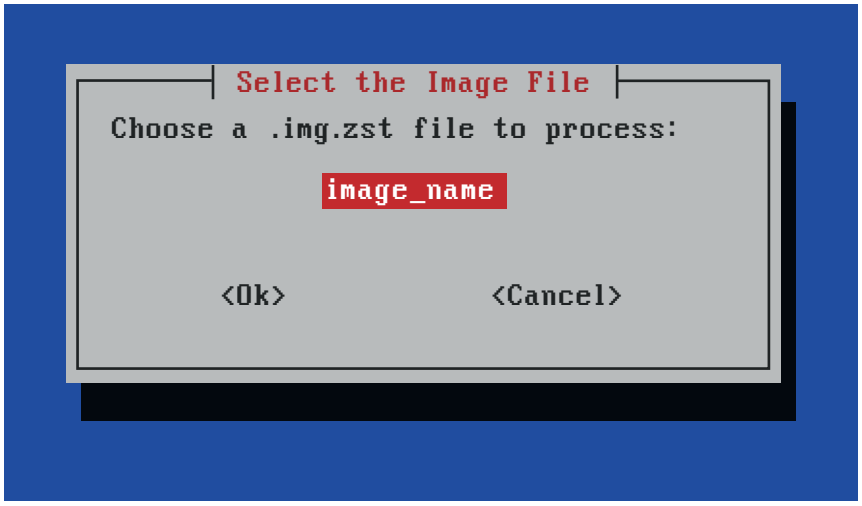


Figure 12-38 Select Restore image file

14. Select the Restore image file for the deployment. Confirm the following message with <Ok>.



Figure 12-39 Confirm Restore image file

15. Optionally, you can check the checksum of the provided image and the correct deployment of the hard disk. The hard disk verification dialog is only displayed if the image is verified. Answer both questions with <Yes>. Note that this will additionally prolong the process.

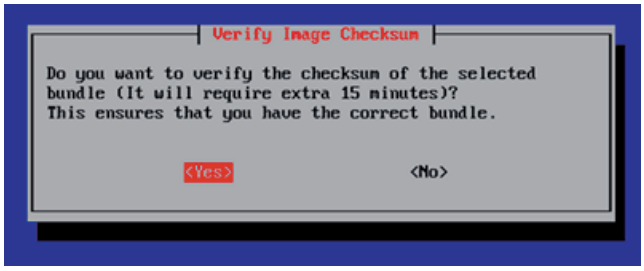


Figure 12-40 Check checksum



Figure 12-41 Check hard disk

16. When you recreate the Restore image, the following message appears: Select whether you want to save the Restore image file in the "Data" folder on the NTFS partition. Select <Yes> or <No>.

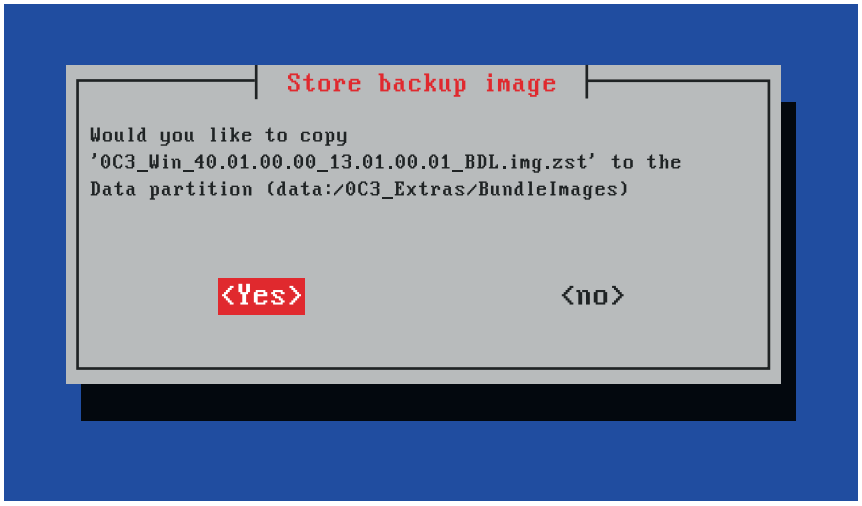


Figure 12-42 Save Restore image file

17. Press any button to restart the device as soon as the deployment is complete. The screen displayed should look like the one shown below. If the error message "SG_IO: bad/missing sense data error" is displayed, restart the process.

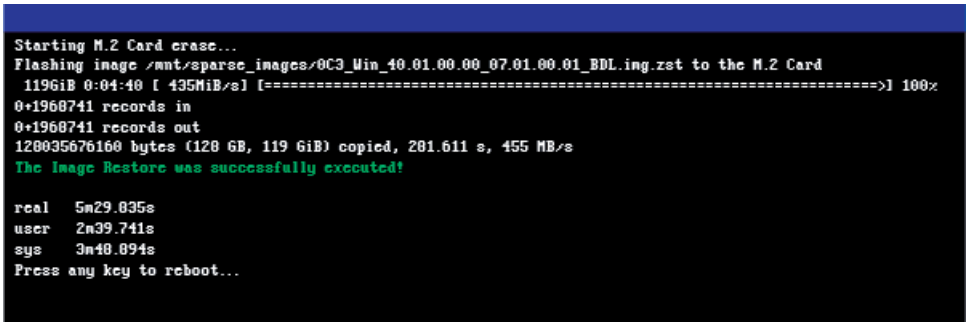


Figure 12-43 Restoring data

18. The system boots from the M.2 SATA SSD.

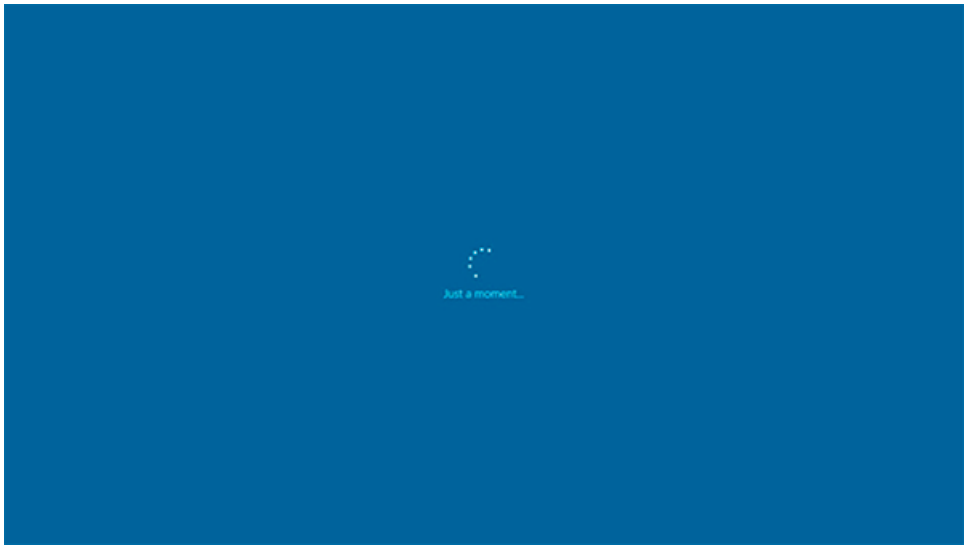


Figure 12-44 System boot

12.6 Data loss in the event of an unexpected shutdown

To protect the operating system against data loss or damage in the event of an unexpected shutdown, there are various options for Microsoft Windows 11 on SIMATIC IPCs and ET200SP Open Controllers. Microsoft recommends always shutting down the operating system properly. If a proper shutdown cannot be guaranteed, select one of the following solutions instead:

- Using an uninterruptible power supply (UPS)
- Using the unified write filter function (Unified Write Filter, UWF)

12.6.1 Options for preventing data loss

To prevent data loss in the event of a forced shutdown (line side switch) or unexpected shutdown (power failure), there are various options to use the UWF (Unified Write Filter) in conjunction with the ET200SP Open Controller.

By restricting write access to the file system, UWF increases the stability and security of Windows devices. Write attempts to a protected drive are redirected by the UWF to a virtual overlay, which protects the contents of a drive from unwanted changes or data loss.

12.6.2 General information on the write filter

The common abbreviation for the "Unified Write Filter" is "UWF" (Unified Write Filter). Enabling the filter ensures that data is no longer saved retentively on the system. All write access operations are swapped out to the work memory (RAM) and are available until system restart. As soon as the computer is restarted, it loses its memory and goes back to the state that it was in before the filter was enabled.

NOTICE
Risk of data loss when "UWF" is activated
When the device is shut down, all changes made after the boot process may be lost due to the write-protected data storage medium.
To prevent this from happening, make changes to data storage media only with disabled write protection.

The "UWF" is disabled in the delivery state!

The filter does not support external removable data storage media, such as USB flash drives and other flash drives that the operating system recognizes as removable data storage media.

NOTE

Note that the work memory is reduced when "UWF" is enabled.

NOTICE
Loss of data due to frequent write cycles.
The number of write cycles on M.2 SATA SSDs is limited for technical reasons.
To avoid data loss, you need to especially protect the M.2 SATA SSD.
To protect the M.2 SATA SSD, enable the "UWF". This feature extends the service life of the M.2 SATA SSD and prevents a possible failure of the CPU 1515SP PC3.

Reference

You can find more information on the "UWF" write filter on the Internet in the online help for Microsoft® Windows® 11.

12.6.3 Functional principle of the UWF

The Unified Write Filter (UWF) protects the content of a volume by redirecting all write attempts to a protected volume on a virtual overlay. By default, the overlay is located in the work memory with a size of 1024 MB.

Depending on the Windows version, the behavior may vary with a full overlay:

- Microsoft Windows 11 IoT (Enterprise 2024 LTSC): System restarts automatically to clear the overlay.

NOTE

The use of Unified Write Filters on systems with 24/7 availability is not planned by Microsoft.

12.6.4 Using UWF with WinCC Unified PC Runtime

NOTE

Support of WinCC Unified

Note that WinCC Unified is not installed on the Open Controller V40.1. However, you can install WinCC Unified independently and use it as a stand-alone component.

When downloading the WinCC Unified PC Runtime project (up to and including V18), it is not possible to set the project path to a partition other than the system partition (usually drive "C:"). A project download to a partition protected with UWF leads to project loss after a restart.

UWF provides the option of excluding specific paths from protection. Changes to the excluded paths are retained even after a restart. Changes are kept in the overlay until the restart and only take effect on the hard disk after the restart.

The overlay area grows with every download of the WinCC Unified project.

If the project size exceeds the free overlay area on the Industrial Workstation/Open Controller, downloading the Runtime project will cause irreversible damage to the device.

Licenses that are managed by the Automation License Manager are lost after a restart if they are transferred to the protected UWF volume.

12.6.5 Options for using UWF with WinCC Unified PC Runtime

To prevent data loss in the event of a forced shutdown (line side switch) or unexpected switch-off (power failure), there are various options to use the UWF in conjunction with WinCC Unified PC Runtime.

The following options are available:

- Using an uninterruptible power supply (UPS) instead of the UWF
- Use of UWF with the following conditions:
- Protecting the system partition "C:\"

- Exclusion of the following paths
  - "C:\ProgramData\SCADAProjects"
  - "C:\ProgramData\Siemens"
- Ensure that sufficient memory is available in the overlay.
- Restart the operating system before downloading the project or generally at regular intervals
- Optional: Place overlay on hard disk and enlarge → increases the time until the overlay is filled
- Protect system partition with UWF, disable UWF for project download and then enable it again
- No protection of the system partition with the following conditions
  - Store SIMATIC product licenses on a separate partition, see note below
  - Protect separate partition with product licenses using UWF.
  - Avoid frequent write operations to minimize the risk of damage to the system due to forced or unexpected shutdowns.

NOTE

No additional partitions can be created with the ET 200SP Open Controller. We recommend using the "D:\" partition for the licenses and authorizations of SIMATIC products and protecting this partition when using UWF.

As of WinCC Unified PC Runtime V21, you can customize the file path for the WinCC Unified project folder. This makes it possible to protect the system partition "C:\" using UWF in conjunction with the WinCC Unified PC Runtime without affecting the download of the Runtime.

12.6.6 Enabling write protection

To enable the "Unified Write Filter = UWF" under Windows, follow these steps:

1. Control Panel > Programs > Programs and Features > Turn Windows features on or off > Device Lockdown > Uniform Write Filter

To activate the UWF and protect the system partition "C:\", perform the following steps:

1. Open the CMD terminal with administrator rights.
2. `uwfmgr filter enable`
3. `uwfmgr volume protect C:`
4. Add exclusions for SCADAProjects and Siemens folders.
5. `uwfmgr file add-exclusion C:\ProgramData\SCADAProjects`
6. `uwfmgr file add-exclusion C:\ProgramData\Siemens`
7. Restart the Open Controller and check the configuration.
8. Open the CMD terminal with administrator rights.
9. `uwfmgr get-config`

You can find an overview of the available commands for UWF in the section UWF Manager. (https://learn.microsoft.com/en-us/windows/iot/iot-enterprise/customize/uwfmgrexe).

12.6.7 Retentive memory NVRAM

A retentive memory is a non-volatile memory for storing a limited amount of data in the event of power failure.

The data defined as retentive is stored in retentive memory. This data is retained beyond a power-off or power failure.

To enable the use of NVRAM, a corresponding function is implemented in the S7-1500 Software Controller. You can activate or deactivate NVRAM with the Resource-Configurator-Tool button. If NVRAM is activated, the data is saved in the non-volatile memory in the event of a power failure. However, if "NVRAM" is deactivated, the system falls back to the "PC Mass Storage" memory, which offers no data protection in the event of a power failure. Select NVRAM by default after installing the Software Controller.

Service and repair

13

13.1 Sending the device to customer service

Before sending

Before you send in the CPU 1515SP PC3 for repair:

- Create a backup copy of your data; see section Backing up data (Page 76).
- Save your SIMATIC License Keys on a USB flash drive, see section Transferring license keys (Page 53).
- Remove your M.2-SATA SSD; see section Removing and inserting the M.2 SATA SSD (Page 97).

Sending in the device

- Pack the device into its original packaging.
- Enclose Identification data (Page 32).
- Send the package to your Siemens representative.

13.2 Removing and inserting the M.2 SATA SSD

Introduction

The CPU 1515SP PC3 has a slot for an M.2 SATA SSD. This SSD contains:

- The operating system
- Your Runtime software
- The restore area
- Your SWCU project (after configuration)

Remove the M.2 SATA SSD before you send in the CPU for repair, for example.

Requirements

CPU 1515SP PC3 is de-energized.

Removing the M.2 SATA SSD

NOTICE
Do **not** remove the M.2 SATA SSD while the Open Controller CPU 1515SP PC3 is running.

1. Open the cover of the slot, use a screwdriver if necessary.
2. Loosen the screw.
3. Pull the SSD out of the slot.
   To do this, grip the rib on the underside of the SSD.

Inserting the M.2 SATA SSD

1. Open the cover of the slot, use a screwdriver if necessary.
2. Insert the M.2 SATA SSD into the slot.
3. Press the M.2 SATA SSD into the slot.
   The M.2 SATA SSD is properly inserted if the cover can be closed without any resistance.
4. Tighten the screw. Use a torque of 0.4 to 0.6 Nm.
5. Close the cover of the slot.

13.3 Recycling and disposal



For environmentally sustainable recycling and disposal of your old equipment, contact a certified electronic waste disposal service and dispose of the equipment according to the applicable regulations in your country.

Technical specifications

14

14.1 Standards and approvals

Introduction

The general technical specifications cover the following:

- The standards and test values that the CPU 1515SP PC3 complies with and fulfills.
- The test criteria according to which the CPU 1515SP PC3 was tested.

Currently valid markings and approvals

NOTE
Information for CPU 1515SP PC3
The currently valid markings and approvals are printed on the CPU 1515SP PC3.

Safety information

⚠ WARNING

Personal injury and damage to property may occur.

In potentially explosive atmospheres, personal injury and damage to property can occur if you disconnect plug-in connections while a CPU 1515SP PC3 is in operation.

Always de-energize the CPU 1515SP PC3 in potentially explosive atmospheres when disconnecting plug-in connections.

⚠ WARNING

Flying sparks due to loose cables

Risk of explosion in hazardous areas.

USB cables and PROFINET connectors may detach from the device in the case of strong oscillation and high vibrating loads.

Attach these cables to the strain relief of the device using cable ties.

⚠ WARNING
Explosion hazard Exchanging components can void compliance with Class I, DIV. 2.

⚠ WARNING
Field of application This device is only suitable for use in Class I, Div. 2, Group A, B, C, D, or in non-hazardous areas.

CE marking

CE

CPU 1515SP PC3 meets the requirements and protection objectives of the following directives and complies with the harmonized European standards (EN) published for programmable logic controllers in the Official Journal of the European Community:

- 2014/30/EU "Electromagnetic Compatibility" (EMC Directive)
- 2014/34/EU "Equipment and protective systems intended for use in potentially explosive atmospheres" (Explosion Protection Directive)
- 2011/65/EU "Restriction of the use of certain hazardous substances in electrical and electronic equipment" (RoHS Directive)
- 2006/42/EC "Machinery Directive" for fail-safe modules

The conformity declaration certificates are available for the responsible authorities and are kept at the following address:

Siemens AG
Digital Factory
Factory Automation
DF FA TI COS TT
Postfach 1963
D-92209 Amberg

They are also available for download on the Siemens Industry Online Support (https://support.industry.siemens.com/cs/de/en/) web pages, keyword "Declaration of Conformity".

UKCA marking

The ET 200SP distributed I/O system complies with the designated British standards (BS) for programmable logic controllers published in the official consolidated list of the British Government. The ET 200SP distributed I/O system meets the requirements and protection targets of the following regulations and associated supplements:

- The Electrical Equipment (Safety) Regulations 2016 (S.I. 2016 No. 1101), and related amendments
- Electromagnetic Compatibility Regulations 2016 (S.I. 2016 No. 1091), and related amendments
- Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016 (S.I. 2016 No. 1107), and related amendments
- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (S.I. 2012 No. 3032), and related amendments
- Supply of Machinery (Safety) Regulations 2008 (S.I. 2008 No. 1597), and related amendments for ET 200SP safety components (fail-safe modules)

The UK Declarations of Conformity are available to the relevant authorities at the following address:

Siemens Aktiengesellschaft
Digital Industries
Factory Automation
DI FA TI COS TT
P.O. Box 1963
D-92209 Amberg, Germany

You can also find the UK Declarations of Conformity on the Internet (https://sieportal.siemens.com/su/blKy1).

cULus approval

Underwriters Laboratories Inc., complying with

- UL 508 (Industrial Control Equipment) OR UL 61010-1 and UL 61010-2-201
- CSA C22.2 No. 142 (Process Control Equipment) OR CAN/CSA. C22.2 No. 61010-1 and CAN/CSA C22.2 No. 61010-2-201

cULus HAZ. LOC. approval



Underwriters Laboratories Inc., complying with

- UL 508 (Industrial Control Equipment) OR UL 61010-1 and UL 61010-2-201
- CSA C22.2 No. 142 (Process Control Equipment) OR CAN/CSA C22.2 No. 61010-1 and CAN/CSA C22.2 No. 61010-2-201
- ANSI/ISA 12.12.01
- CSA C22.2 No. 213 (Hazardous Location)

APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

Installation Instructions for cULus haz.loc.

- WARNING - Explosion Hazard - Do not disconnect while circuit is live unless area is known to be non-hazardous.
- WARNING - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2 or Zone 2.
- This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D; Class I, Zone 2, Group IIC; or non-hazardous locations.

WARNING: EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE RELAY.

Reference

The certificates for the markings and approvals can be found on the Internet under Siemens Industry Online Support (https://support.industry.siemens.com/cs/de/en/).

IEC 61131

CPU 1515SP PC3 with the S7-1500 Software Controller CPU 1505SP (F/T/TF) fulfills the requirements and criteria of the standard IEC 61131-2 (Programmable Logic Controllers, Part 2: Equipment requirements and tests).

PROFINET standard

CPU 1515SP PC3 is based on the IEC 61158 Type 10 standard.

PROFIBUS standard

CPU 1515SP PC3 is based on the IEC 61158 Type 3 standard.

IO-Link standard

CPU 1515SP PC3 is based on the IEC 61131-9 standard.

Use in industrial environments

CPU 1515SP PC3 is designed for industrial applications. It meets the following standards for this type of use:

- Interference requirements EN IEC 61000-6-4
- Immunity requirements EN IEC 61000-6-2

Use in mixed areas

You can use the CPU 1515SP PC3 in a mixed area under certain conditions. A mixed area is used for residential purposes and for commercial operations that do not significantly impact on residents.

If you use the CPU 1515SP PC3 in a mixed area, you must ensure that the limits of the generic standard EN IEC 61000-6-3 are observed with regard to the emission of radio frequency interference. Suitable measures for observing these limits for use in a mixed area are, for example:

- Installation of the CPU 1515SP PC3 in grounded control cabinets
- Use of noise filters in the supply cables

An individual acceptance test is also required.

Use in residential areas

NOTE

CPU 1515SP PC3 not intended for use in residential areas

CPU 1515SP PC3 is not intended for use in residential areas. Using CPU 1515SP PC3 in residential areas may interfere with radio or television reception.

Environmental Product Declaration (EPD)

Siemens is committed to the development and production of environmentally compatible and sustainably produced equipment.

With the help of an Environmental Product Declaration (EPD), you can obtain information on the "ecological footprint" of your Siemens product.

The EPD is based on the international ISO 14021 standard "Environmental labels and declarations – Self declared environmental claims – Type II".

EPDs are based on independently verified data from life cycle assessments, life cycle inventory analyses and information modules that comply with the ISO 14040 series of standards. The EPD contains comprehensive data relating to ingredients and substances (REACH, RoHS), fire load, energy consumption, packaging and disposal information for your Siemens product.

You can find the current Environmental Product Declarations (EPDs) for the ET 200SP distributed I/O system on the Internet (https://support.industry.siemens.com/cs/ww/en/ps/14031/cert?ct=5669).

Importer addresses

In the following table, you can find the importer addresses for specific countries:

Countries	Address
United Kingdom (UK)	Siemens plc. Manchester M20 2UR
Turkey (TR)	Siemens San. ve Tic. A.Ş. Yakacık Cad. No:111 34870 Kartal/İstanbul

14.2 Electromagnetic compatibility

Definition

Electromagnetic compatibility (EMC) is the ability of an electrical installation to function satisfactorily in its electromagnetic environment without interfering with that environment.

CPU 1515SP PC3 also fulfills the requirements of the EMC law of the European Single Market. This requires that the CPU 1515SP PC3 complies with the specifications and guidelines relating to electrical configuration.

EMC according to NE 21

CPU 1515SP PC3 complies with the EMC requirements of the NAMUR directive NE 21.

Pulse-shaped disturbance

The following table shows the electromagnetic compatibility of the CPU 1515SP PC3 with regard to pulse-shaped disturbances.

Table 14-1 Pulse-shaped disturbance

Pulse-shaped disturbance	Test voltage	corresponds to degree of severity
Electrostatic discharge according to IEC 61000-4-2.	Air discharge: ±8 kV Contact discharge: ±6 kV	3 3
Burst pulses (high-speed transient disturbance) according to IEC 61000-4-4.	±2 kV (power supply line) ±2 kV (signal line >30 m) ±1 kV (signal line <30 m)	3 4 3
High-energy single pulse (surge) according to IEC 61000-4-5 External protective circuit required (see function manual Designing interference-free controllers (https://support.industry.siemens.com/cs/ww/en/view/59193566))		

Pulse-shaped disturbance	Test voltage	corresponds to degree of severity
• asymmetric coupling	±2 kV (power supply lines) DC with protective elements ±2 kV (signal/data line only > 30 m), with protective elements	3
• symmetric coupling	±1 kV (power supply lines) DC with protective elements ±1 kV (signal/data line only > 30 m), with protective elements	

Sinusoidal disturbance

The following table shows the electromagnetic compatibility of the CPU 1515SP PC3 with regard to sinusoidal disturbances.

- RF radiation

Table 14-2 Sinusoidal disturbance variables with RF radiation

RF radiation according to IEC 61000-4-3/NAMUR 21 Electromagnetic RF field, amplitude-modulated		corresponds to degree of severity
80 MHz to 2700 GHz	2.7 GHz to 6 GHz	3
10 V/m	3 V/m	
80% AM (1 kHz)		

- RF coupling

Table 14-3 Sinusoidal disturbance variables with RF coupling

RF coupling according to IEC 61000-4-6	corresponds to degree of severity
(10 kHz) 150 kHz to 80 MHz	3
10 V_{rms} unmodulated	
80% AM (1 kHz)	
150 Ω source impedance	

Emission of radio interference

Interference emission of electromagnetic fields in accordance with IEC 61000-6-4/CISPR 16-2-3.

Table 14-4 Interference emission of electromagnetic fields

Frequency	Emitted interference	Measuring distance
30 MHz to 230 MHz	< 40 dB (µV/m)Q	10 m
230 MHz to 1000 MHz	< 47 dB (µV/m)Q	10 m
From 1 GHz to 3 GHz	<76 dB (µV/m) P	3 m
From 3 GHz to 6 GHz	<80 dB (µV/m) P	3 m

Interference via 24 V DC power supply according to IEC 61000-6-4, Annex A / CISPR 16-2-1.

Table 14-5 Interference emission via the AC power supply

Frequency	Emitted interference
0.15 to 0.5 MHz	<89 dB (µV) Q <76 dB (µV) M
0.5 to 30 MHz	<83 dB (µV) Q <70 dB (µV) M

Maximum length of USB cables

The maximum length of USB cables is three meters.

14.3 Shipping and storage conditions

Introduction

CPU 1515SP PC3 exceeds the requirements of IEC 61131-2 with regard to transportation and storage conditions. The following information applies to modules that are shipped and/or stored in their original packaging.

Table 14-6 Shipping and storage conditions for modules

Type of condition	Permissible range
Free fall (in shipping package)	≤1 m
Temperature	From -40 °C to +70 °C
Barometric pressure	from 1140 hPa to 660 hPa (corresponds to an altitude of -1000 m to 3500 m)
Relative humidity	5% to 95%, without condensation
Sinusoidal vibrations according to IEC 60068-2-6	5 - 8.4 Hz: 3.5 mm constant amplitude 8.4 - 125 Hz: 1 g constant acceleration
Shock according to IEC 60068-2-27	150 m/s^2, 11 ms

14.4 Mechanical and climatic ambient conditions

Operating conditions

CPU 1515SP PC3 is intended for weather-protected, stationary use. The operating conditions are based on the requirements of DIN IEC 60721-3-3:

- Class 3M3 (mechanical requirements)
- Class 3K3 (climatic requirements)

Mechanical ambient conditions

The table below shows the mechanical ambient conditions in the form of sinusoidal oscillations.

Table 14-7 Mechanical environmental conditions for BA 2×RJ45

Frequency band	
5 Hz ≤ f ≤ 8.4 Hz	3.5 mm amplitude
8.4 Hz ≤ f ≤ 150 Hz	1 g constant acceleration

Table 14-8 Mechanical environmental conditions for BA 2×FC

Frequency band	CPU 1515SP PC3
5 Hz ≤ f ≤ 8.4 Hz	7.5 mm amplitude
8.2 Hz ≤ f ≤ 500 Hz	2 g constant acceleration

Test of mechanical ambient conditions

The table below provides important information with respect to the type and scope of the test of ambient mechanical conditions.

Table 14-9 Test of mechanical ambient conditions

Condition tested	Test Standard	Comment
Vibration	Vibration test according to IEC 60068-2-6 (sine)	Type of oscillation: Frequency sweeps with a rate of change of 1 octave/minute. BA 2×RJ45 • 5 Hz ≤ f ≤ 8.4 Hz, 3.5 mm constant amplitude • 8.4 Hz ≤ f ≤ 150 Hz, 1 g constant acceleration BA 2×FC • 5 Hz ≤ f ≤ 8.2 Hz, 7.5 mm constant amplitude • 8.2 Hz ≤ f ≤ 500 Hz, 2 g constant acceleration Duration of vibration: 10 frequency sweeps per axis in each of 3 vertically aligned axes
Shock	Shock, tested according to IEC 60068-2-27	Type of shock: Half-sine Shock intensity: 150 m/s^2 peak value, 11 ms duration Direction of shock: 3 shocks in each direction (+/-) at each of 3 vertically aligned axes

Climatic ambient conditions

You can use the CPU 1515SP PC3 under the following climatic ambient conditions:

Table 14-10 Climatic ambient conditions

Ambient conditions	Permissible range	Comments
Temperature: Horizontal mounting	• 50 °C or higher	In configuration with max. 32 ET 200SP modules: 3 x 0.3 A USB load; M.2 SATA SSD, max. 10% load Programs with 3D graphics are disabled.
Temperature: Vertical mounting position	• 40 °C or higher	In configuration with max. 32 ET 200SP modules: 3 x 0.3 A USB load; M.2 SATA SSD Programs with 3D graphics are disabled.
Permitted temperature change	10 K/h	-
Relative humidity	From 10 to 95%	Without condensation
Barometric pressure	From 1140 to 795 hPa	Corresponds to an altitude of -1000 m to 2000 m
Concentration of pollutants	ANSI/ISA-71.04 severity level G1; G2; G3	-

14.5 Information on insulation, protection class, degree of protection and rated voltage

Insulation

The insulation is designed according to the requirements of EN 61131-2: 2007.

NOTE

In the case of modules with 24 V DC (SELV/PELV) supply voltage, galvanic isolations are tested with 707 V DC (type test).

NOTE

The ground/minus pole of the 24 V DC power supply is connected via the device with functional ground (FE).

Pollution degree / overvoltage category according to IEC 61131

- Degree of pollution 2
- Overvoltage category: II

Protection class in accordance with IEC 61131-2:2007

The distributed I/O system ET 200SP fulfills protection class I and includes parts of protection class II and III. CPU 1515SP PC3 is a part of protection class III.

The grounding of the mounting rail must meet the requirements for functional earth FE.

The installation location (e.g. enclosure, control cabinet) must have a protective conductor connection that meets the standard to maintain protection class I.

Degree of protection IP20

Degree of protection IP20 according to IEC 60529, i.e.:

- Protection against contact with standard probe
- Protection against foreign objects with diameters in excess of 12.5 mm
- No protection against water

Rated voltage for operation

CPU 1515SP PC3 operates with the nominal voltage and the corresponding tolerances listed in the following table.

Table 14-11 Rated voltage for operation

Rated voltage	Tolerance range
24 V DC	19.2 to 28.8 V DC [1]

[1] Static value: Creation as functional extra-low voltage with safe electrical isolation in accordance with IEC 60364-4-41

14.6 Use of the ET 200SP in zone 2 potentially explosive atmospheres

See product information Use of subassemblies/modules in a Zone 2 Hazardous Area (https://support.industry.siemens.com/cs/ww/en/view/19692172).

14.7 Technical specifications

You can find the latest technical specifications via the following links in Siemens Industry Online Support.

CPU	Article number	Technical specifications
CPU 1515SP PC3 (basic device)	6ES7677-2DD40-0AA0	Technical specifications CPU 1515SP PC3 (basic device) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2DD40-0AA0)
CPU 1515SP PC3 (Win 11)	6ES7677-2DD44-0GB0	Technical specifications CPU 1515SP PC3 (Win 11) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2DD44-0GB0)

CPU	Article number	Technical specifications
CPU 1515SP PC3 F (Win 11)	6ES7677-2SD44-0GB0	Technical specifications CPU 1515SP PC3 F (Win 11) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2SD44-0GB0)
CPU 1515SP PC3 T (Win 11)	6ES7677-2VD44-0GB0	Technical specifications CPU 1515SP PC3 T (Win 11) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2VD44-0GB0)
CPU 1515SP PC3 TF (Win 11)	6ES7677-2WD44-0GB0	Technical specifications CPU 1515SP PC3 TF (Win 11) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2WD44-0GB0)
CPU 1515SP PC3 (IndOS)	6ES7677-2DD43-0GB0	Technical specifications CPU 1515SP PC3 (IndOS) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2DD43-0GB0)
CPU 1515SP PC3 F (IndOS)	6ES7677-2SD43-0GB0	Technical specifications CPU 1515SP PC3 F (IndOS) (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7677-2SD43-0GB0)
S7-1500 Software Controller CPU 1505SP	6ES7672-5DC14-0YA0	Technical specifications S7-1500 Software Controller CPU 1505SP (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7672-5DC14-0YA0)
S7-1500 Software Controller CPU 1505SP F	6ES7672-5SC14-0YA0	Technical specifications S7-1500 Software Controller CPU 1505SP F (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7672-5SC14-0YA0)
S7-1500 Software Controller CPU 1505SP T	6ES7672-5VC14-0YA0	Technical specifications S7-1500 Software Controller CPU 1505SP T (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7672-5VC14-0YA0)
S7-1500 Software Controller CPU 1505SP TF	6ES7672-5WC14-0YA0	Technical specifications S7-1500 Software Controller CPU 1505SP TF (https://sieportal.siemens.com/en-ww/products-services/detail/6ES7672-5WC14-0YA0)

14.8 Partitions in the delivery state

14.8.1 Partitions for the Windows version

Partitioning the M.2 SATA SSD

The following partitions are set up on the 128 GB M.2 SATA SSD in the delivery state:

Partition	Description	Size	File system
SDA1	EFI System	256 MByte	VFAT
SDA2	Microsoft reserved	128 MByte	
SDA3 (C:)	Basic data	58 GByte	NTFS

Partition	Description	Size	File system
SDA4	Recovery	602 MByte	NTFS
SDA5 (D:)	Basic data	58,9 GByte	NTFS
SDA6	Basic data	1,3 GByte	

DANGER

Do not change the configuration of the partitions. This is the only way to ensure that the Software Controller continues to operate without error.

14.8.2 Partitions for the IndOS version

Partitioning the M.2 SATA SSD

The following partitions are set up on the 128 GB M.2 SATA SSD in the delivery state:

Partition	Description	Size	File system
SDA1	EFI System	256 MByte	VFAT
SDA2	Basic data	128 MByte	VFAT
SDA3	Basic data	128 MByte	VFAT
SDA4	Linux extended boot	2 GByte	VFAT
SDA5	Linux filesystem	8 GByte	EXT4
SDA6	Linux filesystem	1 GByte	EXT4
SDA7	Basic data	4 GByte	RAW
SDA8	Linux root	103,7 GByte	CRYPTO_LUKS

DANGER

Do not change the configuration of the partitions. This is the only way to ensure that the Software Controller continues to operate without error.

14.9 Display resolution

The table below shows the resolutions available with the DisplayPort V1.4 standard:

DisplayPort V1.4 standard	Resolution	Refresh rate
720p	1280 x 720	30 Hz
720p	1280 x 720	60 Hz
1080p	1920 x 1080	30 Hz
1080p	1920 x 1080	60 Hz
1080p	1920 x 1080	120 Hz

DisplayPort V1.4 standard	Resolution	Refresh rate
1080p	1920 x 1080	144 Hz
1080p	1920 x 1080	165 Hz
1080p	1920 x 1080	180 Hz
1080p	1920 x 1080	200 Hz
1080p	1920 x 1080	240 Hz
1440p (2K)	2560 x 1440	30 Hz
1440p (2K)	2560 x 1440	60 Hz
1440p (2K)	2560 x 1440	120 Hz
1440p (2K)	2560 x 1440	144 Hz
1440p (2K)	2560 x 1440	165 Hz
2160p (4K)	3840 x 2160	30 Hz
2160p (4K)	3840 x 2160	60 Hz
2160p (4K)	3840 x 2160	120 Hz
2160p (4K)	3840 x 2160	144 Hz
2880p (5K)	5120 x 2880	30 Hz

Dimension drawings

15

This section contains dimension drawings of the module installed on a mounting rail. Take the dimensions into account when installing in cabinets.

Dimension drawing of CPU 1515SP PC3

The following figure shows the front view of a CPU 1515SP PC3.

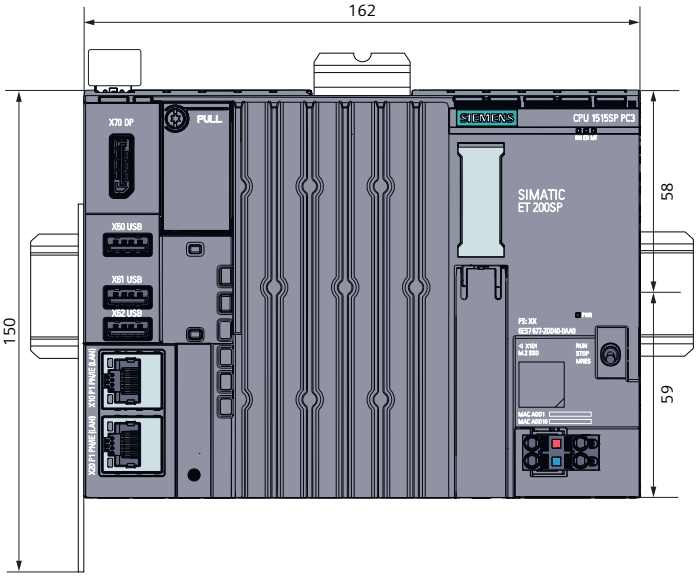


Figure 15-1 Dimension drawing CPU 1515SP PC3, front view

The following figure shows the side view of a CPU 1515SP PC3.

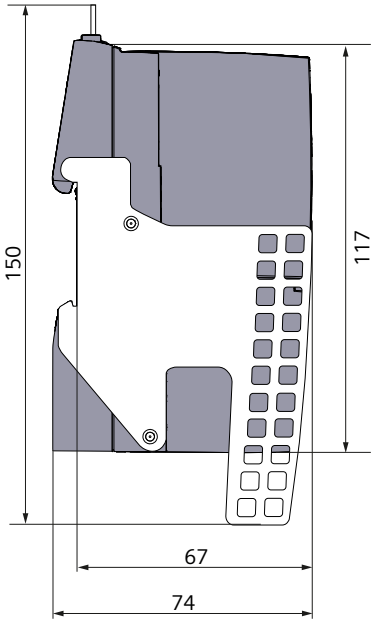


Figure 15-2 Dimension drawing CPU 1515SP PC3, side view

Spare parts/accessories

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16.1 Accessories/spare parts

Accessories for CPU 1515SP PC3

Table 16-1 Accessories for CPU 1515SP PC3

Description	Article number
BusAdapter/media converter; 1 unit	
• BA 2×FC (PROFINET BusAdapter with FastConnect Ethernet connection)	6ES7193-6AF00-0AA0
• BA 2×RJ45 (PROFINET BusAdapter with standard Ethernet socket)	6ES7193-6AR00-0AA0
• BA 2xM12 (2 x M12 push-pull sockets, D coding, also suitable for M12 standard, for PROFINET)	6ES7193-6AM00-0AA0
Server module; 1 unit	6ES7193-6PA00-0AA0
Strain relief for CPU 1515SP PC3	A5E32291462
SIMATIC cable strain relief for SIMATIC BusAdapter (5 items)	6ES7193-6RA00-1AN0
SIMATIC IPC accessories DisplayPort cable, length: 3 m	6AV7860-0DH30-0AA0
SIMATIC IPC accessories DisplayPort cable, length: 5 m	6AV7860-0DH50-0AA0
DisplayPort cable, length: 5 m, E74020-C AWM Style 20276, 80°C, 30 V, VW-1 (with integrated ferrite cores at both ends)	-
SIMATIC PC, DisplayPort according to DVI-I for onboard graphics	6ES7648-3AF00-0XA0
Reference identification label, sheet with 16 labels, 10 units	6ES7193-6LF30-0AW0
Mounting rails, tin-plated steel strip	
• Length: 483 mm	6ES5710-8MA11
• Length: 430 mm	6ES5710-8MA21
• Length: 830 mm	6ES5710-8MA31
• Length: 2000 mm	6ES5710-8MA41
Replacement SSD: M.2 SSD, 128 GB empty, installed in slider for CPU 1515SP	6ES7678-2BA00-0AA0

Online catalog

Additional article numbers can be found on the Internet in the online catalog and online ordering system (https://mall.industry.siemens.com).

Appendix A

A.1 Siemens Industry Online Support

You can find current information on the following topics quickly and easily here:

- **Product support**

  All the information and extensive know-how on your product, technical specifications, FAQs, certificates, downloads, and manuals.

- **Application examples**

  Tools and examples to solve your automation tasks – as well as function blocks, performance information and videos.

- **Services**

  Information about Industry Services, Field Services, Technical Support, spare parts and training offers.

- **Forums**

  For answers and solutions concerning automation technology.

- **mySupport**

  Your personal working area in Industry Online Support for messages, support queries, and configurable documents.

This information is provided by the Siemens Industry Online Support in the Internet (https://support.industry.siemens.com/cs/de/en/).

A.2 Troubleshooting

Problem	Possible cause	Remedy
CPU 1515SP PC3 does not work.	CPU 1515SP PC3 is not supplied with power.	Check the power supply.
Time and/or date of the CPU 1515SP PC3 are not correct.	CPU 1515SP PC3 was not connected for more than 6 weeks.	Check the settings in Windows.
USB device is not working.	USB power supply is overloaded.	Use an external power supply for the USB device (see section Application planning (Page 35)).

SIMATIC S7-1500 data

B

The EU Data Act, a key component of the European data strategy, entered into force on 11 January 2024.

The following information provides an overview of data that the ET 200SP distributed I/O system generates and that is accessible to you.

B.1 Data of the CPU

Type, format, and estimated scope of product data that can be generated

Type of data	Formats	Estimated scope
Process data (input and output data, states, alarms)	Numeric formats, binary formats	Cyclic processing Depending on application
Configuration and program data (upload to programming device/PC)	Binary formats, string formats	Depending on application
Diagnostics data, system and security events, service data	Time formats, string formats, CSV, binary formats	Depending on application Several hundred bytes per event
Operating data (runtimes, cycle times, CPU utilization)	Numeric formats, time formats, JSON	Depending on application
Log data	Time formats, string formats, CSV	Depending on application

Continuous and real-time data generation

The ET 200SP distributed automation system is able to generate data continuously and in real time. Data acquisition takes place continuously throughout the entire operation. The CPU operates with defined cycle times in which process data is acquired and processed.

Data storage and storage duration

Data storage and storage duration

The ET 200SP distributed automation system stores data in integrated memory areas of the CPU.

Local data storage	Storage capacity		Storage duration
	CPU 1505SP	CPU 1505SP F/T/TF	
Load memory	320 MB	320 MB	Permanent
Code work memory	3 MB	4.5 MB	During operation of the CPU

Local data storage	Storage capacity		Storage duration
Data work memory	10 MB	10 MB	During operation of the CPU
Retentive memory	410 KB	410 KB	Permanent
PC mass storage	5 MB	5 MB	No retentive data is maintained in the event of a power failure

More information

You can find more information on memory areas, retentive memory, and memory usage in the Structure and use of the CPU memory Function Manual (https://support.industry.siemens.com/cs/ww/en/view/59193101).

Remote data storage

Data can be transmitted to external systems via various communications interfaces of the ET 200SP, such as PROFINET and Industrial Ethernet.

The ET 200SP can send data to various remote systems, including SCADA systems, SQL databases, cloud platforms (e.g. Insights Hub), and file servers.

The ET 200SP can send logging data to a SIEM system in the form of Syslog messages.

The storage duration on external systems depends on the configuration of the respective system.

The CPU can be integrated as a data source into the Siemens Industrial Edge concept.

Data access/retrieval, terms of use and quality of service

Type of data	Access/retrieval via	Terms of use	Quality of service*
Process data (input and output data, states, alarms)	TIA Portal Web server OPC UA HMI/SCADA systems Display	User management Authentication Certificates	Prioritization of control tasks over data access Data throughput rates of up to 100 Mbps via PROFINET Encrypted data transmission available (HTTPS, TLS)
Configuration and program data	TIA Portal Web server	User management Authentication Certificates	Encrypted data transmission available (HTTPS, TLS)
Diagnostics data, system and security events, service data	TIA Portal Web server Display	User management Authentication Certificates	Encrypted data transmission available (HTTPS, TLS)
Operating data (runtimes, cycle times, CPU utilization)	TIA Portal Web server HMI/SCADA systems SIMATIC controller profiling	User management Authentication Certificates	Encrypted data transmission available (HTTPS, TLS)
Log data	TIA Portal Trace and logic analyzer function	User management Authentication	Encrypted data transmission available (HTTPS, TLS)

* "Quality of service" refers to the ability of the ET 200SP to efficiently manage network resources and ensure that certain performance requirements relating to data transfer are fulfilled.

Deleting data from CPU 1505SP Software Controller

The "Reset to factory settings" function is available to delete all the data stored on the Software Controller.

To reset the Software Controller to the factory settings, the following access options are available:

- Operating mode buttons/mode switches of the hardware platform used
- Display
- TIA Portal

More information

You can find more information on deleting data in the following documents:

- Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F), CPU 1508S (F/T/TF) V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109998256)
- Operating Instructions Software Controller CPU 1505SP (F), CPU 1507S (F) and CPU 1508S (F) SIMATIC Industrial OS V40.1 (https://support.industry.siemens.com/cs/ww/en/view/109989745)
- System Manual ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/58649293)

B.2 Data of the interface and I/O modules

For detailed, device-specific information on the generated data of the additional modules used, observe the relevant manuals for these components.

List of abbreviations

C

C.1 Abbreviations

Abbreviation	Term	Meaning
AC	Alternating Current	Alternating current
ALM	Automation License Manager	Tool for managing license keys in STEP 7
BIOS	Basic Input Output System	Basic Input Output System. A set of important software routines used after the startup of the CPU to load the operating system and to provide the routines for data exchange between hardware components.
CE	Communauté Européenne	CE label
CoA	Certificate of Authenticity	Certificate of Authenticity, label with Microsoft Windows "Product Key"
CoL	Certificate of License	Certificate of License for the SIMATIC software loaded
CPU	Central Processing Unit	
DC	Direct Current	Direct current
DP	DisplayPort	Interface for transfer of image and video data for monitors
ESD	Components sensitive to electrostatic charge	
EN	European standard	
GbE	Gigabit Ethernet	
HMI	Human Machine Interface	User interface
IEC	International Electronical Commission	
IM	Interface module	The interface module connects the ET 200SP distributed I/O system with the IO controller and exchanges data with the I/O modules via the backplane bus.
LAN	Local Area Network	Computer network that is limited to a local area.
LED	Light Emitting Diode	Light emitting diode
LLDP	Link Layer Discovery Protocol	Protocol that enables the exchange of information between adjacent devices.
M.2		Specification for internal computer expansion cards and corresponding ports.
NTFS	New Technology File System	File system that offers targeted access protection at the file level.
NVRAM	Non-Volatile Random-Access Memory	Non-volatile data memory that is RAM-based, the data content of which is retained without external power supply.
PC	Personal Computer	
PELV	Protective Extra Low Voltage	PELV, previously called "extra low voltage with safe isolation", is a protective measure against electrical shock. See EN 50178.

Abbreviation	Term	Meaning
PN	PROFINET	
PG	Programming device	Compact programming device which meets the special requirements of industry. The PG is fully equipped for programming SIMATIC PLCs.
PS	Power Supply	Power supply
PT	Power Tags	Process tags; tags enable data exchange between the components of an automation process, for example, between the HMI device and the controller.
RAM	Random Access Memory	Main or work memory of a computer with direct access, allowing read access to data and editing.
RT	Runtime	
SATA	Serial ATA, Serial AT Attachment	Computer interface for data exchange with hard disk drives, solid-state drives and other storage devices
SELV	Safety Extra Low Voltage	Safety Extra Low Voltage; electrical circuit in which the voltage cannot exceed 30 V AC (RMS), 42.4 V AC peak or 60 V DC under NORMAL CONDITIONS and CONDITIONS OF A SINGLE FAULT, including ground faults in other circuits.
SWCPU	Software Controller	
UL	Underwriters Laboratories Inc.	
UWF	Unified Write Filter	Configurable write protection under Windows 11, for protection of data storage media (for example, M.2 SATA SSD, internal USB drives, etc.); see Data loss in the event of an unexpected shutdown (Page 92)
USB	Universal Serial Bus	Serial bus system for connecting a computer to external devices.

Glossary

Backup

A copy of a program, data storage medium or data inventory made for archiving purposes or to prevent the loss of otherwise irretrievable data in case the working copy is damaged or destroyed.

Cold restart

A startup procedure commencing when the CPU is switched on. Upon a cold restart, the system typically performs some basic hardware checks and then loads the operating system from the hard disk into the work memory.

Controller

Integrated hardware and software controlling the operation of a specific internal or I/O device (e.g. keyboard controller).

coreboot

Open Source firmware that performs early hardware initialization (CPU, memory, chip set) and then passes control to a payload (bootloader or runtime) to load the operating system. It replaces proprietary BIOS/UEFI for faster boot processes that can be better customized.

Device configuration

The device configuration of a PC/programming device includes information on the features and options of the PC/programming device such as memory configuration, drive types, monitor, network address etc. The data is stored in a configuration file and is used by the operating system to load the corresponding device drivers or assign device parameters.

Drivers

Program sections of the operating system. They convert data from the user programs to the specific formats required by the I/O devices (e.g. hard disks, monitors, printers).

Ethernet

Local area network (bus structure) for text and data communication with a data transfer rate of 10/100/1000/2500 Mbps.

Image

An image is an copy of hard disk partitions, for example, which is saved to a file so that it can be restored if necessary.

Interface

- Connection between individual hardware elements such as PCs, programming device, printer or screen by means of physical plug-in connections (cables).
- Connection between different programs to allow them to be used together.

LAN

Local Area Network: LAN refers to a local network consisting of a group of computers and other devices which are distributed over a relatively restricted area and connected through communication lines. The devices connected to a LAN are referred to as nodes. The purpose of networks is the shared use of files, printers or other resources.

License key

The license key is the electronic license stamp of a license. Siemens provides a license key for software that is protected by licensing laws.

NVRAM

NVRAM stands for Non-Volatile Random-Access Memory. The data stored in this memory is retained even if the computer is switched off or there is no longer a power supply.

Open Controller

ET 200SP Open Controller, CPU 1515SP PC (F/T/TF), is a robust, compact control system that combines the function of an ET 200SP controller with a PC-based platform. The controller can be used to control special and series machines or in a distributed manner to control plants. In addition to the Standard and Fail-safe variants, the Technology and Technology Fail-safe variants are also available for the Open Controller.

Operating system

Generic term which describes all functions for controlling and monitoring user program execution and distribution of system resources to the user programs as well as maintenance of the operating mode in cooperation with the hardware.

Power options

The power options can be used to reduce the power consumption of the computer while still keeping it ready for immediate use. In Windows via **Start** > **Control Panel** > **Hardware and Sound** > **Power Options**.

Restart

The restart of the company that is already in operation using, for example, the <Ctrl+Alt+Del> shortcut without switching off the power supply.

ROM

Read Only Memory. ROM refers to a read-only memory where each memory location can be addressed individually. The stored programs or data are hard-coded and are preserved even in the event of a power failure.

S.M.A.R.T.

Self-Monitoring, Analysis and Reporting Technology (SMART or S.M.A.R.T.) is an industry standard for storage media. It provides for permanent monitoring of relevant parameters and thus early recognition of pending defects.

SATA

Serial Advanced Technology Attachment. An interface for hard disk drives and optical drives with serial data transfer.

Software Controller

Software Controller, CPU 1505SP (F/T/TF), is a software implementation of the SIMATIC S7-1500 controller that runs on industrial PCs. It is designed to operate independently of general operating systems on supported platforms.

USB Restore flash drive

The USB Restore flash drive is a USB flash drive you create yourself to reset your system partition or the entire hard disk to the factory state in the event of an error. The USB flash drive contains all the necessary image files and is bootable.

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