SIMATIC

S7-1500, ET 200SP, ET 200pro

Web server

Edition 12/2017
Preface

Documentation guide

General information

Web pages

SIMATIC

S7-1500, ET 200SP, ET 200pro
Web server

Function Manual
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 personnel are those who, based on their training and experience, are capable of identifying risks and
avoiding potential hazards when working with these products/systems.

Proper use of Siemens products
Note the following:

**WARNING**
Siemens products may only be used for the applications described in the catalog and in the relevant technical
documentation. 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.

Trademarks
All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication
may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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.
Preface

Purpose of the documentation
This documentation supports you in the operation of the Web server.
The Web server offers, among other things, web page access to diagnostic data and to process data of the CPU.

Basic knowledge required
The following knowledge is required in order to understand the documentation:

- General knowledge in the field of automation technology
- Knowledge of the industrial automation system SIMATIC
- Experience of working with Windows-based computers
- Knowledge about how to use STEP 7 (TIA Portal)

Scope of the documentation
This documentation is valid for CPUs as of firmware version V2.5 and contains illustrations of the Web server user interface. The images used are identical for all CPUs of the S7-1500 automation system and distributed I/O system ET 200SP and the CPU 1516pro-2 PN of distributed I/O system ET 200pro.
The displayed illustrations can differ from the interface of the Web server in some details, e.g. depending on the browser used.

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<td>New web page &quot;User files&quot; You can download ASCII files (files in binary format) from the SIMATIC Memory Card, directory UserFiles\ to the web page and delete them.</td>
<td>Section User files (Page 115)</td>
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<td>Time display as Coordinated Universal Time (UTC) or as PLC local time The display of the UTC allows you to use a uniform time for the web pages. You can set the format of the time display to Coordinated Universal Time (UTC) or PLC local time (default setting).</td>
<td>Section Start page with general CPU information (Page 35)</td>
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<td>Automated downloading, reading out and archiving of DataLogs You can, for example, read out and archive DataLogs daily from one or more CPUs at a specific time via the Web server. Automatic downloading of DataLogs is realized either by the execution of scripts in, for example, Bash or via JavaScript on your HTML user page.</td>
<td>Section Automated reading out of data logs (Page 113)</td>
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<td>The &quot;Permit access only with HTTPS&quot; check box is activated in the default setting of a configured CPU. The web pages are transmitted by default via a secure connection and are protected from attacks by third parties.</td>
<td>Section Configuring the Web server (Page 21)</td>
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<td><strong>Changed contents</strong></td>
<td>Web page &quot;Module information&quot;: New column Device number You can read the assignment of the device number to the device name.</td>
<td>Section Module information (Page 47)</td>
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<td>Web page &quot;Topology&quot;: Selection of the available PROFINET interfaces, for example X1, X2, CM 1542-1 You can select the topology display for the PROFINET interfaces X1, X2 and for connected PROFINET communication modules.</td>
<td>Section Topology (Page 62)</td>
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<td>Web page &quot;DataLogs&quot;: New column for deleting DataLog files You can delete DataLog files via the Web server.</td>
<td>Section DataLogs (Page 112)</td>
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<td>Web page &quot;Trace&quot;: Changes in the display of Trace recordings You can evaluate the Trace recordings in more detail through the extension of the display.</td>
<td>Section Trace (Page 133)</td>
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<td></td>
<td>Web page &quot;Trace&quot;: New arithmetic functions In the case of completed measurements you can combine the measured signals mathematically with each other and this generate signals that were not recorded. You can, for example, form the difference of two signals in order to better display the deviation of the current pressure of a boiler from the set setpoint value.</td>
<td></td>
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**Preface**

Web server

Function Manual, 12/2017, A5E03484625-AF

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## What's new in the Web Server function manual, Version 09/2016 compared to Version 12/2014

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<td>You protect the Web server against tapping or distortion of the communication through access via the secure transmission protocol &quot;HTTPS&quot; including a special Web server certificate.</td>
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<td>Four additional languages for the Web server interface</td>
<td>Section Start page with general CPU information (Page 35)</td>
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<td>You can set the Web server interface to the following languages:</td>
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<td>• Turkish</td>
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<td>• Portuguese (Brazil)</td>
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<td></td>
<td>Assignment of different project languages extended</td>
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<td>You can assign up to three different project languages for comments, alarm texts and diagnostic information to the user interface languages of the Web server.</td>
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<td>&quot;Start page&quot; web page extended</td>
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<td>The display of the TIA project name immediately indicates whether the desired project is selected.</td>
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<td>You can change the value of tags and write them to the CPU, also using the absolute address.</td>
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<td>New &quot;Motion Control diagnostics&quot; web page</td>
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<td>You can monitor statuses, errors, technology alarms and the current values of configured technology objects (TOs) with the Web server without STEP 7.</td>
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<td>You can read, view and save trace recordings via the Web server and thus obtain plant and project information for diagnostics and maintenance without STEP 7.</td>
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## What's new?

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## Conventions

In this documentation, "STEP 7" is used as a synonym for all versions of the configuration and programming software "STEP 7 (TIA Portal)".

Please 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 and on the section of the documentation to which particular attention should be paid.
**Security Information**

Siemens provides products and solutions with industrial security 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 security 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 security measures that may be implemented, please visit [http://www.siemens.com/industrialsecurity](http://www.siemens.com/industrialsecurity).

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 customers' exposure to cyber threats.


**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 [http://www.siemens.com/automation/service&support](http://www.siemens.com/automation/service&support).
Industry Mall

The Industry Mall is the catalog and order system of Siemens AG for automation and drive solutions on the basis of Totally Integrated Automation (TIA) and Totally Integrated Power (TIP).

Catalogs for all the products in automation and drives are available on the Internet [https://mall.industry.siemens.com](https://mall.industry.siemens.com).
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The documentation for the SIMATIC S7-1500 automation system, for CPU 1516pro-2 PN based on SIMATIC S7-1500, and for the distributed I/O systems SIMATIC ET 200MP, ET 200SP and ET 200AL is divided into three areas. This division allows you easier access to the specific information you require.

Basic information
System manuals and Getting Started manuals describe in detail the configuration, installation, wiring and commissioning of the SIMATIC S7-1500, ET 200MP, ET 200SP and ET 200AL systems; use the corresponding operating instructions for CPU 1516pro-2 PN. The STEP 7 online help supports you in configuration and programming.

Device information
Product manuals contain a compact description of the module-specific information, such as properties, terminal diagrams, characteristics and technical specifications.
General information

The function manuals contain detailed descriptions on general topics such as diagnostics, communication, Motion Control, Web server, OPC UA.

You can download the documentation free of charge from the Internet [https://support.industry.siemens.com/cs/ww/en/view/109742705].

Changes and additions to the manuals are documented in product information sheets.

You will find the product information on the Internet:


Manual Collections

The Manual Collections contain the complete documentation of the systems put together in one file.

You will find the Manual Collections on the Internet:

- S7-1500/ET 200MP [https://support.industry.siemens.com/cs/ww/en/view/86140384]
- ET 200SP [https://support.industry.siemens.com/cs/ww/en/view/84133942]

"mySupport"

With "mySupport", your personal workspace, you make the best out of your Industry Online Support.

In "mySupport", you can save filters, favorites and tags, request CAx data and compile your personal library in the Documentation area. In addition, your data is already filled out in support requests and you can get an overview of your current requests at any time.

You must register once to use the full functionality of "mySupport".

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

"mySupport" - Documentation

In the Documentation area in "mySupport" you can combine entire manuals or only parts of these to your own manual.

You can export the manual as PDF file or in a format that can be edited later.

You can find "mySupport" - Documentation on the Internet [http://support.industry.siemens.com/My/ww/en/documentation].
"mySupport" - CAx data

In the CAx data area in "mySupport", you can access the current product data for your CAx or CAe system.

You configure your own download package with a few clicks.

In doing so you can select:

- 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" - CAx data on the Internet [http://support.industry.siemens.com/my/ww/en/CAxOnline].

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 will find the application examples on the Internet [https://support.industry.siemens.com/sc/ww/en/sc/2054].

TIA Selection Tool

With the TIA Selection Tool, you can select, configure and order devices for Totally Integrated Automation (TIA).

This tool is the successor of the SIMATIC Selection Tool and combines the known configurators for automation technology into one 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 [http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool].
SIMATIC Automation Tool

You can use the SIMATIC Automation Tool to run commissioning and maintenance activities simultaneously on different SIMATIC S7 stations as a bulk operation, independently of the TIA Portal.

The SIMATIC automation tool provides a variety of functions:

- Scanning of a PROFINET/Ethernet plant network and identification of all connected CPUs
- Address assignment (IP, subnet, gateway) and station name (PROFINET device) to a CPU
- Transfer of the date and programming device/PC time converted to UTC time to the module
- Program download to CPU
- Operating mode switchover RUN/STOP
- CPU localization by means of LED flashing
- Reading out CPU error information
- Reading of CPU diagnostic buffer
- Reset to factory settings
- Updating the firmware of the CPU and connected modules

You can find the SIMATIC Automation Tool on the Internet [https://support.industry.siemens.com/cs/ww/en/view/98161300].

PRONETA

With SIEMENS PRONETA (PROFINET network analysis), you analyze the plant network during commissioning. PRONETA features two core functions:

- The topology overview independently scans PROFINET and all connected components.
- The IO check is a fast test of the wiring and the module configuration of a plant.

You can find SIEMENS PRONETA on the Internet [https://support.industry.siemens.com/cs/ww/en/view/67460624].
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 optimal exploitation of resources

You can find SINETPLAN on the Internet [https://www.siemens.com/sinetplan].
General information

2.1 Properties of the Web server

Benefits of the Web server

The Web server lets you monitor and administer the CPU through authorized users by means of a network. Evaluations, diagnostics, and modifications are thus possible over long distances. Monitoring and evaluation is possible without STEP 7; all you need is a web browser. Make sure that you take appropriate measures (e.g., limiting network access, using firewalls) to protect the CPU from being compromised.

Activating the Web server

The Web server is deactivated in the delivery state of the CPU. This means that you must load a project in which the Web server is activated to enable access using the Web browser.

Security functions

The Web server provides the following security functions:

- Access via the secure transmission protocol "HTTPS" using the CA-signed Web server certificate
- User authorizations you can configure by means of user list
- Activation for specific interfaces
Web browser

You need a web browser to access the HTML pages of the CPU.

The following web browsers have been tested for communication with the CPU. Other web browsers may also work, especially newer versions. However, if problems occur with web browsers not mentioned here that cannot be rectified, use one of the following tested web browsers:

- Internet Explorer (Version 11)
- Microsoft Edge (Version 40)
- Google Chrome (versions 47 to 62)
- Mozilla Firefox (version 47 to 56)
- Opera (Version 48)
- Mobile Safari and Chrome for iOS (iOS 10)
- Android browser (Android 6)
- Android Chrome (Android 6 to 8 (Certificate only works with restriction under Android 8))

**Note**

If you are using Internet Explorer, disable "Compatibility view" in the settings ("Options" menu).

**Note**

For access to display devices with low screen resolution, we recommend the use of basic websites, see section [Basic websites (Page 155)].

**Note**

Older versions of the web browsers mentioned which previously supported access to the HTML pages of the CPU continue to do so. However, these older versions do not support the new functions and HTML pages described in this edition.

**Note**

Two reserved communication connections are available to the Web server for communication with the CPU.

Depending on the web browser used, different numbers of connections to the CPU are established. If more connections are available, more communication connections will be established.

If no more connections are available, display or functional problems may occur, because the Web server will reject all other communication connections apart from the two that are reserved.

For this reason, the web pages may not load fully.
General information

2.1 Properties of the Web server

Note

If you access the Web server of the CPU using a communication processor (CP), ensure that the cache (temporary Internet files) is enabled in your browser. Choose the "Automatically" option in the cache settings of your browser.

If the cache is disabled or if a setting other than "Automatically" is made in the cache settings of your browser, this may result in slow access times and incomplete display.

Note

After a firmware update of the CPU, incorrect display of Web pages can occur in various Web browsers. This is caused by problems of the new CPU firmware with the cache of the Web browser.

Solution: Press F5 or clear the Web browser cache.
Reading out data

With the Web server, you can read out the following data from the CPU and, in some cases, modify and write back the data to the CPU:

- Start page with general CPU information (Page 35)
- Information on Diagnostics (Page 40)
  - Identification
  - Program protection
  - Memory
  - Runtime information
  - Fail-safe (with an F CPU)
- Contents of the diagnostics buffer (Page 45)
- Module information (Page 47)
- Firmware update (Page 52)
- Alarms (Page 55)
- Information on Communication (Page 57)
  - Important interface parameters
  - Port statistics
  - Display of the communication resources
  - Display of the communication connections
- PROFINET Topology (Page 62)
  - Graphical view (set and actual topology)
  - Table view (actual topology)
  - Status overview
- Tag status (Page 72)
- Watch tables (Page 75)
- User pages (Page 77)
- Filebrowser (Page 111)
- DataLogs (Page 112)
- User files (Page 115)
- Online backup and restoration of the configuration (Page 120)
- Diagnostic information for technology objects (Page 125)
- Evaluation of trace recordings (Page 133)
- Reading out service data (Page 154)
- Basic websites (Page 155)

On the following pages, you will find more detailed descriptions of the HTML pages.

---

**Note**

**Max. characters at data type WSTRING**

Note that the data type WSTRING is limited to 254 characters for the display in the Web server. If the 254 characters are exceeded, the Web server does not display the superfluous characters.
2.1 Properties of the Web server

Web access to the CPU via PG/PC, HMI devices and mobile terminal devices

Proceed as follows to access the Web server:

1. Use STEP 7 to download a project in which the Web server is enabled to the CPU.

2. Connect the display device (PG/PC, HMI, mobile terminal device) with the CPU or a communication module using a PROFINET interface. If you are working with WLAN, activate the WLAN on the display device and establish a connection to the access point (e.g. SCALANCE W788-1RR or SCALANCE W784-1), which is in turn connected to the CPU.

3. Open the web browser on the display device.

4. Enter the IP address of the interface of the CPU which is connected to the client in the "Address" field of the web browser in the following format: http://a.b.c.d or https://a.b.c.d (sample input: http://192.168.3.141). The CPU intro page opens. From the intro page you can navigate to additional information.

Additional information on access using the secure transmission protocol "HTTPS" is available in the section Configuring the Web server (Page 21) under "Permit access only with HTTPS".

Additional information

Using a smartphone, you can access the Web server of the CPU either via WLAN or access to the CPU via the SIMATIC S7 app (using Web server functionality). You can find additional information in the FAQ entry ID 103473392 on the Service&Support Internet page.

Note: The Web server must also be activated for access to the CPU via the SIMATIC S7 app.

The SIMATIC S7 app offers you additional functions. You can find a detailed application example with further documentation and example projects on the Service&Support Internet page.
2.2 Configuring the Web server

To use the full range of functions offered by the Web server, you need to make the settings in STEP 7 listed below:

Procedure

You have opened the properties dialog of the CPU in the STEP 7 project view.

Figure 2-1  Web server settings in STEP 7
2.2 Configuring the Web server

Activate Web server

In the default setting of a configured CPU, the Web server is disabled. Proceed as follows to enable the Web server:

1. Open the "Devices & Networks" view with a double-click in the STEP 7 project tree.
2. Select the required CPU in the device view, network view or topology view.
3. Navigate to the "Web server" area in the Inspector window properties, "General" tab.
4. Select the "Activate web server on this module" check box.

The following note is output:

![Web server security note](image)

Figure 2-2 Security note upon activation of the Web server in STEP 7

Note

When projects from deliveries are applied in which the Web server was already activated and configured on the module, this security note is not shown.
Creating and assigning a Web server certificate

The activation of the Web server using the secure transmission protocol "HTTPS" requires a valid Web server certificate.

With SIMATIC S7-1500 CPUs as of firmware V2.0, you have to create the certificate for the Web server of the CPU with STEP 7 yourself and assign it to the Web server in the CPU properties. When the hardware configuration is downloaded to the CPU, this certificate is also automatically downloaded. STEP 7 itself has a Certification Authority (CA) certificate, with which the device certificate (end-entity certificate) of the Web server is signed.

Note

If you update the firmware of a SIMATIC S7-1500 CPU or ET 200SP with firmware version < V2.0 to firmware version ≥ V2.0, a valid server certificate is automatically generated and used. The same applies to the replacement parts scenario in which a newer CPU replaces a CPU with firmware version < V2.0.

You can create different Web server certificates:

- If you use the certificate manager in the global security settings, the certificate authority of the project (CA certificate) signs the device certificate of the Web server. During loading, the CA certificate of the project is automatically loaded as well.
- If you do not use the certificate manager in the global security settings, STEP 7 generates the device certificate as a self-signed certificate.

NOTICE

Utilizing the full functionality of the Web server

A valid CA-signed Web server certificate in the CPU is a requirement for:

- User management with password-protected users
- The use of safety-related functions (online backup and restore of the CPU configuration, saving and downloading diagnostic information in csv files)

To use the full functionality of the Web server, we therefore recommend that you use the Certificate Manager to create a CA-signed server certificate in the global security settings and assign it to the CPU.
Creating a self-signed server certificate

To create a self-signed Web server certificate, follow these steps:

1. In the Inspector window Properties of the CPU, "General" tab, navigate to the "Web server > Security" area.
2. Click the "Add" button in the drop-down list to select a certificate. The "Create a new certificate" dialog opens.
3. Select the "Self-signed" check box in the subsequent dialog.
4. Enter the parameters for the new certificate or confirm the default settings.
   - Select "Web server" in the "Usage" box.
   - Enter the IP address(es) of the interface(s) or the domain name of the configured CPU in the "Subject Alternative Name" field.
5. Click "OK" to confirm.
6. Compile and load the configuration into the CPU. The device certificate of the Web server is a component of the configuration.

Creating and assigning a CA-signed Web server certificate

To create a CA-signed Web server certificate, follow these steps:

1. In the Inspector window Properties of the CPU, "General" tab, navigate to the "Protection & Security > Certificate Manager" area and select the "Use global security settings for certificate manager" option. The "Global security settings" appear in the project tree.
2. Log on as a user in the project tree in the "Global security settings > User logon" area. The "Administrator" role is the default for the first logon for a new project.
3. In the Inspector window Properties of the CPU, "General" tab, navigate to the "Web server > Security" area.
4. Click the "Add" button in the drop-down list to select a certificate. The "Create a new certificate" dialog opens.
5. In the following dialog, select the "Signed by certificate authority" check box and select the certificate authority from the drop-down list.
6. Enter the parameters for the new certificate or confirm the default settings.
   - Select "Web server" in the "Usage" box.
   - Enter the IP address(es) of the interface(s) or the domain name of the configured CPU in the "Subject Alternative Name" field.
7. Click "OK" to confirm.
8. Compile and load the configuration in the CPU. The device certificate of the Web server and the CA certificate are components of the configuration.

Note

To edit the Certificate Manager in the global security settings, you require the "Configure security" configuration permission.
**NOTICE**

**Addressing the Web server of the CPU via domain names**

If you enter the IP address(es) of the interface(s) of the configured CPU in the "Subject Alternative Name" field, the generated certificate may not be accepted by all Internet browsers. You also need to create and load a new server certificate (end-entity certificate) every time you change the IP address of an Ethernet interface of the CPU, since the identity of the CPU changes along with the IP address.

You can avoid this problem by addressing the Web server of the CPU using domain names instead of IP address(es), e.g. "myconveyer-cpu.room13.myfactory.com". For this purpose, you have to manage the domain names of your CPU via a DNS server.

**Additional information**

Detailed information on local self-signed certificates and global CA certificates, on the "Public Key Infrastructure" (PKI) and on certificate management can be found in the Communication function manual [https://support.industry.siemens.com/cs/ww/en/view/59192925] and in the online help for STEP 7, keyword "Secure communication".
Permit access only with HTTPS

Note: The activation of the Web server using the secure transmission protocol "HTTPS" requires a valid Web server certificate in the CPU. See "Creating and assigning a Web server certificate" in the section above.

To ensure secure access to the Web server the "Permit access only with HTTPS" check box is activated in the basic setting of a configured CPU.

The web pages are transmitted by default via a secure connection and are protected from attacks by third parties. Note that the URL of the CPU starts with "https://" in this case.

For error-free HTTPS access to the CPU, the following conditions must be met:

- The current date/time must be set in the CPU.

Note

When using secure communication (e.g. HTTPS), make sure that the corresponding modules have the current time of day and the current date. Otherwise, the modules evaluate the used certificates as invalid and the secure connection will not be established.

- The IP address of the CPU must be set.
- A valid server certificate offered by the CPU is installed in the Web browser.

NOTICE

Safety-related functions only possible with CA-signed Web server certificate

Online backup and restore of the CPU configuration, see section Online backup (Page 120), as well as saving and downloading diagnostic information to csv files are only possible with a CA-signed Web server certificate.

A valid CA-signed Web server certificate in the CPU is also required for user administration with password-protected users.

To use the full functionality of the Web server, we therefore recommend that you use the Certificate Manager to create a CA-signed server certificate in the global security settings and assign it to the CPU.

If no CA-signed Web server certificate is installed, a warning is output recommending that you do not use the page. To view the page, you may need to "Add an exception", depending on the Web browser used.

A valid CA certificate is available for download from the "Intro" web page under "Download certificate".

You can find instructions for installing the certificate in the help system of your Web browser and in the FAQ with the entry ID 103528224 at the Service&Support (https://support.industry.siemens.com/cs/ww/en/view/103528224) website.
Note
To protect against manipulation from the outside, download the certificate only in an environment that is guaranteed not to be compromised. Installation of the CA certificate has to be carried out once for each display device you wish to use.

Access protection
The certificate establishes an encrypted connection that prevents tapping or distortion of the communication but does not provide access protection. This means you have to protect your CPU from unauthorized access with the corresponding configuration in the user management.

You can find additional information on access protection in the online help for STEP 7, keyword: "Protection".

Automatic update
Automatic updating is activated in the default setting of a configured CPU.

The following web pages are updated automatically:

- Start page
- Diagnostics (memory, runtime information, fail-safe)
- Diagnostics buffer
- Module information
- Alarms
- Communication
- Topology
- Tag status
- Watch tables
- Filebrowser
- DataLogs
- User files
- Motion Control diagnostics
- Trace

Note
The preset activation interval is 10 seconds.
Larger amounts of data or several HTTP-/HTTPS connections increase the update time.
2.2 Configuring the Web server

Setting the language for the Web

In total, you can assign up to three different project languages to the user interface languages of the Web server.

In STEP 7, activate the project languages you wish to use and then assign one of the activated project languages to each interface language of the Web server.

You can find additional information about the language settings and a description of how to assign a project language to the interface languages in the section [Language settings](Page 31).

Amending user management

Note: A valid CA-signed Web server certificate in the CPU along with a secure HTTPS connection are required for user administration with password-protected users. See "Creating and assigning a Web server certificate" and "Permit access only with HTTPS" in this section.

![User management in STEP 7](image)

In STEP 7, you can manage the user list in the "Web server > User management" area. The user list provides the following options:

- Create users
- Specify access permissions
- Assign passwords

Users only have access to the options that are permanently linked to the access rights.

You can assign different user rights depending on the used CPU and firmware.
The available user rights can be available for selection as follows in STEP 7:

If you are not logged in, you automatically access the Web server as the user "Everybody". It does not matter in this case whether you have configured additional users.
### User "Everybody"

A user with the name "Everybody" is preset in the user list; this user has minimum access rights. These are read-only access to the intro page and start page. The user "Everybody" is defined without a password. However, you can assign all access authorizations available in STEP 7 to this user.

You can create a maximum of 20 users and a user "Everybody".

Because the user "Everybody" is defined in STEP 7 without assignment of a password, be careful of the access authorizations that you assign to this user. Certain authorizations, such as the possibility of changing the operating mode, could represent a security risk.

For the assignment of security-relevant authorizations, we recommend that you create a user with password protection in STEP 7.

---

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>

With an F-CPU, do not assign the access authorization "F-Admin" to the user "Everybody".

Make sure that you observe the warnings relating to this in the section "Restoring a backup of the safety program to an S7-300/1500 F-CPU" in the manual SIMATIC Safety - Configuring and Programming: [http://support.automation.siemens.com/WW/view/en/54110126](http://support.automation.siemens.com/WW/view/en/54110126).

Passwords should always be more than 8 characters in length and contain uppercase and lowercase characters as well as special characters and numbers (!?+%$1234...). Computer keyboard character strings and words from the dictionary are unsuitable. Change the password regularly.

---

<table>
<thead>
<tr>
<th>Note</th>
</tr>
</thead>
</table>

When assigning rights, note that read or write access to the watch tables and tag status is retained even if you have disabled the "Accessible from HMI/OPC UA" attribute in the PLC tag table when configuring the data block in STEP 7.

---

### User pages

In the "User pages" area you can download your own web pages to the CPU and make your own web applications available via the web browser.

You can find additional information in section User pages (Page 77).
Activation of the Web server for specific interfaces

In the area "Overview of interfaces", you have the option to enable or disable access to the Web server.

![Activation of the Web server via the interfaces](image)

**Figure 2-5  Activation of access to the Web server via the interfaces**

### 2.3 Language settings

**Introduction**

The Web server provides the user interface in the following languages:

- German (Germany)
- English (U.S.)
- French (France)
- Italian (Italy)
- Spanish (traditional sort)
- Japanese
- Chinese (Simplified)
- Korean
- Russian
- Turkish
- Portuguese (Brazil)
2.3 Language settings

Requirements for the availability of the East Asian languages

The following requirements must be met for the East Asian languages:

- The corresponding support package for East Asian languages is installed on the display device (e.g., PC).
  For this purpose, activate the "Install files for East Asian languages" option in the "Regional and Language Options > Languages" tab of the Windows Control Panel.
- STEP 7 for East Asian languages is installed on the programming device used to configure the CPU.

Note
East Asian languages are not supported for SIMATIC HMI devices with Windows CE operating system.

Requirements for multilingual output of text

To ensure that the Web server displays alarms, comments and diagnostic information correctly in the various project languages, you have to assign a project language of the Web server to each required interface language in STEP 7.

Note
The project languages of the STEP 7 project you want to assign must be activated and the corresponding texts (translations) must be available in the project. The project languages selection is available in the project tree under "Languages & Resources".
Setting the language for the Web

Once you have activated the Web server on your module, assign a project language of the STEP 7 project from the drop-down list to each interface language.

1. Navigate to the "Multilingual support" area in the Inspector window Properties of the CPU, "General" tab.

2. Assign a project language from the drop-down list to each interface language of the Web server.

![Figure 2-6 Language settings for the Web server in STEP 7](image)

You can also assign interface languages the same project language, for example:

- ① Project language German for user interface language German, English (US) for English, French for French.
- ② Project language English (US) for all other available interface languages of the Web server.

In total, you can assign up to three different project languages of the STEP 7 project to the user interface languages of the Web server.

Reference

You can find additional information on how to set the project language in STEP 7 in the online help for STEP 7, keyword: "Selecting project languages".
2.4 Updating and saving information

Updating the screen content

Automatic updating is activated in the default setting. The preset update time is 10 s.
You update the web pages manually with the <F5> function key.

Disabling automatic updating for an individual web page

Click Off to temporarily deactivate automatic updating for a web page.
Note that the deactivation affects only the currently visited web page. Automatic updating is activated again when you change to a different web page.
You reactivate automatic updating by clicking On.

Note

If the load on the CPU is very high during operation, for example, due to a large number of PROFINET interrupts or extensive communication jobs, the updating of web pages may be significantly delayed for the duration of this high CPU load.

Printing web pages

The Web server offers you a print preview on most web pages. Click the symbol to open it.
Created printouts always contain the current information in the CPU. This means that it is possible that the information in the print preview is more up-to-date than the information in the standard view.
3.1 Start page with general CPU information

Connecting to the Web server

Establish a connection to the Web server by entering the IP address of the interface of the configured CPU which is connected to the client in the address bar of the web browser, for example, http://192.168.3.141 or https://192.168.3.141. The connection is set up and the "Intro" page opens.

The examples in the next section provide information about the different web pages.

Intro

The figure below shows the first page (Intro) called by the Web server.

![Intro page of the Web server of the CPU 1516-3 PN/DP](image)

Figure 3-1 Intro page of the Web server of the CPU 1516-3 PN/DP

Click the NEXT link to go to the Web server pages.

Note

Select the "Skip Intro" check box in order to skip the intro. The Web server will then take you directly to its start page in future. This setting is saved in the user profile of the current PC user.

You can undo the setting "Skip Intro" by clicking the "Intro" link in the left-hand navigation bar of a web page.
### Setting the user interface language

You can change the language for the Web server interface, e.g., from English to German, in the upper right corner. This option is available to you on all web pages of the Web server.

### Switching the time display

You can set the format of the time display to Coordinated Universal Time (UTC) or PLC local time (default setting) on the left next to the language setting.

![Figure 3-2 Switching the time display](image)

You can switch the time display on all the Web pages that provide this drop-down list. The displayed PLC local time result from the time zone and Daylight Savings Time / Standard Time setting that are set in the CPU properties.

![Figure 3-3 Setting the time in the CPU properties](image)
The switchover has an effect on the following Web pages:

Table 3-1  Switching the time display: Display on Web pages

<table>
<thead>
<tr>
<th>Web pages</th>
<th>Display as Coordinated Universal Time (UTC) or as PLC local time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start page</td>
<td>Last F-change</td>
</tr>
<tr>
<td>Diagnostics buffer</td>
<td>Date and time of the diagnostic buffer entry</td>
</tr>
<tr>
<td>Alarms</td>
<td>Date and time of the alarms</td>
</tr>
<tr>
<td>Online backup</td>
<td>Backup file with date and time of the backup</td>
</tr>
<tr>
<td>DataLogs</td>
<td>Date of change and time of change</td>
</tr>
<tr>
<td>File browser</td>
<td>Date of change and time of change</td>
</tr>
<tr>
<td>User files</td>
<td>Date of change and time of change</td>
</tr>
<tr>
<td>Save service data</td>
<td>File with time stamp of the storage</td>
</tr>
</tbody>
</table>

Start page

The start page before login offers information as shown in the figure below. The CPU image with LEDs returns the actual CPU status at the time of the data request.

Figure 3-4  Start page before login
Log in

To use the full functionality of the web pages, you must be logged in. Log in with a user name and password specified in the Web configuration in STEP 7. You now have corresponding permissions to access the web pages released for this user. If you have not configured a user, read-only access is granted to intro and start pages by default.

Note

After carrying out your required actions, log out explicitly from the Web server by clicking "Logout" in order to minimize the risk of unauthorized external access.

Figure 3-5 Start page after login

① "General"

"General" contains information on the CPU with the Web server to which you are currently connected, as well as the version of the TIA Portal with which the CPU was configured.

② "Status"

"Status" contains information about the CPU at the moment of the query.
③ "CPU operator panel"

If you have the necessary access permissions, you can change the operating mode of the CPU ("RUN"/"STOP" buttons) or have the LEDs flash ("Flash LED" button) in the "CPU operator panel" area.

Additional information for F-CPUs

Figure 3-6 Start page after login to an F-CPU

④ "Fail-safe"

"Fail-safe" contains additional information on the F-CPU. Further information about the specification is available in the Programming and Operating Manual SIMATIC Safety - Configuring and Programming

[https://support.industry.siemens.com/cs/de/de/view/54110126/en?dl=en].

Reference

You can find additional information in the section Configuring the Web server [Page 21].
3.2 Diagnostics

Overview

The "Diagnostics" web page provides more information about the tabs:

- Identification
- Program protection
- Memory
- Runtime information
- Fail-safe (with an F CPU)

"Identification" tab

The CPU characteristics are available in the "Identification" tab.

![Identification tab](image)

1."Identification"

The "Identification" info box contains the plant and location designation and the serial number. Plant and location designations can be configured in STEP 7 in the properties dialog box of the CPU, in the "General" tab.

2."Order number"

The "Order number" info box contains the order number for the hardware.
③ "Version"

You can find the hardware, firmware and bootloader versions in the "Version" info box.

"Program protection" tab

The "Program protection" tab provides information on whether the PLC program contains know-how protection or copy protection.

![Image of the "Program protection" tab]

Figure 3-8  "Program protection" tab

① "Know-how protection"

Information on whether the PLC program contains at least one block with know-how protection or not can be found in the info field "Know-how protection".

② "Binding"

In the info field "Binding" you can find information on whether copy protection has been activated by binding at least one program block of the PLC program to the serial number of the CPU or memory card.

- "Binding"
- "No binding"
- "No matching binding": At least one block is bound to a different serial number (load process is rejected)
"Memory" tab

The "Memory" tab contains current values on the memory currently in use.

![Image of "Memory" tab]

Figure 3-9 "Memory" tab
"Runtime information" tab

Current information on program/communication load and cycle time can be found in the "Runtime information" tab. This enables you to see whether there may be runtime problems during execution of your user program.

<table>
<thead>
<tr>
<th>Identification</th>
<th>Program protection</th>
<th>Memory</th>
<th>Runtime information</th>
<th>Fail-safe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program-Communication load:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*Current user program load:</td>
<td></td>
<td></td>
<td>0 %</td>
<td></td>
</tr>
<tr>
<td>**Current user communication load:</td>
<td></td>
<td></td>
<td>4 %</td>
<td></td>
</tr>
<tr>
<td>Project defined communication load:</td>
<td></td>
<td></td>
<td>50 %</td>
<td></td>
</tr>
</tbody>
</table>

Cycle time:
- Shortest cycle time: 1 ms
- Current cycle time: 1 ms
- Longest cycle time: 2 ms
- Configured min. cycle time: 1 ms
- Configured max. cycle time: 150 ms

* Runtime of all OB's with higher priority than the program cycle OB's calculated as arithmetical mean value of the last second in percent
** Runtime of all communication processes calculated as arithmetical mean value of the last second in percent

Figure 3-10  "Runtime information" tab

The current user communication load is the actual load arising through communication, for example through Web server access or PROFINET communication. In the example above, 4% of the project-defined communication load is “used”. The remaining 46% is available for the operating system and the user program. You can find additional information about the influence of the communication on the cycle time in the Cycle and Response Times [https://support.industry.siemens.com/cs/us/en/view/59193558](https://support.industry.siemens.com/cs/us/en/view/59193558) function manual.
"Fail-safe" tab (with an F-CPU)

The safety program of an F-CPU consists of one or two F-runtime groups. You can find their F-runtime group signature, cycle times (F-monitoring time) and runtimes in the "Fail-safe" tab.

Figure 3-11  "Fail-safe" tab
3.3 Diagnostics buffer

Requirements

The Web server is activated, languages are set, the text libraries are loaded and the project has been compiled and downloaded with STEP 7.

Diagnostics buffer

The browser displays the content of the diagnostics buffer on the "Diagnostics buffer" web page.

![Diagnostics Buffer Table]

<table>
<thead>
<tr>
<th>Number</th>
<th>Time</th>
<th>Date</th>
<th>Status</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10:45:20:907</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Mode transition from STARTUP to RUN</td>
</tr>
<tr>
<td>2</td>
<td>10:45:20:905</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Request for Automatic warm restart</td>
</tr>
<tr>
<td>3</td>
<td>10:45:20:873</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Parameter assignment error</td>
</tr>
<tr>
<td>4</td>
<td>10:45:20:856</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Parameter assignment error</td>
</tr>
<tr>
<td>5</td>
<td>10:45:20:834</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Mode transition from STOP to STARTUP</td>
</tr>
<tr>
<td>6</td>
<td>10:45:16:805</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Distributed I/Os: end of the synchronization with a DP ...</td>
</tr>
<tr>
<td>7</td>
<td>10:44:57:159</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>All modules are ready for operation</td>
</tr>
<tr>
<td>8</td>
<td>10:43:36:635</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Module monitoring time started</td>
</tr>
<tr>
<td>9</td>
<td>10:43:36:487</td>
<td>13.11.2017</td>
<td>incoming event</td>
<td>Power on backed up</td>
</tr>
</tbody>
</table>

Figure 3-12 Diagnostics buffer

1 "Diagnostics buffer entries 1-50"

The diagnostics buffer can accommodate different numbers of alarms depending on the CPU used.

For information on the maximum number of diagnostics buffer entries, refer to the technical specifications of the CPU used.

Select an interval for the entries from the drop-down list. Each interval comprises 50 entries.
Web pages

3.3 Diagnostics buffer

② "Event"

The "Event" info box contains the diagnostics interrupts with date and time.

Note that the diagnostics events are displayed in the project language of the STEP 7 project that is assigned to the current user interface language of the Web server. You can find out how to assign project languages to interface languages in section Language settings (Page 31).

③ "Details"

This field outputs detailed information about a selected event. Select the corresponding event from the ② "Event" info field.

Saving diagnostics buffer entries

You can save diagnostics buffer entries to a csv file for further processing in a spreadsheet program or database program.
Save the data by clicking the icon.

A dialog opens in which you can specify the file name and target directory.
3.4 Module information

Module information

The status of a device is indicated by means of symbols and comments on the "Module information" web page.

Figure 3-13 Module information

Meaning of the symbols in the "Status" column

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>✅</td>
<td>Green</td>
<td>Component is OK</td>
</tr>
<tr>
<td>✗</td>
<td>Gray</td>
<td>Deactivated PROFIBUS slaves or PROFINET devices.</td>
</tr>
<tr>
<td>❓</td>
<td>Gray</td>
<td>State cannot be determined</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• &quot;State cannot be determined&quot; is displayed during system diagnostics for all configured I/O modules and I/O systems after restart of the CPU.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• However, this state can also be displayed temporarily during operation if a diagnostics interrupt burst occurs for all modules.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• It is not possible to determine the status of modules on a subsystem that is connected to a CP.</td>
</tr>
<tr>
<td>❗</td>
<td>Red</td>
<td>Component &quot;not reachable&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&quot;Not reachable&quot; is displayed when a module has been removed or a module has been configured but does not exist.</td>
</tr>
<tr>
<td>🟡</td>
<td>Black</td>
<td>No input or output data available.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input or output channels of the (sub)module are disabled.</td>
</tr>
<tr>
<td>🟢</td>
<td>Green</td>
<td>Maintenance required (Maintenance Required)</td>
</tr>
<tr>
<td>🟡</td>
<td>Yellow</td>
<td>Maintenance demanded (Maintenance Demanded)</td>
</tr>
<tr>
<td>🟡</td>
<td>Red</td>
<td>Error - component faulty or not available due to an incorrect type</td>
</tr>
<tr>
<td>🟡</td>
<td>Red</td>
<td>A module in a lower module level does not have the status &quot;Component OK&quot;</td>
</tr>
</tbody>
</table>
3.4 Module information

Navigation to further module levels

The status of individual components/modules/submodules is displayed when you navigate to the further module levels:

- To the next higher module level using the links in the display of the module levels
- To the next lower module level using the links in the "Name" column

![Module information table](image)

Figure 3-14 Navigation to further module levels

① "Module information"

Depending on the selected level, the table contains information about the rack, the DP master system, the PROFINET IO master system, about the devices, the individual modules, as well as the modules or submodules of the device.

② "Display of the module levels"

The links are used to access the "Module information" of the higher module levels.

③ "Topology"

The two web pages, "Topology" and "Module information", are linked. A click on "Topology" of the selected module automatically takes you to this module in the graphic view of the set topology on the "Topology" web page. The module is displayed in the visible area of the "Topology" web page. The device header of the selected module flashes for a few seconds.
④ "IP address"

If a link is available, you can use it to access the Web server of the configured device you selected.

⑤ "Details"

Additional information about the selected module is provided in the "Status" and "Identification" tabs via the "Details" link.

⑥ "Status" tab

The tab contains information about the status of the selected module when a fault or alarm exists.

⑦ "Identification" tab

The tab contains data on the identification of the selected module.

Note

This tab displays only the data configured offline of the module.
"Statistics" tab

The tab is only displayed for PROFINET IO devices and includes the following information on communication statistics of the selected IO device:

- "Total statistics - Sent data packages"
  You can assess the data transmission on the transmit line based on the key data in this info box.

- "Total statistics - Received data packages"
  You can assess the data transmission on the receive line based on the key data in this info box.

- "Statistics port x - Sent data packages"
  You can assess the data transmission on the transmit line for each port based on the key data in this info box.

- "Statistics port x - Received data packages"
  You can assess the data transmission on the receive line for each port based on the key data in this info box.

![Figure 3-15 "Statistics" tab](image)

Reference

You can find additional information in the "Statistics" tab in the section Communication (Page 57).
### Example: Module information - module

#### Module information

<table>
<thead>
<tr>
<th>Slot</th>
<th>Status</th>
<th>Device number</th>
<th>Name</th>
<th>Order number</th>
<th>I address</th>
<th>Q address</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>✔</td>
<td>1</td>
<td>IM155-SPN5T</td>
<td>Details</td>
<td>6ES7155-6AA00-0BA0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>✔</td>
<td>2</td>
<td>PS 1500-230x24 VDC</td>
<td>Details</td>
<td>6ES7565-542A00-0AB0</td>
<td></td>
<td>Modul PS (3)</td>
</tr>
<tr>
<td>2</td>
<td>✔</td>
<td>3</td>
<td>DI 16x24VDC HF</td>
<td>Details</td>
<td>6ES7521-1BH00-0AB0</td>
<td>2</td>
<td>Modul DI (3)</td>
</tr>
<tr>
<td>3</td>
<td>✔</td>
<td>4</td>
<td>DQ 16x24VDC/S 5A ST</td>
<td>Details</td>
<td>6ES7522-1BH00-0AB0</td>
<td>5</td>
<td>Modul DQ (3)</td>
</tr>
</tbody>
</table>

**Status**

PN device 3 on PN system 100 Slot 3: Module removed
Name: IM165-SPN5T Module: DQ 16x24VDC/S 5A ST
I/O address: Q1

---

**Note**

If you are using the function Configuration control (option handling) in the central configuration of your plant, the information text in the headings area of the web page informs you that the status of the I/O modules may be displayed inconsistently. No corresponding text is displayed for the distributed I/O.

---

### Example: Module information - submodule

#### Module information

<table>
<thead>
<tr>
<th>Slot</th>
<th>Status</th>
<th>Device number</th>
<th>Name</th>
<th>Order number</th>
<th>I address</th>
<th>Q address</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1</td>
<td>✔</td>
<td>1</td>
<td>MyIM155-SPN5T</td>
<td>Details</td>
<td>6ES7155-5AA00-0AB0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X1 P1</td>
<td>✔</td>
<td>2</td>
<td>MyPort1 (3)</td>
<td>Details</td>
<td>6ES7565-542A00-0AB0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X1 P2</td>
<td>✔</td>
<td>3</td>
<td>MyPort2 (3)</td>
<td>Details</td>
<td>6ES7565-542A00-0AB0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Status**

---

**Reference**

You can find additional information on the "Module information" in the online help for STEP 7, keyword: "Module information".
3.5 Firmware update

Introduction

You update the firmware as a user with the corresponding access rights on the "Module information" web page at the module level. You will find information on user management in section Configuring the Web server (Page 21) under "Amending user management". You use an update file to update the firmware of the CPU, the display of the CPU, or the individual central or distributed modules. Note that all modules you want to update must be compatible with the TIA Portal as of V12.0.

Note

A firmware update is not possible if access is via a mobile terminal device with the "iOS" operating system.
Procedure

The following steps are required to perform a firmware update:

- Click on "Browse" in the Firmware Loader area.
- Select the file you would like to use for the firmware update. You can find the available firmware updates on the Service&Support page on the Internet [http://support.automation.siemens.com].

**Figure 3-18 Module information, "Firmware" tab, "Ready for update" status**

- If the status is "Ready for update", click "Run update". If the CPU is in RUN mode during the update, the following alarm is output:

  **Figure 3-19 Alarm after clicking "Run update"**
Acknowledge the alarm output by clicking "OK". The CPU is set to STOP mode and the firmware update is executed.
If you click "Cancel", the CPU remains in the current mode and the firmware update is canceled.

- A alarm informs you about the order number and version ID of the updated firmware once the update is complete.
The CPU is automatically placed in RUN mode when the mode selector of the CPU is in RUN and when you acknowledge the alarm with "OK". This may take a few minutes; there is no progress indicator.
If you click "Cancel", the CPU remains in STOP mode and you can run additional updates.

![Figure 3-20 Alarm: Firmware successfully transferred](image)
3.6 Alarms

Requirements

The alarm texts were configured in the user-specific languages. For information about configuring alarm texts, refer to STEP 7 and to the Service&Support pages [http://www.siemens.com/automation/service&support].

Alarms

To receive compact information on fault analysis, we recommend that you always first read out the content of the alarm buffer. This is the most effective method to get an overview of the pending faults.

The browser displays the content of the alarm buffer on the “Alarms” web page.

Figure 3-21 Alarms
"Alarms"

CPU alarms are displayed in descending chronological order with date and time in info box ①.

The alarm text parameter is an entry which contains the alarm texts configured for the corresponding fault definitions.

Note that the alarm texts are displayed in the project language of the STEP 7 project that is assigned to the current user interface language of the Web server. You can find out how to assign project languages to interface languages in section Language settings [Page 31].

Sorting

You also have the option to display the individual parameters of the currently displayed web page (max. 50 entries) sorted in ascending or descending order. For this purpose, click on one of the parameters in the column header:

- Alarm number
- Date
- Time (of the CPU)
- Alarm text
- Status
- Acknowledgment

The alarms are returned in chronological order when you click the "Date" entry. Incoming and outgoing events are output at the Status parameter.

If you have the appropriate user rights (see section Configuring the Web server [Page 21]), for alarms which can be acknowledged, a button is available to you in the "Acknowledgment" column with which you can acknowledge the alarm.

"Details on alarm number"

You can view detailed alarm information in this info box. Select the corresponding alarm from the info field ②.

Saving alarms

You can save alarms to a csv file for further processing in a spreadsheet program or database program.

Save the data by clicking the icon.

A dialog opens in which you can specify the file name and target directory.
3.7 Communication

Overview

The "Communication" web page provides detailed information about the following tabs:

- Parameters
- Statistics
- Resources
- Connections

① "Parameter" tab

A summary of the information on the PROFINET and Ethernet interfaces of the selected CPU is available in the "Parameter" tab.

![Parameter Tab Image]

Figure 3-22 Parameters of the integrated PROFINET and Ethernet interfaces

② "Network connection"

The item "Network connection" includes information for identification of the integrated PROFINET and Ethernet interfaces of the corresponding CPU. The MAC address is located on the CPU above the respective PROFINET or Ethernet interface.

③ "IP parameter"

This parameter includes information on the configured IP address and number of the subnet in which the corresponding CPU is located.
④ "Physical properties"

The following information on the interface hardware is available in the "Physical properties" field:

- Port number
- Link status
- Settings
- Mode
- Connection medium
① "Statistics" tab

Information on the data transmission can be found on the "Statistics" tab.

![Image](image1.png)

Figure 3-23 "Statistics" tab with key data on data transmission

② "Total statistics - Sent data packages"

You can assess the data transmission on the transmit line based on the key data in this info box.
③ "Total statistics - Received data packages"

You can assess the data transmission on the receive line based on the key data in this info box.

④ "Statistics Port x - Sent data packages"

You can assess the data transmission on the transmit line for each port based on the key data in this info box.

⑤ "Statistics port x - Received data packages"

You can assess the data transmission on the receive line for each port based on the key data in this info box.

① The "Resources" tab

For information about the resource consumption of the connections, refer to the "Resources" tab.

![Figure 3-24 "Resources" tab]

② Number of connections

Under "Number of connections", you will find information on the maximum number of connections and the number of connections not assigned.

③ Connections

The item "Connections" provides information on the number of connections reserved or used for ES, HMI, S7, OpenUser, web communication and other communication functions.
1. "Connections" tab

The "Connections" tab contains information on the status of the communication connections.

![Figure 3-25 "Connections" tab](image)

2. Status

Under "Status", you will find an overview of the communication connections being established and the already established communication connections.

For each connection, the table contains the following information: status of the connection, local ID, slot of gateway, remote address (IP address), the corresponding remote address type, method of connection, and type of connection.

3. Details

Under "Details", you will find detailed information about the selected connection.

Reference

For an explanation of the error message displayed when a connection is interrupted or an attempt to establish a connection fails, refer to the STEP 7 online help.
3.8 Topology

3.8.1 Introduction

Topology of the PROFINET devices

The "Topology" web page provides information on the topological configuration and status of the PROFINET devices on your PROFINET IO system.

There are three tabs for the following views:

- Graphical view (set and actual topology)
- Table view (actual topology only)
- Status overview (excluding topological correlations)

You can print the table view and status overview. Before printing, use the print preview of your browser and, if necessary, correct the format.

Set topology

The set topology is displayed if you have topologically interconnected the connections in the configuration with STEP 7.

This view identifies the topological assignment of PROFINET devices that have failed, the differences between the set and actual topology, and interchanged ports.

Note

The configured set topology is always displayed by default in the following scenarios:

- When the "Topology" web page is called via the navigation bar
- When you change from the overview of PROFINET IO devices on the "Module information" web page to the "Topology" web page by means of the "Topology" link.

If a setpoint topology was not configured, the actual topology is displayed.

Actual topology

 Displays the current topological structure of the "configured" PROFINET devices of a PROFINET IO system and the directly adjacent, non-configured PROFINET devices (display of the neighbor relationships, provided these can be determined; but the status of these adjacent PROFINET devices is not displayed).
3.8.2 Graphical view

Requirements

For error-free operation of the topology, the following conditions must be met:

- You have made the Language settings (Page 31).
- In the Topology Editor of STEP 7, you configured the topological interconnection of ports (requirement for display of the set topology and the corresponding topological target connections).
- The project has been compiled in STEP 7.
- The project is completely loaded.

Set and actual topology - graphical view

You can select the interface with the topology you want to display (X1, X2, X3 or PROFINET communication modules such as CM 1542-1) at the top left of the "Topology" Web page.

![Graphical view - Set and actual topology](image)
Meaning of the colored connections in the set/actual topology:

Table 3-3  Meaning of the colored connections in the set/actual topology

<table>
<thead>
<tr>
<th>Connection</th>
<th>Set topology</th>
<th>Actual topology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>The current actual connection matches the configured target connection.</td>
<td>Connections detected</td>
</tr>
<tr>
<td>Red</td>
<td>Mismatch between the current actual connection and the configured target connection (e.g., port interchanged).</td>
<td>-</td>
</tr>
</tbody>
</table>
| Yellow     | Connection diagnostics not possible. Causes:  
  • Malfunction of communication with a device (e.g., cable was removed)  
  • Connection to a passive component (e.g., switches or cables)  
  • Connection to devices/PROFINET devices on a different IO controller or IO subsystem. | - |

① Configured and accessible PROFINET devices

Configured and accessible PROFINET devices are displayed in dark gray. Connections indicate the ports used to connect the PROFINET devices of a station.

② Configured but inaccessible PROFINET devices

Configured but inaccessible PROFINET devices are indicated in pink with red frame (e.g., device failure, cable disconnected).

③ Deactivated devices

All deactivated, configured PROFINET devices are displayed in light gray.

④ Interchanged ports

Interchanged ports are highlighted in red in the set topology view. The actual topology view indicates the actually connected ports, while the set topology view displays the configured target connections.
⑤ PROFINET devices of a different PROFINET IO subsystem

- In the set topology:
  
  A PROFINET device of a different PROFINET IO subsystem is indicated by means of a green link (or red link for interchanged ports) if it is available on the bus and directly adjacent to an accessible configured PROFINET device ①. If the PROFINET device of a different PROFINET IO subsystem is inaccessible, it is identified by means of a yellow connecting line.
  
  The connection between two PROFINET devices which both belong to a different PROFINET IO subsystem cannot be identified and is always indicated in yellow color.

- In the actual topology:
  
  The PROFINET device of a different PROFINET IO subsystem is not displayed unless it is directly adjacent to a configured PROFINET device. The PROFINET device is shown in light gray with a dashed line around the device header.
  
  The status of PROFINET devices of a different PROFINET IO subsystem is not displayed in the device header.

⑥ Displaying faulty neighbor relationships

Devices from which the relation data could not be read completely or with error are highlighted in light gray with a red frame.

---

Note

Displaying faulty neighbor relationships

If a device does not have the matching firmware, the relationships cannot be displayed correctly. This means a firmware update of the respective device is required in case a faulty neighbor relationship is displayed.

Views after changes to the configuration

- If a device fails, it remains at the same position in the "Set topology" view. This error state is indicated with a red border around the device header and the icon.

- If a device fails, it is displayed in the "Actual topology" view. This error state is indicated separately in the bottom area with a red border around the device header and the icon.

Link between the "Topology" and "Module information" web pages

The two web pages, "Topology" and "Module information", are linked. A click on the header of a selected module in the topology view automatically takes you to this module on the "Module information" web page.

You can find additional information on this in the section Module information (Page 47).
3.8 Topology

Reference

Additional examples for graphical topology view are available in the section Examples for graphical topology views (Page 69).

3.8.3 Tabular view

Topology - tabular view

The "Tabular view" always shows the "Actual topology".

![Figure 3-27 Topology - tabular view](image)

Image 3-27 Topology - tabular view

Meaning of the symbols relating to the status of the PROFINET devices

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Configured and accessible PROFINET devices</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Unconfigured and accessible PROFINET devices</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Configured but inaccessible PROFINET devices</td>
</tr>
<tr>
<td><img src="image" alt="icon" /></td>
<td>Devices for which neighbor relations cannot be determined, or for which the neighbor relationship could not be read out completely, or only with errors</td>
</tr>
</tbody>
</table>
2 Meaning of the symbols relating to the module status of the PROFINET devices

Table 3-5  Meaning of the symbols relating to the module status of the PROFINET devices

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>green</td>
<td>Component is OK.</td>
</tr>
<tr>
<td>✔️</td>
<td>gray</td>
<td>Deactivated PROFIBUS slaves or PROFINET devices</td>
</tr>
<tr>
<td>❓</td>
<td>black</td>
<td>State cannot be determined</td>
</tr>
<tr>
<td>❓</td>
<td>red</td>
<td>Component failed or is not reachable</td>
</tr>
<tr>
<td>🛠️</td>
<td>green</td>
<td>Maintenance required (Maintenance Required)</td>
</tr>
<tr>
<td>🛠️</td>
<td>yellow</td>
<td>Maintenance demanded (Maintenance Demanded)</td>
</tr>
<tr>
<td>🛠️</td>
<td>red</td>
<td>Error - component faulty or not available due to an incorrect type.</td>
</tr>
<tr>
<td>◀️</td>
<td>-</td>
<td>A module in a lower module level does not have the status &quot;Component OK&quot;.</td>
</tr>
</tbody>
</table>

Reference

For additional information on the "Report System Error" function, refer to the STEP 7 online help, keyword: "System diagnostics".
3.8.4 Status overview

Topology - status overview

The "Status overview" provides a clear presentation of all PROFINET IO devices/PROFINET devices (without connection relations) on one page. A quick error diagnostics is possible based on the symbols that show the module statuses.

The overview also provides a link of the modules to the Web page Module information (Page 47).

![Topology - status overview](image)

Figure 3-28 Topology - status overview
3.8.5 Examples for graphical topology views

The following section shows, as an example, some displays of the different topology views for a simple project.

"Set topology" is OK

Here you see the connections as they are configured in the topology editor by STEP 7. The configuration and wiring match.

"Actual topology" is OK

Shows the actual layout of all configured devices that can be reached topologically.
"Set topology" with failed device

If a device has failed in the meantime, this device remains in the same place in the "Set topology" view. The failed device is displayed with a red border around the device header and the icon.

![Figure 3-31 "Set topology" with failed device](image)

"Actual topology" with failed device

In the "Actual topology" view, the device that has failed in the meantime is displayed separately in the bottom area of the view. The failed device is displayed with a red border around the device header and the icon.

![Figure 3-32 "Actual topology" with failed device](image)
"Set topology" with interchanged ports

If a port was interchanged for a configured, directly adjacent PROFINET device, this device remains in the same place in the "Set topology" view. The interchanged connection is indicated by a red line.

Figure 3-33 "Set topology" with interchanged ports
3.9 Tag status

Tag status

The browser outputs the tag status on the web page of the same name.

---

**Note**

**Saving the tag status as a bookmark**

When the page is exited, the entries made on it are not saved. If you want to monitor the same entered tags again later on, then create a bookmark in your Web browser for the "Tag status" page. Otherwise, you will have to enter the tags again when the page is reopened.

If you have defined your user page as start page of the Web server, you cannot access the tag status via the saved bookmarks. You can find additional information in section Defining the user page as start page (Page 98).

---

**Note**

**Selected tag addresses are copied to the URL**

The maximum number of characters for the URL of the tag status page is 2083. You can see the URL which corresponds to your current tag status page in the address bar of your Web browser.

To monitor several tags, we recommend the use of the watch tables (Page 75).

---

![Figure 3-34 Tag status](image-url)
① "Name"

In the "Name" text box, enter the address of the tag whose behavior you want to monitor. This may be a symbolic or absolute address.

- PLC tags (inputs and outputs, bit memories, times and counters) and DB tags in blocks with standard access have an absolute and a symbolic address.
- DB tags in blocks with optimized access have a symbolic address and no absolute address.

**Example** for access to the absolute address of a data block with standard access:
The absolute address consists of the preceding address ID %, the number of the data block and the absolute address of the tags in the data block, separated by a period: \%DB1.DBX1.0 = absolute addressing of the tags "DBX1.0" in the global data block "DB1".

Invalid entries are displayed in red font.

② "Display format"

Using the drop-down list box, select the desired display format of the respective tag. If the tag cannot be displayed in the desired format, it will be displayed in hexadecimal format.

③ "Value"

Under "Value", the value of the corresponding operand is displayed in the selected format.
"Modify value"

You can change the value of tags and write them to the CPU in this column. To transfer several changed values in one operation, click the "Apply" button below the table.

To be able to read values and write values to the CPU, you need to have configured a user with the appropriate access rights in STEP 7.

If the value you entered is not valid (e.g. binary value in a BOOL field), the entry is not applied and the corresponding input field remains empty. A specific message relating to this is not output.

You can change the values of the following data types:

- Bool, Byte
- DWord, LWord, Word
- Int, DInt, LInt, SInt, UDInt, UInt, ULInt, USInt
- Real, LReal
- LDT
- Counter, Date
- Time, LTime, Time_Of_Day, LTime_Of_Day, Timer
- S5Time
- Char, WChar, String

**Note**

The following generally applies: To be able to write data, the "Referrer" transfer must be activated in your Web browser (this is the default in all common browsers).

**Special considerations when changing languages**

You can change the language, e.g., from German to English, in the upper right corner. Note that the German mnemonics differ from those of the other languages.

**For monitoring available data types**

In principle, all data types of PLC tags that can be monitored in STEP 7 can also be monitored via the Web server.

Note that structured data types such as ARRAY, STRUCT and DTL are not available as data types for PLC tags because of their data volume.

**Reference**

You can find additional information on the available data types in the STEP 7 online help, keyword: "Overview of the valid data types".
3.10 Watch tables

Watch tables

The browser displays the content of the configured, web-enabled watch tables on the web page of the same name.

Note

Please note that you can observe a maximum of 50 of the watch tables configured in STEP 7 in the Web server.

Each of these tables is displayed in the Web server with a maximum of 200 entries.

If you are monitoring many large watch tables in the Web server, the update time may increase due to the large data volumes.

The number of watch tables that you can monitor download into the CPU also depends on the size of the SIMATIC memory card used.

Select one of the configured watch tables from the drop-down list.
“Name”

The symbolic name of the tag is shown in this info box.

“Address”

The absolute address of the tags is displayed within this info field (if present, e.g. for inputs or outputs; DB tags in blocks with optimized access have no absolute address).

“Format”

Select the display format of the respective tag from the drop-down list.

“Value”

This column shows the values in the corresponding display format.

“Modify value”

You can change the value of tags and write them to the CPU in this column.

To be able to read values and write values to the CPU, you need to have configured a user with the appropriate access rights in STEP 7.

If the value you entered is not valid (e.g. binary value in a BOOL field), the entry is not applied and the corresponding input field remains empty. A specific message relating to this is not output.

Note

The following generally applies: To be able to write data, the “Referrer” transfer must be activated in your Web browser (this is the default in all common browsers).

Note that the comments are displayed in the project language of the STEP 7 project that is assigned to the current user interface language of the Web server. You can find out how to assign project languages to interface languages in section Language settings (Page 31).

Reference

You can find additional information on the available data types in the STEP 7 online help, keyword: “Overview of the valid data types”.
3.11 User pages

User pages

In the "User pages" area of the Web server you can upload HTML pages you have created yourself for reading out data of the target system.

Figure 3-36 User pages

You create the pages with an HTML editor of your choice from which you generate data blocks (Web control DB and Fragment DBs) in STEP 7 and download them to the CPU. The "WWW" instruction synchronizes the user program with the Web server on the CPU and initializes the Web server. With the first call of the "WWW" instruction, the link to the user page is displayed on the web page of the CPU. A click on the link opens the user page in a new window.

Note

Write access to user pages allows the process parameters and, thus, the operation of the CPU to be influenced.
To prevent external manipulation, always assign a password for users with write access to user pages in the user management. You will find information on user management in section Configuring the Web server (Page 21) under "Amending user management".
Requirements

- You have assigned symbolic names to the tags you want to use on your web page in STEP 7.
- In the Inspector window under "Properties > General > Web server", you have at least:
  - Activated the Web server
  - Assigned read-only or read and write permissions to the users for user pages (see section Configuring the Web server (Page 21))
- You have completed all necessary communication settings (IP address parameter, subnet mask, etc.).
- You have downloaded the configuration.
- You have created your user page in an HTML editor of your choice:
  - Automatic HTML pages, if you want to disable control of the page layout by means of the user program (requires at least one call of SFC 99). Changes in mode from RUN to STOP do not affect the call of the user pages.
  - Manual HTML pages, if you want to enable control of the page layout by means of the user program (cyclic call of SFC 99 required).
Creating user pages

You can use any HTML editor to create your own user page(s). Make sure that your HTML code complies with the standards of the W3C (World Wide Web Consortium), because STEP 7 does not check the HTML syntax in any way. In addition to the simple HTML code, you can also use JavaScript commands in your user pages.

Proceed as follows:

1. Create the HTML file for your user page with an HTML editor. To allow data from the CPU to be output on your web page, integrate the AWP commands as HTML comments (see section AWP commands (Page 81)).
2. Store the HTML file and all associated source files (e.g., *.gif, *.jpg, *.js, etc.) in a directory on your PG/PC and note the storage path.
3. Call the "WWW" instruction in STEP 7 and program it (see section Programming the WWW instruction (Page 96)).
4. Configure the user page in STEP 7 (see section Configuring user pages (Page 94)). In this way, you compile the contents of your HTML files, among other things, into data blocks.
5. Download the configuration and the user program to the CPU.
6. Open your user page with your display device by means of a web browser in the Web server of the CPU.

Note

Extensive HTML pages, especially those with a lot of images, take up a lot of space in the load memory. Make sure you select a SIMATIC memory card with enough memory to provide sufficient load memory.

If the sum of the HTML pages > 1 MB, performance losses may occur as only 1 MB data is saved in the cache.

We recommend that you create each individual file of an HTML page with a size not exceeding 512 KB; otherwise, problems can occur when sending the file from the Web server to the browser. You can view the size of the respective file in the file explorer of the directory.
Updating user pages

User pages are not updated automatically in the browser. You can program the HTML code so that the pages are updated automatically.

Pages which read out data from the controller are always up-to-date due to regular updates.

Note

If the HTML page contains form fields for data input, automatic update can impair the correct data input by the user.

To update the entire page automatically, you can add the following instruction to the <head> area of your HTML page, whereby the number "10" stands for the update interval in seconds:

```html
<meta http-equiv="refresh" content="10">
```

References

The description of a user page is available in the section [Example of a user page](Page 100).

Additional help for visualization with user pages is available in the application examples on the Internet:

- Visualizing with user-defined Web pages on SIMATIC CPUs with PROFINET interface [http://support.automation.siemens.com/WW/view/en/44212999]
- How do you integrate the string contents in your user-defined Web page of the S7-1500 CPU as of Firmware V1.6? [https://support.industry.siemens.com/cs/ww/en/view/98754370]

You will find more information on JavaScript commands in the ECMAScript specification on the Internet [http://www.ecma-international.org/ecma-262/5.1/].

For more information about how to automatically update web pages and how to incorporate user pages with relative path names, refer to the FAQ with entry ID 62543256 on the Service&Support Internet page.
3.11.1 AWP commands

Overview

Automation Web Programming (AWP) commands are a special command syntax for data exchange between CPU and user page (HTML file).

AWP commands are entered as HTML comments and offer the following options for your user pages:

- Reading PLC tags
- Writing PLC tags
- Reading special tags
- Writing special tags
- Defining enum types
- Assigning enum types to tags
- Defining data block fragments
- Importing data block fragments
- Accessing the values of an array
- Accessing the values of a PLC tag of STRUCT data type

General syntax

All AWP commands, except for the command for reading a PLC tag, have this structure:

<!-- AWP_<command name and parameter> -->

Files including AWP commands:

- must be UTF-8 encoded.
  To define UTF-8 as character set of the page, add the following line to your HTML code:
  <meta http-equiv="content-type" content="text/html; charset=utf-8">

Note

Saving the HTML page

Make sure that you save the file in the editor in UTF 8 character encoding as well.

- may not include the following sequence: ]]>  
- may not include the following sequence outside "read tag areas" (:="<Varname":):  
- depending on the use, must identify special characters in tag names or data block names with character escape sequences or quotation marks  
- are case-sensitive  
- should be additionally enclosed by JavaScript comments ("/\*...\*/") in JavaScript files
Overview of AWP commands

Table 3-6  AWP commands

<table>
<thead>
<tr>
<th>Function</th>
<th>Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading PLC tags</td>
<td>:=&lt;Varname&gt;:</td>
</tr>
<tr>
<td>Writing PLC tags</td>
<td>&lt;!-- AWP_In_Variable Name='&lt;Varname1&gt;' --&gt;</td>
</tr>
<tr>
<td>Reading special tags</td>
<td>&lt;!-- AWP_Out_Variable Name='&lt;Typ&gt;:&lt;Name&gt;' --&gt;</td>
</tr>
<tr>
<td>Writing special tags</td>
<td>&lt;!-- AWP_In_Variable Name='&lt;Typ&gt;:&lt;Name&gt;' --&gt;</td>
</tr>
<tr>
<td>Defining enum types</td>
<td>&lt;!-- AWP_Enum_Def Name='&lt;Name Enum-Typ&gt;' Values='0: &quot;&lt;Text_1&gt;&quot;,1:&quot;&lt;Text_2&gt;&quot;,...,x:&quot;&lt;Text_y&gt;&quot;' --&gt;</td>
</tr>
<tr>
<td>Assigning enum types to tags</td>
<td>&lt;!-- AWP_Enum_Ref Name='&lt;Varname&gt;' Enum='&lt;Name Enum-Typ&gt;' --&gt;</td>
</tr>
<tr>
<td>Defining data block fragments</td>
<td>&lt;!-- AWP_Start_Fragment Name='&lt;Name&gt;'[Type=&lt;Typ&gt;] [ID=&lt;Id&gt;] --&gt;</td>
</tr>
<tr>
<td>Importing data block fragments</td>
<td>&lt;!-- AWP_Import_Fragment Name='&lt;Name&gt;' --&gt;</td>
</tr>
<tr>
<td>Accessing the values of an array</td>
<td>&lt;!-- AWP_Start_Array Name='&quot;&lt;DB name&gt;&quot;.&lt;array name&gt;' --&gt;</td>
</tr>
<tr>
<td></td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>&lt;!-- AWP_End_Array --&gt;</td>
</tr>
<tr>
<td>Accessing the values of a PLC tag of STRUCT data type</td>
<td>&lt;!-- AWP_Start_Struct Name='&quot;&lt;DB name&gt;&quot;.&lt;struct name&gt;' --&gt;</td>
</tr>
<tr>
<td></td>
<td>&gt; ...</td>
</tr>
<tr>
<td></td>
<td>&lt;!-- AWP_End_Struct --&gt;</td>
</tr>
</tbody>
</table>

3.11.1.1 PLC tags

Introduction to PLC tags

User pages can read PLC tags from the CPU and write data to the CPU.

To do so, PLC tags must:

- be enclosed by double quotation marks ("...").
- also be enclosed by single quotation marks (" ... ") or with quotation marks masked with a backslash (\" ... \").
- be specified by a PLC tag name.
- if the PLC tag name includes the characters \ (backslash) or ', identify these characters with the escape sequence \\ or ' as normal characters of the PLC tag name.
- be enclosed with single quotation marks ('...'), if an absolute address (input, output, bit memory) is used in the AWP command.
Reading PLC tags

These out-tags (output direction as seen from the controller) are inserted at any place in the HTML text with the syntax described below.

Syntax

`:=<Varname>:`

`<Varname>` corresponds to the tag to be read from your STEP 7 project and can be a simple shared tag or a complete tag path to a structural element. Make sure that you use the name of the data block and not its number when you use data blocks.

Examples

`:="Conveying speed":`

`:="My.datablock".bitmemory1:`

`:=%MW100:`

Reading tags of the String and Character type

Below, these types of quotation marks are used in the explanation: single quotation marks (‘), double quotation marks (").

As of firmware V1.6, with the "Read PLC tags" function, the CPU outputs tags of the String or Character type enclosed in single quotation marks to the browser.

For example:

- "Varname".MyString = ABC string tag
- You read the tag in HTML using the function :="Varname".MyString:
- The Web server outputs the character string 'ABC' to the browser
Using String or Character tags in expressions

On your HTML page, you use an expression in which the character string for reading a tag is enclosed in quotation marks, for example in forms.

Possible HTML code used:
```
<input type="text" name="appfield" value="myvalue">
```

If you read the displayed value for the "value" attribute from a PLC tag in this expression, the HTML code appears as follows:
```
<input type="text" name="appfield" value=":="Varname".MyString:"/>
```

By reading the PLC tag, the Web server outputs the value 'ABC'. In HTML, the code is then represented as follows:
```
<input type="text" name="appfield" value=" 'ABC' ">
```

If you have used single quotation marks instead of double quotation marks in your HTML code to enclose the attributes, the Web server passes on the content of the tags enclosed in two single quotation marks to the browser. As a result of this, the browser does not output the content of the String or Character tag, since two consecutive single quotation marks each form a closed sequence. The values to be read are located between these sequences and are not output by the browser.

In this context, note in particular that the character string with double quotation marks is not identical to two single quotation marks even if they appear to be identical.

Note

The code is not adapted automatically during an update to firmware as of V1.6. Adapt your HTML code if you have used single quotation marks to enclose attributes for the "Read PLC tags" function.

![Figure 3-37 Example of HTML code with attribute in single quotation marks](image-url)
Writing PLC tags

These in-tags (input direction as seen from the controller) are set on the browser page. This can take place in a form on your HTML page, for example, with text input or list selection boxes that correspond to the tags that can be written.

The tags are either set in the HTTP Header (per cookie or POST method) or in the URL (GET method) by the browser in the HTTP request and are then written by the Web server into the respective PLC tag.

Note

Write access during operation

For data to be written from a user page to the CPU, a user must have the required write permissions and be logged on as this user. This applies to all write accesses of web pages to the CPU.

Syntax

<!-- AWP_In_Variable Name="<Varname1>" Name="<Varname2>" Name="<Varname3>" -->

If the name of the tag that you are using for the web application is not identical with the name of the PLC tag, you can assign it to a PLC tag with the "Use" parameter.

<!-- AWP_In_Variable Name='<Varname_Webapp>' Use='<PLC_Varname>' -->

Examples with HTML input boxes

<!-- AWP_In_Variable Name='"Target_Level"' -->
<form method="post">
<p>Input Target Level: <input name=""Target_Level"" type="text"><input type="submit" value="Write to PLC"> </p>
</form>

<!-- AWP_In_Variable Name='"Data_block_1".Braking' -->
<form method="post">
<p>Braking: <input name=""Data_block_1".Braking" type="text"> <input type="submit" value="Write to PLC"></p>
</form>

Examples with HTML drop-down list

<!-- AWP_In_Variable Name='"Data_block_1".ManualOverrideEnable' -->
<form method="post">
<select name=""Data_block_1".ManualOverrideEnable">
<option value=1>Yes</option>
<option value=0>No</option>
</select><input type="submit" value="submit setting"> </form>
3.11.1.2 Special tags

Special tags

Special tags are mainly the HTTP tags specified in the definitions of the World Wide Web Consortium (W3C). Special tags are also used for cookies and server tags.

Reading special tags

The Web server can read PLC tags and transfer them to special tags in the HTTP response header. You can, for example, read out a path name from a PLC tag to redirect the URL to another storage location with the special tag "HEADER:Storage location".

Syntax

```xml
<!-- AWP_Out_Variable Name='<Type>:<Name>' Use='<Varname>' -->
```

<Type> corresponds to the type of special tag. Options are:

- HEADER
- COOKIE_VALUE
- COOKIE_EXPIRES

<Name> corresponds to the name of the HEADER tag or the cookie:

- HEADER tags:
  - Status: HTTP status code (if no other value was set, status code 302 is returned).
  - Location: path for redirection to another page. Status code 302 must be set.
  - Retry-After: time for which the service is most likely not available. Status code 503 must be set.
- COOKIE_VALUE:name: value of the named cookie.
- COOKIE_EXPIRES:name: expiration time of the named cookie in seconds.

Examples

The HTTP HEADER tag is written to the PLC tag of the same name:

```xml
<!-- AWP_Out_Variable Name="HEADER:Status" -->
```

If the name of the special tag is not identical with the name of the PLC tag, you can assign it to a PLC tag with the "Use" parameter:

```xml
<!-- AWP_Out_Variable Name="HEADER:Status" Use="Status" -->
```
Writing special tags

The Web server gives you the option to write values of special tags written in the HTTP header in the CPU. You can, for example, save information on the cookie of a user page or on the user that accesses a page in STEP 7.

Syntax

<!-- AWP_In_Variable Name='\<Type\>:\<Name\>' Use='Varname' -->

<Type> corresponds to the type of special tag.
Options are:

- HEADER
- SERVER
- COOKIE_VALUE

<Name> corresponds to the name of the HEADER tag or the cookie:

- HEADER tags:
  - Accept-Language: accepted or preferred language
  - User-Agent: information on the browser
  - Authorization: credentials for a requested resource
- SERVER tags:
  - current_user_id: Indicates whether a user is logged on:
    current_user_id=0: No user is logged on / access by "Everybody" user.
    current_user_id=1: At least one user is logged on.
  - current_user_name: user name of the logged-on user
- COOKIE_VALUE:name: value of the named cookie.

Examples

The HTTP-SERVER tag is written to the PLC tag of the same name:

<!-- AWP_In_Variable Name='"SERVER:current_user_id"' -->

The HTTP-SERVER tag is written to the PLC tag "My_userID":

<!-- AWP_In_Variable Name='"SERVER:current_user_id"'
Use='"My_userID"' -->
3.11.1.3  Enum types

Enumeration types (enum types)

Enum types convert numerical values from the PLC program into texts or vice versa. The numerical values may also be assigned for use with several languages.

Define enum types

You can define enum types in your user pages and assign the values in an AWP command.

Syntax

```html
<!-- AWP_Enum_Def_Name='<Name Enum-Typ>' Values='0:"<Text_1>", 1:"<Text_2>",...,x:"<Text_y>"' -->
```

Examples

To store German values as HTML file in the "de" folder of the HTML directory:

```html
<!-- AWP_Enum_Def Name="Enum1" Values='0:"on", 1:"off", 2:"Fault"' -->
```

To store English values as HTML file in the "en" folder of the HTML directory:

```html
<!-- AWP_Enum_Def Name="Enum1" Values='0:"on", 1:"off", 2:"error"' -->
```

Assigning enum types to tags

The assignment of tags from the user program to the individual enum types takes place by means of a separate AWP command. The used tag can be used at a different location of the user pages in a read operation or in a write operation.

For a read operation, the Web server replaces the value read from the CPU with the enum text value defined correspondingly. For a write operation, the Web server replaces the defined enum text value with the corresponding integer value of the enumeration before the value is written to the CPU.

Syntax

```html
<!-- AWP_Enum_Ref_Name='<Varname>' Enum=<Enum-Type> -->
```

Example for a declaration

```html
<!-- AWP_Enum_Ref_Name='"Alarm"' Enum="AlarmEnum" -->
```
Example for use when reading a tag

<!-- AWP_Enum_Def Name='AlarmEnum' Values='0:"No alarms", 1:"Container is full", 2:"Container is empty"' -->
<!-- AWP_Enum_Ref Name='"Alarm"' Enum='AlarmEnum' -->

...<p>The current value of "Alarm" is :="Alarm": </p>

If the value of "Alarm" in the CPU is 2, the HTML page shows 'The current value of "Alarm" is container is empty' because the definition of the enum type assigns the numerical value 2 to the character sequence "Container is empty".

Example for use when writing a tag

<!-- AWP_Enum_Def Name='AlarmEnum' Values='0:"No alarms", 1:"Container is full", 2:"Container is empty"' -->
<!-- AWP_In_Variable_Name='"Alarm"' -->
<!-- AWP_Enum_Ref Name='"Alarm"' Enum='AlarmEnum' -->

...<form method="post">
<p><input type="hidden" name ="Alarm" value='Container is full' /></p>
<p><input type="submit" value='Set container is full' /></p>
</form>

The value 1 is written to the PLC tag "Alarm" because the definition of the enum type assigns the numerical value 1 the text "Container is full".

Keep in mind that the name specified in "AWP_In_Variable" must be exactly the same in "AWP_Enum_Ref".
3.11.1.4 Fragments

Fragments

Fragments are "short paragraphs" of a website that the CPU processes separately. Fragments are usually entire pages, but they can be individual elements, such as files (e.g. images) or documents.

Note

In each fragment in which enum texts are referenced by a PLC tag, this PLC tag must be assigned to the enum type name with the appropriate AWP command.

Defining fragments

A fragment extends to the beginning of the next fragment or to the end of the file.

Syntax

<!-- AWP_Start_Fragment_Name='<Name>' [Type="<Typ>"] [ID="<Id>"] -->

This command specifies the start of a fragment.

- `<Name>` Specifies the name of the fragment. The name must start with a letter [a-zA-Z] or an underscore (_). This first character can be followed by letters, underscores or numbers [0-9].
- `<Type>` Specifies the type of the fragment.
  - "manual": The user program is notified of the request for a fragment and can react accordingly. The function of the fragment must be controlled with STEP 7 and the tags of the control DB.
  - "automatic": The page is automatically processed (default)
- `<Id>` You can specify a numerical ID for the fragment. If no ID is assigned, the fragment is automatically assigned an ID. For manual pages (<Type>=manual), the fragment can be addressed with this ID in the user program of the CPU.

Note

ID assignment

Set the ID as low as possible because the highest ID influences the size of the Web control DB.

- `<Modus>`
  - "visible": The contents of the fragment are displayed on the user page (default).
  - "hidden": The contents of the fragment are not displayed on the user page.
Importing fragments

You can specify a fragment in an HTML page and import this fragment into other websites.

Note

Ensure that no AWP command for importing fragments is positioned between an enum assignment and enum usage, because this import can result in the enum assignment being located in a different fragment than the enum usage.

Example

A company logo is to be displayed on all websites of a web application.

The HTML code for the fragment that displays the company logo exists only once. You can import the fragment as often and into as many HTML files as necessary.

Syntax

```html
<!-- AWP_Import_Fragment_Name='<Name>' -->
```

`<Name>` corresponds to the name of the fragment to be imported.

Example

HTML code within a website that creates a fragment for displaying an image:

```html
<!-- AWP_Start_Fragment Name='My_company_logo' -->
<p><img src="Company logo.jpg"></p>
```

HTML code that imports the created fragment into another website:

```html
<!-- AWP_Import_Fragment Name='My_company_logo' -->
```

3.11.1.5 Arrays

Arrays

The Web server provides the user program commands AWP_Start_Array and AWP_End_Array for accessing all values of an array.

Only one-dimensional arrays are supported.

Multidimensional arrays of the form `array[x][y]` are not supported.

Syntax

```html
<!-- AWP_Start_Array Name='"<DB name>".<array name>' -->
... Content of the array, utilized keywords: ArrayIndex and value..
<!-- AWP_End_Array -->
```
Parameter

- `<Name>` defines the name of the array with the elements you want to access.
  - You require the DB name and the name of the array corresponding to the data block structure defined in STEP 7.
  - The name must be within single or double quotation marks.
  - The DB name is within double quotation marks.
- `<ArrayIndex>` Index of an array element
- `<value>` Value of an array element

Example

The example reads all elements of the "MyArray" structure in the "DB_Name" data block of the CPU and displays the index and the values of the tags on the user-defined web page.

<table>
<thead>
<tr>
<th>DB_Name</th>
<th>Name</th>
<th>Data type</th>
<th>Start value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Static</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>myArray</td>
<td>Array[0..2] of int</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>myArray[0]</td>
<td>Int</td>
<td>42</td>
</tr>
<tr>
<td>4</td>
<td>myArray[1]</td>
<td>Int</td>
<td>43</td>
</tr>
<tr>
<td>5</td>
<td>myArray[2]</td>
<td>Int</td>
<td>44</td>
</tr>
</tbody>
</table>

```html
<!-- AWP_Start_Array Name='"DB_Name".MyArray' -->
Index: :=ArrayIndex: Value: :=value:
<!-- AWP_End_Array -->
```

The code indicated above generates the following display:

Index: 1 Value: 42
Index: 2 Value: 43
Index: 3 Value: 44
Representation of arrays of the BOOL data type

The output of arrays of the BOOL type is always filled to the next full 8 bits. This particular feature only occurs with BOOL arrays.

Example:

"DB_1".bitArray is a BOOL array with 5 elements.

<!-- AWP_Start_Array Name=""DB_1".bitArray" -->
:=ArrayIndex: -> :=value:
<!-- AWP_End_Array -->

Edition:

0 -> Value from "DB_1".bitArray[0]
1 -> Value from "DB_1".bitArray[1]
2 -> Value from "DB_1".bitArray[2]
3 -> Value from "DB_1".bitArray[3]
4 -> Value from "DB_1".bitArray[4]
5 -> 0
6 -> 0
7 -> 0

3.11.1.6 Structures

Structures

The Web server provides user program commands for accessing structures in order to access the values of a PLC tag of the STRUCT data type.

Syntax

<!-- AWP_Start_Struct Name=""<DB name>"."<struct name>"" -->
... Content of structure ...
<!-- AWP_End_Struct -->

Parameter

- <Name> defines the name of the structure with the elements you want to access.
  - You require the DB name and the name of the structure corresponding to the data block structure defined in STEP 7.
  - The name must be within single or double quotation marks.
  - The DB name is within double quotation marks.
3.11 User pages

Example

The example reads elements of the "MyStruct" structure in the "DB_Name" data blocks of the CPU and displays the value of the tag on the user-defined web page.

```
<!-- AWP_Start_Struct Name="DB_Name".MyStruct' -->
:=A:
:=B:
:=C:
<!-- AWP_End_Struct -->
```

The code indicated above corresponds to the following commands:

```plaintext
:"DB_Name".MyStruct.A:
:"DB_Name".MyStruct.B:
:"DB_Name".MyStruct.C:
```

3.11.2 Configuring user pages

Configuring user pages

Figure 3-38 Configuring user pages in STEP 7
Proceed as follows to configure the user pages in STEP 7:

1. Select the CPU in the device configuration.

2. Open the settings in the Inspector window of the CPU under "Properties > General > Web server".

3. In the area "User pages" under ① "HTML directory", select the folder on your display device in which you have saved your HTML page.

4. Enter the name of the HTML page under ② "Start HTML page" that is to open when you start the application.

5. You can also specify a name for your application under ③ "Application name". This name is used to further divide or group the webpages. If an application name already exists, the URL is displayed in the following format: http://a.b.c.d/awp/<application name>/<page name>.html

6. In the "Extended" area, enter the file extensions that have to be checked for AWP commands in input box ⑥ "Files with dynamic contents". By default, STEP 7 analyses files with the extensions ".js", ".htm" and ".html". Here you can enter other file extensions that you have used when creating your user page.

7. You can accept the number for the Web DB ⑦ and the fragment DB start number ⑦ or you can assign a new number of your choice that is not assigned.

8. Click the button ④ "Create blocks" to create data blocks from the source files. The created data blocks are stored in the STEP 7 project tree in the folder "System blocks > Web server". These data blocks consist of a control data block (Web control DB) that controls the display of the webpages and one or several data block fragments (fragment DBs) with the compiled webpages.

9. In the network view, select the CPU you want to download and select the command "Download to device" in the "Online" menu to download the blocks. The compilation of the blocks is implicitly triggered before the download. If errors are signaled during this process, they must be remedied before you can download the configuration.

Deleting data blocks

Click the "Delete block" button ⑤ to delete previously generated data blocks. STEP 7 deletes the Web Control DB and all fragment DBs from the project containing your user pages.
3.11.3 Programming the WWW instruction

The WWW instruction

The WWW instruction initializes the Web server of the CPU or synchronizes the user pages with the user program in the CPU. The Web control DB is the input parameter for the WWW instruction and specifies the content of the pages as they are displayed in the fragment DBs as well as the status and control information. STEP 7 creates the Web control DB when you click the button "Create blocks".

Note

DB number of the web control DB.

If you change the DB number of the DB 333, the user pages in the Web server can no longer be reached at renewed downloading into the CPU. Error code W#16#007F is output at the parameter RET_VAL. Therefore observe the default setting DB 333 for the Web Control DB.

If you want to change the DB number nevertheless, you have to switch the CPU POWER-OFF → POWER ON, so that the user pages in the Web server can be reached.

Programming the WWW instruction

The user program must execute the WWW instruction so that the user pages can be accessed in the Web server.

Table 3-7 WWW instruction

<table>
<thead>
<tr>
<th>LAD/FBD</th>
<th>SCL</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="null" alt="LAD/FBD Diagram" /></td>
<td>ret_val :=WWW(ctrl_db:=uint_in_);</td>
<td>Access to user pages by means of the Web server</td>
</tr>
</tbody>
</table>

Parameters

The table below shows the parameters of the WWW instruction.

Table 3-8 Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Declaration</th>
<th>Data type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTRL_DB</td>
<td>Input</td>
<td>DB_WWW</td>
<td>Data block that describes the user pages (Web control DB)</td>
</tr>
<tr>
<td>RET_VAL</td>
<td>Output</td>
<td>INT</td>
<td>Error information</td>
</tr>
</tbody>
</table>
## RET_VAL parameter

### Table 3-9 RET_VAL

<table>
<thead>
<tr>
<th>Error code (W#16#...)</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>No error has occurred. There are no pending website requests that must be released by the user program.</td>
</tr>
</tbody>
</table>
| 00xy                  | x: indicates if an error occurred during initialization of the Web control DB (CTRL_DB):  
  x=0: No errors occurred.  
  x=1: Error(s) occurred. The error is encoded in the  
  "CTRL_DB.last_error" byte of the Web control DB.  
  y: Number of the pending request. Several requests are possible  
  (e.g., request "0" and "1" are pending: y="3").  
  y="1": Request "0"  
  y="2": Request "1"  
  y="4": Request "2"  
  y="8": Request "3" |
| 803A                  | The specified Web Control DB does not exist on the CPU.                     |
| 8081                  | Incorrect version or incorrect format of the Web Control DB.               |
| 80C1                  | There are no resources available to initialize the Web application.        |
3.11.4 Defining the user page as start page

Defining the user page as start page

In addition to the default intro page, you can also define the start page of your user pages as the start page of the Web server.

Figure 3-39  Example of user page as start page of the Web server

Requirements

The following requirements must be met before the user page is displayed as the start page of the Web server:

- You have configured the user page as the start page.
- You have configured a user in STEP 7 whom you have assigned at least the authorization "... open user-defined web pages".
- The CPU is in RUN mode.
**Procedure**

Proceed as follows to define the user pages in STEP 7 as start page of the Web server:

1. Select the CPU in the device configuration.
2. Open the settings in the Inspector window of the CPU under "Properties > General > Web server".
3. Select the entry "AWP1" in the area "Entry page" under "Select entry page".

4. Download the configuration to the CPU.
   If you now enter the IP address of the CPU in the browser, a connection is automatically established to your user pages.
   If you want to access the web pages of your CPU again, link the web pages from your user pages, via the URL "http://a.b.c.d/Portal/Portal.mwsl?PriNav=Start" or "https://a.b.c.d/Portal/Portal.mwsl?PriNav=Start" for example. In this case, the information "a.b.c.d" represents, as an example, the IP address of the configured CPU.
   Example of link in HTML:
   `<a href="/Portal/Portal.mwsl?PriNav=Start">SIMATIC web pages</a>`

**Note**

If you define your user page as start page of the Web server, all direct access to the web pages of the CPU is disabled. This applies also to the bookmarks you saved for the web pages of the CPU as well as the page for reading out the service data.

**Reading out service data**

If you define your user page as start page of the Web server, all direct access to the web pages for reading out the service data is also disabled.
If you want to continue to read out service data via the Web server when servicing is required, here is how you can link the service data page directly to your user page.
Just as for the web pages of the CPU, link the service data page e.g. via the URL "http://a.b.c.d/save_service_data" or "https://a.b.c.d/save_service_data", the "a.b.c.d" here is an example of the IP address of the configured CPU.
Example of link in HTML:
 `<a href="/save_service_data">Service data</a>`
3.11 User pages

3.11.5 Example of a user page

3.11.5.1 Website for monitoring and controlling a wind turbine

Example of a user page

Here you see a user page for monitoring and controlling a wind turbine:

![Remote Wind Turbine Monitor: Turbine #5 East Farm 1](image)

The user page was created in English in this example, but you can select any language you wish when you create your own user page.

In this application, each wind turbine of the wind farm has a data block in STEP 7 with specific data for the respective location and the turbine.

The user page gives you the option to access the turbine remotely with a display device. A user can open the standard websites for a CPU of a specific wind turbine and go to the "Remote Wind Turbine Monitor" user page to view the turbine data. A user with the corresponding access permissions can also set the turbine into the manually controlled mode and thus control the tags for speed, orientation and angle of attack of the turbine by means of the website. The user can also specify a brake value regardless of manual or automatic control of the turbine.

STEP 7 checks the Boolean values for override of the automatic control and, if set, uses the values for speed, orientation and angle of attack of the turbine as defined by the user.
Files used

Three files are used in the application example:

- **Wind_turbine.html**: The user page in the figure shown above. The control data is accessed by AWP commands.

- **Wind_turbine.css**: The Cascading Style Sheet which includes the formatting specifications of the user page. The use is optional but can simplify the design of the user page.

- **Wind_turbine.jpg**: The background image displayed on the user page. The use of images is optional, user pages with lots of images require a lot more memory in the load memory.

These files are not part of your installation but they are described as an example below.
Implementation

The user page uses AWP commands to read out values from the CPU as well as writing values to it. The user page also uses AWP commands for the definition of enum types, such as the assignment of tags to enum types for handling the ON/OFF settings.

The user page is structured as follows:

1. Header of the website with number and location of the wind turbine.
2. Atmospheric conditions at the turbine, wind speed, wind direction and current temperature are displayed.
3. Read-out power output.
4. Manual override: Activates manual override of the turbine. To make manual settings for speed, orientation and angle of attack, the STEP 7 user program requires that manual override has been activated.
5. Override of the orientation: Activates manual override of the turbine orientation.
6. Override of the angle of attack: Activates manual override of the angle of attack of the rotor blades.
7. By clicking this button, you transfer the override settings to the CPU.
8. Manual setting of a percentage value for braking. The setting "Manual override" is not required to enter a brake value.

Figure 3-42 Overview of user page wind turbine

The user page also uses an AWP command which writes the special tag into the tag table; it includes the user ID of the user who currently accesses the page.
3.11.5.2 Reading and displaying data from the CPU

Example HTML code for reading out and displaying data from the CPU

This part of the HTML code is used for displaying the power output on the user side.

The text "Power Output:" is displayed on the left-hand side; on the right-hand side, the value of the tags for the power output including the unit ("KW") is displayed.

The AWP command :="Data_block_1".PowerOutput executes the reading operation. The data block is referenced by its symbolic name here and not by its number ("Data_block_1" instead of "DB1").

The code used in the example is:

```html
<tr style="height:2%;">
<td>
<p>Power output:</p>
</td>
<td>
<p style="margin-bottom:5px;"> :="Data_block_1".PowerOutput: KW</p>
</td>
</tr>
```

See also PLC tags (Page 82)
3.11.5.3 Using enum types

Definition of enum types

The described user page uses enum types in three locations. "On" or "Off" is displayed for a Boolean value at these locations.

The enum type for "On" results in a value of 1; the enum type for "Off" results in a value of 0. The following excerpts from the HTML code of the user page show the declaration of an enum type with the name "OverrideStatus" and the values "0" and "1" for "Off" or "On" as well as the specification of an enum type reference of "OverrideStatus" for the tag "ManualOverrideEnable" in the data block "Data_block_1".

Note
Assignment of enum types

If the user page writes into a tag by using an enum type, there has to be a declaration "AWP_In_Variable" for each "AWP_Enum_Ref" declaration.

The code used in the example is:

<!-- AWP_In_Variable_Name='"Data_block_1".ManualOverrideEnable' -->
<!-- AWP_Enum_Def_Name="OverrideStatus" Values='0: "Off",1:"On"' -->
<!-- AWP_Enum_Ref_Name='"Data_block_1".ManualOverrideEnable' Enum="OverrideStatus" -->

The following code describes a display box for displaying the current status of "ManualOverrideEnable". A normal read command for tags is used but because of the declared and referenced enum type, the website displays the values "On" and "Off" instead of "1" and "0".

```html
<td style="width:24%; border-top-style: Solid; border-top-width: 2px; border-top-color: #ffffff;">
<p>Manual override: "Data_block_1".ManualOverrideEnable: </p>
</td>
```

The following code describes a drop-down list for changing "ManualOverrideEnable" by the user. The drop-down list consists of the "Yes" and "No" options that are assigned to the "On" or "Off" values by means of the enum type reference. If you make no selection, the status remains the same.

```html
<select name=""Data_block_1"ManualOverrideEnable">
<option value='"Data_block_1".ManualOverrideEnable:'> </option>
<option value="On">Yes</option>
<option selected value="Off">No</option>
</select>
```

The drop-down list is included in the form on the website. The form is uploaded, when the user clicks on the "Send" button. If the user has selected "Yes", the value "1" is written in the tag "ManualOverrideEnable" in the "Data_block_1" data block; if the user has selected "No", the value "0" is written.
3.11.5.4 Writing user inputs into the controller

Setting options

The user page "Remote Wind Turbine Monitor" includes different AWP commands for writing data into the controller. A user with the corresponding access permissions can control the wind turbine manually, activate the override for the turbine speed and the turbine orientation as well as the angle of attack of the rotor blades with the declaration of different "AWP_In_Variable" write commands. The user can also specify floating-point numbers for turbine speed, orientation angle of attack and percentage of braking. The user page uses an HTTP command in the format "POST" to write the tags into the controller.

The code used in the example for setting the brake value is:

```html
<!-- AWP_In_Variable Name="'Data_block_1'" -->
...<tr style="vertical-align: top; height: 2%;">
  <td style="width: 22%;"><p>Braking:</p></td>
  <td><form method="POST">
    <p><input name="'Data_block_1'.Braking" size="10" type="text">
    %</p>
  </form></td>
</tr>
```

This excerpt from the HTML code first defines a "AWP_In_Variable" for the "Data_block_1" data block which enables the user page to write any number of tags into the data block. The text "Braking:" is displayed on the left-hand side; on the right-hand side is a box in which the user can make entries for the "Braking" tag in the data block.

The user page reads out the actual braking value from the controller and displays it in the text box. A user with the corresponding access permissions can then write a brake value that controls the braking process into the data block of the CPU.

Note

Declaration of data blocks

If you declare an entire data block by means of a "AWP_In_Variable", each tag in the data block can be written by means of the user page. If only certain tags in the data block are to be writable, you declare this specifically using `<!-- AWP_In_Variable Name="'Data_block_1'.Braking' -->`, for example.
3.11.5.5 Writing special tags

Using special tags

The user page "Remote Wind Turbine Monitor" writes the special tag "Server:current_user_id" into a tag of the CPU. The tag value contains the value "1" if a user is logged on and "0" if a user is not logged on. In this example, a user is logged on, so the tag value is set to "1". The special tag is written into the CPU by the user page and does not need a user interface.

The code used in the example is:

```html
<!-- AWP_in_variable Name="SERVER:current_user_id" Use="User_ID" -->
```
3.11.5.6  **HTML code of the user page "Remote Wind Turbine Monitor"**

The complete HTML code of the example user page "Remote Wind Turbine Monitor" as well as the used Cascading Style Sheet (CSS) is listed below.

```html
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">-->
This test program simulates a website for monitoring and operating a wind turbine.
Required PLC tags and data block tags in STEP 7:
PLC tag:
User_ID: Int
Data blocks:
Data_block_1
Tags in Data_Block_1:
TurbineNumber: Int
WindSpeed: Real
WindDirection: Real
Temperature: Real
PowerOutput: Real
ManualOverrideEnable: Bool
TurbineSpeed: Real
YawOverride: Bool
Yaw: Real
PitchOverride: Bool
Pitch: Real
Braking: Real
The user-defined website shows the current values for the PLC data and offers a drop-down list to specify the three Boolean values with the assigned enumeration type. The selected Boolean values as well as the data text boxes for speed, orientation and angle of attack of the turbine are uploaded with the "Send" button. The brake value can be specified without the "Send" button.

No actual STEP 7 program is required for using this page. The STEP 7 program would theoretically only respond to the values for speed, orientation and angle of attack of the turbine, if the assigned Boolean values were specified. The only requirement for STEP 7 is that the WWW instruction is called with the DB number of the generated data blocks for this page.

```
<html>
<head>
<meta http-equiv="content-type" content="text/html; charset=utf-8">
<link rel="stylesheet" href="Wind_turbine.css">
<title>Remote monitoring of wind turbines</title>
<body>
<table cellpadding="0" cellspacing="2">
<tr style="height: 2%;">
<td colspan="2">
<h2>Remote Wind Turbine Monitor: Turbine #: "Data_block_1".TurbineNumber:</h2>
</td>
</tr>
<tr style="height: 2%;"><td style="width: 25%;"><p>Wind speed: :="Data_block_1".WindSpeed: km/h</p></td>
</tr>
<tr style="height: 2%;"><td style="width: 25%;"><p>Wind direction: :="Data_block_1".WindDirection: deg.</p></td>
</tr>
<tr style="height: 2%;"><td style="width: 25%;"><p>Temperature: :="Data_block_1".Temperature: deg. C</p></td>
</tr>
<tr style="height: 2%;"><td style="width: 25%;"><p>Power output: :="Data_block_1".PowerOutput: kW</p></td>
</tr>
<tr style="height: 2%;"><td style="width=25%; border-top-style: Solid; border-top-width: 2px; border-top-color: #ffffff;">
</td>
</tr>
<tr style="vertical-align: top; height: 2%;"><p>Turbine speed: :="Data_block_1".TurbineSpeed: RPM</p></td>
</tr>
</table>
<form method="POST" action="">
<tr style="height: 2%;">
<td style="width: 25%;"><input name="" value='"Data_block_1".TurbineSpeed' size="10" type="text"> RPM</input></td>
</tr>
</form>
</body>
</html>
<p>Yaw override: \texttt{\textendash Data\_block\_1}.YawOverride: \texttt{\textendash Data\_block\_1}.YawOverride</p>

<tr style="vertical-align: top; height: 2%;">
<td style="width: 25%; border-bottom-style: Solid; border-bottomwidth: 2px; border-bottom-color: #ffffff;">
<p>Blade pitch:</p>
</td>
<td>
<p>\texttt{\textendash Data\_block\_1}.Pitch</p>
</td>
</tr>

<form method="POST" action="">
<tr style="vertical-align: top; height: 2%;">
<td colspan="2">
<input name="\texttt{\textendash Data\_block\_1}.Braking" size="10" value=':="Data_block_1”.Braking:' type="text"> %
</input>
</td>
</tr>
</form>
Wind_turbine.css

BODY {
    background-image: url('./Wind_turbine.jpg')
    background-position: 0% 0%
    background-repeat: no-repeat
    background-size: cover
}

H2 {
    font-family: Arial;
    font-weight: bold;
    font-size: 14.0pt;
    color: #FFFFFF;
    margin-top:0px;
    margin-bottom:10px;
}

P {
    font-family: Arial;
    font-weight: bold;
    color: #FFFFFF;
    font-size: 12.0pt;
    margin-top:0px;
    margin-bottom:0px;
}

TD.Text {
    font-family: Arial;
    font-weight: bold;
    color: #FFFFFF;
    font-size: 12.0pt;
    margin-top:0px;
    margin-bottom:0px;
}
3.12 Filebrowser

Requirements

Access rights must be assigned for the user in the user management.

Filebrowser

The browser displays the content of the SIMATIC memory card on the "Filebrowser" web page. This means, for example, that you can read and edit the log files generated by the CPU without having to use STEP 7.

<table>
<thead>
<tr>
<th>Name</th>
<th>Size</th>
<th>Changed</th>
<th>Delete</th>
<th>Rename</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>LOG</em></td>
<td>32768</td>
<td>00:39:08 05/03/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>calc.exe</td>
<td>912</td>
<td>00:39:08 05/03/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>data1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>recipes</td>
<td>95630</td>
<td>24/10/2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>datalog</td>
<td>95630</td>
<td>24/10/2017</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Directory operations:

- Upload file

Figure 3-43 Filebrowser view

The Filebrowser lists all existing files and directories on the SIMATIC memory card. You can download, delete, rename and upload the files. You can create, delete and rename the directories.

Note

The Filebrowser only grants you read access to the "DataLogs", "Backups" and "UserFiles" directories.

Exception system files

The system files include the job file and all special directories including their contents to which the job file refers. System files are not displayed, and cannot be changed or deleted.
3.13 DataLogs

On the DataLogs web page, you can view all the DataLogs that you have created.

You can sort the DataLogs according to individual parameters in ascending or descending order.

For this purpose, click on one of the parameters in the column header:

- Name
- Size
- Changed

You can download the relevant DataLog file by clicking the file name.

The "Active" column shows whether the respective DataLog file is used (is active) or not.

When the DataLog file is active, you can call (download) and empty the relevant DataLog file by clicking the icon 📊. The file must be closed. The empty DataLog file is still maintained in the list of DataLogs.

You delete the DataLog file by clicking the icon delete in the "Delete" column. The file must be closed.

You close an opened DataLog file in STEP 7 by using the "DataLogClose" instruction.

<table>
<thead>
<tr>
<th>DataLogs</th>
<th>Off</th>
<th>Edit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Size</td>
<td>Changed</td>
</tr>
<tr>
<td>datalog_1.csv</td>
<td>0 bytes</td>
<td>12:05:00</td>
</tr>
<tr>
<td>datalog_2.csv</td>
<td>0 bytes</td>
<td>12:05:00</td>
</tr>
</tbody>
</table>

Figure 3-44 DataLogs
3.13.1 Automated reading out of DataLogs

In addition to the downloading of individual DataLogs via the user interface of the Web server, you can download, read out and archive DataLogs. Automatic downloading of DataLogs is realized either by the execution of scripts in, for example, Bash or on your HTML user page via JavaScript.

A typical application for this functionality is the daily reading out and archiving of DataLogs from one or more CPUs at a specific time.

Calling up of the DataLogs from the SIMATIC memory card

The CPU makes a URL in the following format available so that you can download DataLogs automatically from the SIMATIC memory card of your CPU:

```
http[s]://[ip]/DataLogs?Action=List
```

Enter the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS), for example

```
```

Subsequently call up the URL in your browser or command line interpreter.

The URL returns a list of the DataLogs on the SIMATIC memory card. Each entry returns the URL by which you download the corresponding DataLog.

For simple syntax analysis of the list by command line interpreters (such as Bash) or web-based programming languages (such as JavaScript) the individual URLs are separated by a line break \n. The following example shows the syntax of two URLs that access the DataLog files Test.txt and Test2.txt:

```
/DataLogs?Path=/DataLogs/Test.txt&Action=DOWNLOAD&E=1\n
/DataLogs?Path=/DataLogs/Test2.txt&Action=DOWNLOAD&E=1\n
\n
```

When the URLs are called successfully, the CPU returns the status code 200 OK. The CPU also returns this status code if no DataLogs exist on the SIMATIC memory card.

---

Note

Access authorization to the CPU for the reading out of data

In order to download DataLogs from the CPU, the user has to dispose of reading rights on the CPU. If the user does not have the required rights, the CPU returns the status code 403 FORBIDDEN in the HTTP Response.

---

Downloading of the DataLogs via Bash scripts

The following example shows how you can download DataLogs automatically from the CPU by using a Bash script. Replace the URL of the example by the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS).

```
```
**Downloading of the DataLogs via JavaScript**

The following example shows how you can download DataLogs automatically by using JavaScript. Replace the URL of the example by the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS).

```html
<html>
<head>
    <title>DataLog JavaScript Test</title>
    <script type="text/javascript" src="jquery-1.12.4.min.js"></script>
</head>
<body>
<h1>DataLog JavaScript Test</h1>
<div><button id="load">Load DataLogs</button></div>
<div><ul id="list"></ul></div>
<script type="text/javascript">
    $('#load').click(function(){
        $.get('http://192.168.2.132/DataLogs', {'Action': 'LIST'},
        function(data){
            $('#list').empty();
            $.each(data.split(/
/), function(){
                if (this.length == 0) continue;
                $('#list').append('<li><a href="http://192.168.2.132' + this + '">' + this + '</a></li>');
            });
        });
    });
</script>
</body>
</html>
```
3.14 UserFiles

Introduction

You read and write with the instructions "FileReadC" (Compact Read Data of a File) or "FileWriteC" (Compact Write Data to a File) in STEP 7 ASCII files (files in binary format).

Requirements

You need to save the UserFiles in the "UserFiles" directory on the SIMATIC memory card. You specify the storage location in the path of the "FileReadC" or "FileWriteC" instruction.

Path and file name for UserFiles have to fulfill the following rules:

- The file name must not be longer than 55 characters.
- The following characters are permitted for the directory and file name: 0 to 9, a to z in upper- and lower-case, "," and "_"
- The path name must not start with "/", "\" or "."
- The path name must not contain ".."

Examples:

- UserFiles\Lift16_DataBase.txt
- UserFiles\2017-04-13_ErrorLog.bin
"User files" Web page

The browser displays the content of the SIMATIC memory card, directory UserFiles\ on the "User files" Web page.

You can sort the UserFiles according to the individual parameters in ascending or descending order.
To do this, click on one of the parameters in the column header:

- Name
- Size
- Changed

You can download, delete, and upload files.

You download the UserFile by clicking the file name.

By clicking on the icon, you can delete the UserFile. The file must be closed.

![User Files Table]

Size UserFiles

When you open a large UserFile through this Web page, the processing times of the instructions that process this file can increase notably.
3.14.1 Reading or upload user files automatically

In addition to the Web server's user interface, you can automatically list, delete, download and upload UserFiles. Use JavaScript or Bash for this, for example.

Opening UserFiles from the SIMATIC memory card

The CPU makes a URL in the following format available so that you can list UserFiles automatically from the SIMATIC memory card of your CPU:

http[s]://[ip]/UserFiles?Action=List

Enter the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS), e.g. https://192.168.2.132/UserFiles?Action=LIST. Subsequently call up the URL in your browser or command line interpreter.

The URL returns a list of the UserFiles on the SIMATIC memory card. Each entry returns the URL by which you download or delete the corresponding UserFile from the CPU. The actions to be performed are separated by a vertical line "|".

For simple syntax analysis of the list by web-based programming languages (such as JavaScript), the individual URLs are separated by a line break `<CR><LF>`. The following example shows the syntax of two URLs that access the UserFiles File1.csv and File2.csv:


When the URLs are called successfully, the CPU returns the status code 200 OK. The CPU also returns this status code if there are no UserFiles on the SIMATIC memory card.

Note

Access authorization to the CPU for the reading out of data

In order to download UserFiles from the CPU, the user must have reading rights for the CPU. If the user does not have the required rights, the CPU returns the status code 403 FORBIDDEN in the HTTP Response.
Uploading UserFiles to the SIMATIC memory card

The CPU makes a URL in the following format available so that you can upload UserFiles automatically to the SIMATIC memory card of your CPU:

http[s]://[ip]/UserFiles?Action=UPLOAD

The following example shows how you can upload a UserFile to your HTML user page automatically using JavaScript.

Replace the URL of the example by the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS).

```html
<html>
  <head>
    <title>UserFiles Upload</title>
  </head>
  <body>
      <input type="file" name="File" />
      <input type="submit" />
    </form>
  </body>
</html>
```

When the upload of the UserFile is successful, the CPU returns the status code 201 CREATED. If the UserFile already exists on the SIMATIC memory card, the CPU returns the status code 409 CONFLICT.

---

**Note**

**Access authorization to the CPU for uploading data**

In order to download UserFiles to the CPU, the user must have write rights for the CPU. If the user does not have the required rights, the CPU returns the status code 403 FORBIDDEN in the HTTP Response.

---

**Downloading UserFiles via Bash scripts**

The following example shows how you can download UserFiles automatically from the CPU using a Bash script. Replace the URL of the example by the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS).

```
```
The following example shows how you can download UserFiles automatically using JavaScript. Replace the URL of the example by the correct IP address of the interface of your CPU at this URL and use the appropriate transfer protocol (HTTP or HTTPS).

```html
<html>
<head>
  <title>UserFiles JavaScript Test</title>
  <script type="text/javascript" src="jquery-1.11.2.min.js"></script>
</head>
<body>
<h1>UserFiles JavaScript Test</h1>
<div><button id="load">Load UserFiles</button></div>
<table border="1">
  <thead>
    <tr>
      <th>Name</th>
      <th>Operation</th>
    </tr>
  </thead>
  <tbody id="list"></tbody>
</table>
  <input type="file" name="File" />
  <input type="submit" />
</form>
<script type="text/javascript">
  function Delete(url) {
    $.post('http://192.168.2.132/UserFiles' + url, {}, function() {
      $('#load').click();
    });
  }
  $('#load').click(function() {
    $('#list').empty();
    $.get('http://192.168.2.132/UserFiles', {'Action': 'LIST'}, function(data) {
      $.each(data.split(/
/), function(i, line) {
        var data = line.split('|');
        if (data.length == 3) {
          $('#list').append('<tr><td>' + decodeURIComponent(data[0]) + '</td><td><a href="http://192.168.2.132"+data[1]+' Download' + data[2]+'&amp;"">Delete</a><button type="button"
          onclick="Delete("'+data[2]+'&amp;")">Delete</button></td></tr>');</n    });
  });
</script>
</body>
</html>
```
3.15 Online backup

Backing up and restoring the CPU configuration

You can back up a CPU configuration using the Web server with the corresponding access rights. If necessary, you can also restore this configuration at a later time using the Web server.

You can create as many backups as you want and store a variety of configurations for a CPU.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to every restoration of the CPU configuration, always first perform an online backup of the current CPU configuration and save this backup file to a local directory of your PC. This ensures that you can undo a restoration which failed (e.g. due to a damaged backup file) or which does not show the desired result.</td>
</tr>
</tbody>
</table>

Note

You can also perform online backup and restoration of the CPU configuration in STEP 7 (see online help for STEP 7, keyword: "Creating a backup of an S7 CPU").

With a backup using STEP 7, the backup file is saved within the STEP 7 project. With a backup using the Web server, the backup file is saved to a local directory of your PG/PC (e.g. "Downloads" directory). Web server backup files cannot be restored via STEP 7, nor can STEP 7 backup files be restored directly using the Web server.

To restore a STEP 7 backup file using the Web server, first save the STEP 7 backup file to a local directory of your PG/PC (e.g. "Downloads" directory). From there, you can restore the backup with the Web server.

Requirements

- You access the CPU via the secure transmission protocol "HTTPS".
- A valid CA-signed certificate is installed in the Web browser; see section Configuring the Web server (Page 21).
Online backup

Figure 3-46  Online backup
1. **Perform online backup of the configuration**

   To perform an online backup of the CPU configuration, proceed as follows:

   1. Click the "Create online backup" button in the "PLC backup" area.

   2. If the CPU is in RUN mode, the following alarm is output:
     "Creation of an online backup requires PLC STOP. Do you want to set the PLC to STOP mode?"
     Acknowledge the alarm output by clicking "OK". The CPU is set to STOP mode and online backup is performed. (If you click "Cancel", the CPU remains in the current mode and the online backup is canceled.)

   3. Save the backup file to a local directory of your PC.

   4. Set the CPU back to RUN mode ("RUN" button in the "CPU operator panel" area of the start page).

**Scope of the backup**

The backup includes all data needed to restore a particular state of a CPU, i.e. the specific combination of the configuration of the CPU with the current values of the user-related retentive data.

The following data of the configuration of the CPU is backed up:

- The contents of the SIMATIC memory card, e.g. configuration, program code, recipes and archives, DataLogs

The following user-relevant retentive data is backed up:

- Retentive memory areas of data blocks, bit memories, counters and timers
- Front-panel settings, dynamic IP configuration data, operating hours counters, retentive Motion Control sensor data

**Note:**

- Entries in the diagnostic buffer are not included in the backup.
- The current time of day is not backed up for a SIMATIC S7-1500 CPU.
- The entire contents of the SIMATIC memory card are backed up, i.e. any data stored on the card (e.g. PDF files, GSD files).
- The backup file is assigned the name of the CPU and the project with the time and date of the backup, e.g. "2015-09-10_11-01_03_online backup_PLC69_machineControl.s7pbkp".
- The backup file of an F-CPU also contains the collective signature of the safety program in the file name. Check whether it is the expected F-collective signature.
- You can rename the backup, but you cannot make any changes to the contents of the backup.
② Restore the configuration

To restore the CPU configuration, follow these steps:

1. Enter the password of the currently logged-in user in the "PLC restore" area.
2. Click the "Browse" button and select the backup file of the configuration that you want to restore.
3. Click "Load online backup".
4. If the CPU is in RUN mode, the following alarm is output:
   "Download online backup to device. The CPU is set to STOP and the contents of the CPU will be overwritten. Do you want to continue?"
   
   If the CPU is already in STOP mode, the following alarm is output:
   "Download online backup to device. The contents of the CPU will be overwritten. Do you want to continue?"

   Acknowledge the alarm output by clicking "OK". The CPU is set to "STOP" mode if required, and the online backup is downloaded. (If you click "Cancel", the CPU remains in the current mode and downloading is canceled.)

5. An alarm informs you that you must not leave the web page during the "restore procedure". Acknowledge the alarm output by clicking "OK".

   The restoration of the CPU configuration starts and you will be continuously informed of the current status:
   - "Download of online backup has been started."
   - "Checking backup file."
   - "Formatting memory card and resetting CPU."
6. If you have started the restoration procedure with a user name and password defined in the Web server configuration, you will be asked to enter these again after restoration of the CPU. Enter the required information and click "Login".

If you have started the restoration procedure as the user "Everybody" without a password (but with appropriate access rights), this prompt is not displayed.

**Note**

To restore the configuration of an F-CPU whose security program and/or password has been changed for the F-CPU in the meantime, you also need the access authorization "F-Admin"; see "Amending user management" in the section Configuring the Web server (Page 21).

---

**WARNING**

The authorization "F-admin" for the Web server without password protection (User "Everybody") is only for test purposes, commissioning etc. i.e. only when the system is in productive operation. In this case, you have to ensure the security of the plant through other organizational measures, e.g. through spatial protection.

Prior to the transition to productive operation, you must remove the right "F-Admin" for the user "Everybody".

The password of the user of the Web server with the right "F-Admin" should only be accessible to authorized persons.

The restoration of the CPU configuration starts and you will be continuously informed of the current status:

- "Loading configuration."
- "Resetting CPU."

This may take a few minutes.

7. When the procedure is complete, you will be logged out and the "Reload page..." button will be displayed.

If you did not receive an error message during the restoration procedure, the restoration of the CPU configuration was successfully completed and you will receive a corresponding message.

Click the "Reload page..." button and log on to the newly downloaded CPU configuration with your user name and password.

You will receive the following error message if:

- the newly downloaded CPU configuration does not contain the same IP address as the former one
- the Web server is deactivated in the newly downloaded CPU configuration
- the browser does not receive a response from the CPU after 3 minutes

Error message: "The CPU is not reachable anymore. Please check the IP address and the Web server configuration. The result of the restore can be checked in the ASLog."
3.16 Motion Control diagnostics

Overview

The Web server displays statuses, errors, technology alarms and the current values of the configured technology objects (TOs):

- Speed-controlled axis (TO_SpeedAxis)
- Positioning axis (TO_PositioningAxis)
- Synchronous axis (TO_SynchronousAxis)
- External encoder (TO_ExternalEncoder)
- Measuring input (TO_MeasuringInput)
- Output cam (TO_OutputCam)
- Cam track (TO_CamTrack)

The "Motion Control Diagnostics" web page provides detailed information on the configured technology objects in the following views:

- Diagnostics
- Service overview

Diagnostics

The "Diagnostics" view offers you:

- ① An overview list of the configured technology objects
- ② The status and error messages of a selected technology object
- ③ Values and limits of the status of a selected axis/cam
"Diagnostics" view

Under "Status", you will find an overview list of the configured technology objects with the designation and type, which indicates whether the technology object in question is "released" and "referenced".

The technology object is enabled: The axis can be moved with motion jobs.

The technology object is homed: The relationship between the position in the technology object and the mechanical position was successfully created.

Figure 3-47  Motion Control diagnostics: Status and error bits
Meaning of the symbols in the "Status" column

Table 3-10  Meaning of symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Symbol color</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GREEN</td>
<td>Component is OK</td>
</tr>
<tr>
<td></td>
<td>YELLOW</td>
<td>Warning pending</td>
</tr>
<tr>
<td></td>
<td>RED</td>
<td>Error - component faulty or not available</td>
</tr>
</tbody>
</table>

Select the required technology object. The related diagnostics information is shown in the bottom tabs.

② "Status and error bits" tab

You use the "Status and error bits" tab to monitor the status and error messages for the technology object as in STEP 7.
③ "Motion status"/"Cam track status" tab

You use the "Motion status" tab to monitor the motion status of the axis as in STEP 7.

![Motion Control diagnostics: Motion status](image)

Figure 3-48  Motion Control diagnostics: Motion status
You use the "Cam track status" tab to monitor the cam track status as in STEP 7.

![Motion control diagnostics](image)

**Figure 3-49  Motion Control diagnostics: Cam track status**

**Service overview**

The "Service overview" view offers you:

- 1 Diagnostics information for several technology objects
- 2 A filter option for selecting the displayed technology objects
① "Service overview" view

The "Service overview" shows the diagnostics information for several technology objects in table form.

![Motion Control diagnostics, service overview](image)

Figure 3-50  Motion Control diagnostics, service overview: Status and error information
To select the information to be displayed, click the list symbol in the first column of the table. Make your selection in the next window. Click the list symbol again to leave the selection window.

![Motion control diagnostics table]

Figure 3-51  Motion Control diagnostics, service overview: Configuring the status and error information
Selection "Select technology objects"

You can make a selection of the displayed technology objects with the selection "Select technology objects".

![Select technology objects](image)

Figure 3-52 Motion Control diagnostics, service overview: Status and error information - Select technology objects

Reference

You can find explanations of the diagnostics functions "Status and error bits" and "Motion status"/"Cam track status" of the individual technology objects in the online help for STEP 7.
3.17 Trace

Trace and logic analyzer function

You record device tags and evaluate the recordings with the trace and logic analyzer function. Tags are, for example, drive parameters or system and user tags of a CPU.

The recordings are saved on the device and can be read out by users with appropriate access rights via the Web server and saved. The trace and logic analyzer function is therefore suitable for monitoring highly dynamic processes in the Web server.

Requirements

- A trace configuration has been created, i.e. you have defined the recording and trigger conditions and selected the signals to be recorded.
  - Note: Only measurements which are saved on the SIMATIC memory card can be displayed on the "Trace" Web page.

  For the CPU to save the measurements on the SIMATIC memory card, you must make the following settings for the trace configuration in STEP 7:
  1. Set the "Trigger mode" to "Trigger on tag".
  2. Select the "Save measurements on device (memory card)" check box.

- You have transferred the trace configuration to the device and activated it there.
- You have been assigned the access right "The user is authorized to..." > "...query diagnostics" in the user administration of the Web server; see section Configuring the Web server (Page 21).
Space requirements for storing trace recordings

The "Save measurements on device (memory card)" function in STEP 7 saves Trace recordings on your SIMATIC memory card.

Response when number reached

The "Deactivate recording" parameter repeats the measurements until the configured "Number of measurements" is reached.

The "Overwrite oldest recording" parameter replaces the oldest measurement with the latest measurement when the configured "Number of measurements" is reached. Note, however, that continuously writing data to the SIMATIC memory card shortens its service life.

Figure 3-53 Dialog of settings for storing measurements on the memory card in STEP 7

Number of measurements

The CPU supports a maximum of 999 measurements. While the CPU writes the trace recordings to the load memory of the memory card, it pauses monitoring of the trigger conditions for the trace job. After the CPU has terminated the storing of Trace recordings, the CPU continues checking of the trigger conditions.

NOTICE

Required memory on the SIMATIC memory card

Note that the "Save measurements on device (memory card)" function needs >1024 KB of free space on your SIMATIC memory card. This amount of required space is independent of the size of the SIMATIC memory card you are using. If this space is no longer available, the CPU stops storing measurements on the memory card and writes a corresponding entry to the diagnostic buffer.

Therefore, ensure that there is enough space on the SIMATIC memory card before running the "Save measurements on device (memory card)" function. Delete trace recordings no longer required from the SIMATIC memory card.

You can view the current values on the currently used space in the load memory in the "Memory" tab on the "Diagnostics" web page.
**Additional information**

The operation of the interface of the "Trace" web page largely corresponds to the operation of the trace function in STEP 7. See the Using the trace and logic analyzer function manual ([https://support.industry.siemens.com/cs/ww/en/view/64897128](https://support.industry.siemens.com/cs/ww/en/view/64897128)) and the online help for STEP 7 for more on this.

**Displaying the trace recordings**

The web page of the trace and logic analyzer function consists of several areas. The example in the figure below shows how the Web server user interface is divided when the "Trace" web page is first called.

![Figure 3-54 Trace start page without measurement](image)

1. Trace recordings
2. Toolbar of the trend diagram
3. Trend diagram and bit track
4. Signal tables

Figure 3-54 Trace start page without measurement
Opening measurements

To open a measurement, right-click on a measurement to select it from the "Trace recordings" area. Then select the command "Display in diagram" in the shortcut menu.

The measurement is displayed in the "Curve diagram and bit track" area.

To display multiple measurement at once, right-click on a measurement to select it from the "Trace recordings" area. Then select the command "Add to table" in the shortcut menu.

The measurements are displayed in the "Curve diagram and bit track" area.
Trace recordings

The "Trace recordings" area shows a list of all existing measurements, sorted by date and time of the trace recordings. A measurement always consists of a trace configuration with an associated recording.

The following table shows the special Web server shortcut menu commands in the Trace recordings area:

Table 3-11 Web server shortcut menu commands in the trace recordings area

<table>
<thead>
<tr>
<th>Shortcut menu command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Delete&quot;</td>
<td>Deletes the selected measurement on the memory card of the CPU. A confirmation dialog opens. After deletion, the display in the trend diagram is not automatically overwritten.</td>
</tr>
<tr>
<td>&quot;Save as&quot;</td>
<td>Saves the selected measurement.</td>
</tr>
<tr>
<td>&quot;Show in chart&quot;</td>
<td>Loads the selected measurement to the display area of the Web server.</td>
</tr>
</tbody>
</table>

Some data types offer the display of individual bit tracks. Enable the individual bit tracks of the signal opened in the signal table using the icon.

You can adjust the display of the signals in the signal table and with the toolbar of the curve diagram.

Figure 3-57 Trace measurement - All areas visible
## Toolbar of the trend diagram

As in STEP 7, tools are available for adapting the display via buttons of the toolbar of the trend diagram.

The following table shows the Web server buttons in the trend diagram toolbar:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>Open / add measurement</td>
<td>Opens measurements or adds measurement to an existing measurement.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Save as</td>
<td>Saves measurement(s) as a file with the extension .csv, .wtrc (SIMOTION format for saving Trace data) or .ttrecx (TIA Portal format for saving Trace data). In addition to the measured data the command also saves the diagram, snapshots, marking and calculated signals.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Undo move / zoom</td>
<td>Undoes the move / zoom function executed last. If you have carried out several move / zoom functions, you can undo these step-by-step.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Repeat move / zoom</td>
<td>Redoes the last undone move / zoom function. If you have undone several move / zoom functions, you can redo these step-by-step.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Snapshot</td>
<td>Saves the current view as a snapshot (see the section &quot;Settings and displays of the Snapshot symbol&quot;).</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Move view</td>
<td>Moves the display with a pressed mouse button - corresponds to the button in STEP 7.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Zoom selection</td>
<td>Selection of an arbitrary range with the mouse button pressed. The button scales the display to the range selection.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Vertical zoom selection</td>
<td>Selection of a vertical range with the mouse button pressed. The button scales the display to the range selection.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Horizontal zoom selection</td>
<td>Selection of a horizontal range with the mouse button pressed. The button scales the display to the range selection.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Zoom in</td>
<td>Enlargement of the display. The ranges of the X axis and Y axis are reduced every time the button is clicked. The curves are displayed larger.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Zoom out</td>
<td>Reduction of the display. The ranges of the X axis and Y axis are reduced every time the button is clicked. The curves are displayed smaller.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Scaling</td>
<td>Scales all the signals or also only signal / signal group vertically and horizontally.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Restore standard view</td>
<td>The button undoes scaling and move commands. The view is reset to the status at the time of loading of the measurement. Hidden signals are also reset but remain disabled.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Display all</td>
<td>The button moves all the signals completely into the display area without changing the relative positions of the signals to each other.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Scale X automatically</td>
<td>Automatic scaling of all visible signals on the horizontal X area.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Scale Y automatically</td>
<td>Automatic scaling of all visible signals on the vertical Y area.</td>
</tr>
</tbody>
</table>
### 3.17 Trace

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td>Arrange in tracks</td>
<td>Activate or deactivate the trace arrangement. When the trace arrangement is activated, the signals are arranged among themselves with the relevant value axes. Signal groups are displayed in the same trace. This setting does not affect the display for the bit tracks.</td>
</tr>
</tbody>
</table>
| ![Symbol](image2) | Unit switching of the time axis | Switching the unit of the time axis. You can enter the following information:  
- Measuring points  
- Time (relative time related to the trigger time)  
- Trigger stamp of the measurement points |
| ![Symbol](image3) | Display measurement points | The button displays the measurement point as small circles on the curves. |
| ![Symbol](image4) | Interpolation on/off | The buttons activate/deactivate the interpolation of the data of the trend diagram. |
| ![Symbol](image5) | Grid | The button activates/deactivates the grid of the trend diagram and regulates its brightness in the Levels 1 to 9. |
| ![Symbol](image6) | Vertical measurement cursor | Display of vertical measurement cursor. The vertical position of the two measurement cursors can be moved with the mouse. The values of the signals and the difference between two measuring points are displayed in the signal table for all displayed signals and also in the trend diagram for the selected signal. The measuring point or the relative/absolute time to the measurement cursors is displayed depending on the set unit of the time axis (X axis) in the movable pop-up window “Measuring points/Time values”. |
| ![Symbol](image7) | Horizontal measurement cursor | Display of the horizontal measurement cursors. The horizontal position of the two measurement cursors can be moved with the mouse. The Y values of the measurement cursor for the selected signal are displayed in the movable pop-up window “Y values”. |
| ![Symbol](image8) | Difference of the measurement cursor | Display of the difference of the horizontal and vertical measurement cursors and the Y values at the intersections with the vertical measurement cursors. |
| ![Symbol](image9) | Show legend | Showing or hiding of the legend in the curve diagram and the bit track labels. |
| ![Symbol](image10) | Align the chart legend to the left | Display of the legend and the bit track labels on the left side of the curve diagram. |
| ![Symbol](image11) | Align the chart legend to the right | Display of the legend and the bit track labels on the right side of the curve diagram. |
| ![Symbol](image12) | Change background color | Changeover between various background colors. |
| ![Symbol](image13) | Identification | The following table provides an overview of marked signal areas. Note that markings are only possible for analog signal. |

All icons in the toolbar are equipped with tooltips.
Trend diagram

The trend diagram displays the selected signals of a recording. Bits are shown in the lower diagram as a bit track.

Figure 3-58  Trace measurement - only trend diagram visible

The following table shows the special Web server shortcut menu commands of a selected signal in the trend diagram:

Table 3-13  Web server shortcut menu commands in the trend diagram area

<table>
<thead>
<tr>
<th>Shortcut menu command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Scale Y automatically&quot;</td>
<td>Automatic scaling of the selected signal in Y direction.</td>
</tr>
<tr>
<td>&quot;Hide signal&quot;</td>
<td>Hides the selected signal in the trend diagram.</td>
</tr>
</tbody>
</table>
### Use of the trend diagram

You can zoom the display area as you like. Measurement cursors (see "② Toolbar of the trend diagram") can be used to select individual values for display in the signal table.

The following image shows how you can change the display area of the trend diagram as required with rulers and scroll bars.

![Image of trend diagram with rulers and scroll bars](image)

① Vertical ruler  
② Vertical scroll bar  
③ Horizontal ruler  
④ Horizontal scroll bar

**Figure 3-59 Trace measurement - rulers and scroll bars**

**Using the vertical ruler**

- If you click the vertical ruler at the top or the bottom, you increase the size of the display at the top or bottom.
- If you click the vertical ruler at the top or the bottom while keeping the shift key pressed, you scale both ends.
- If you click the vertical ruler at the top or the bottom while keeping the Ctrl key pressed, you move the display up or down.
### Using the horizontal ruler

- If you click the horizontal ruler on the left or the right, you increase the size of the display on the left or right.
- If you click the horizontal ruler on the left or right while keeping the shift key pressed, you scale both ends.
- If you click the horizontal ruler on the left or the right while keeping the Ctrl key pressed, you move the display to the left or right.

### Using the mouse wheel

- If you activate the mouse wheel in the display, you move the display up or down.
- If you activate the mouse wheel in the display while keeping the shift key pressed, you move the display to the left or right.
- If you activate the mouse wheel in the display while keeping the Ctrl key pressed, you increase/reduce the size of the display at the position of the mouse pointer.

### Signal tables

The signal tables list the signals of the selected measurement and provides setting options for some properties. The area of the signal tables is divided into the tabs "Measurements", "Signals" and "Calculated signal".
### Settings and displays in the "Signals" tab

The following figure shows the signal table of the "Signals" tab.

![Signal Table](image)

#### Column

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal or error symbol</td>
<td>Signal symbol</td>
</tr>
<tr>
<td>![Signal symbol icon]</td>
<td>Symbol for calculated signals (formulas)</td>
</tr>
<tr>
<td>![Error symbol icon]</td>
<td>Error in the formula of the calculated signal</td>
</tr>
<tr>
<td>![Selection icon]</td>
<td>Selection for the display in the trend diagram</td>
</tr>
<tr>
<td>![Selection icon]</td>
<td>The point indicates that at least one bit has been selected for display as bit track for the signal in the bit selection.</td>
</tr>
<tr>
<td>Signal number</td>
<td>Automatically generated number of the signal</td>
</tr>
<tr>
<td>Name</td>
<td>Display of the signal name</td>
</tr>
<tr>
<td>![Open bit selection icon]</td>
<td>Open bit selection</td>
</tr>
<tr>
<td>![Open bit selection icon]</td>
<td>Individual bits can also be selected for the following data types for display as a bit track in the lower curve diagram:</td>
</tr>
<tr>
<td>![Open bit selection icon]</td>
<td>• Byte, Word, DWord, LWord</td>
</tr>
<tr>
<td>![Open bit selection icon]</td>
<td>• SInt, USInt, Int, UInt, DInt, UDInt, LInt, ULInt</td>
</tr>
<tr>
<td>![Open bit selection icon]</td>
<td>Example of an opened bit selection for the DWORD data type:</td>
</tr>
</tbody>
</table>

![Example of bit selection](image)

Select or deselect the relevant bit for display by clicking the ![Open bit selection icon].

<table>
<thead>
<tr>
<th>Data type</th>
<th>Display of the data type</th>
</tr>
</thead>
</table>

---

**Figure 3-60 Display in the "Signals" tab**

The following table shows the settings and displays of the recorded signals of the "Signals" tab:
The following table shows the possible Web server shortcut menu commands of the "Signals" tab:

<table>
<thead>
<tr>
<th>Shortcut menu command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Scale Y automatically&quot;</td>
<td>Automatic scaling of the selected signal in Y direction.</td>
</tr>
<tr>
<td>&quot;Show signal&quot;</td>
<td>Shows the signal in the trend diagram</td>
</tr>
<tr>
<td>&quot;Hide signal&quot;</td>
<td>Hides the signal in the trend diagram</td>
</tr>
<tr>
<td>&quot;Show all bits&quot;</td>
<td>Shows all the bits of a signal</td>
</tr>
<tr>
<td>&quot;Hide all bits&quot;</td>
<td>Hides all the bits of a signal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
</table>
| Address                 | Display of the address of the signal  
The field remains empty with optimized / type correct tags.                   |
| Color                   | Display and setting option for the color of the signal                                               |
| Signal group            | Display or input of the signal group name for one signal group  
The Y-scales are scaled identically for all signals of one signal group.  
Enter an identical signal group name for those signals that you want to scale identically.  
To remove signals from a signal group:  
  • Delete the signal group name.  
  • Click the empty entry in the shortcut menu of the signal group  
  Note that you cannot group binary signals. |
| Gray field for the chain icon of the signal group | To add or delete the signal from a signal group, move the mouse pointer over the grey field or the chain icon (🔗 or🔗).  
  Clicking the🔗 chain icon adds the signal to a signal group or creates a new signal group.  
  Clicking the🔗 chain icon removes the signal from the signal group.  
  For a selected signal with signal group, the🔗 chain icon displays all signals of the same signal group. |
| Input field of the signal group | The input field displays the signal group name. As an alternative to the chain icon, you can assign or delete a group name via text input in this field. |
| Min. Y-scale            | Display or input of the minimum value for the scaling of the signal                                   |
| Max. Y-scale            | Display or input of the maximum value for the scaling of the signal                                   |
| Comment                 | Display and input option for a comment about the signal                                               |
Settings and displays in the "Measurements" tab

The following figure shows the display of the "Measurements" tab and the shortcut menu of the "Alignment" column of a selected measurement.

![Figure 3-61 Tab "Measurements" with shortcut menu](image)

Figure 3-61 Tab "Measurements" with shortcut menu
The following table shows the settings and displays for the measurements:

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment of the measurements</td>
<td></td>
</tr>
<tr>
<td>Trigger/Sample</td>
<td>Alignment of the measurements in accordance with the trigger or measurement point. The individual zero point for the measurement is predefined in the table under the &quot;Alignment&quot; column.</td>
</tr>
<tr>
<td>Time stamp (absolute time)</td>
<td>Alignment of the measurements in accordance with their time stamp. The signals are aligned in accordance with the time from the absolute time stamp.</td>
</tr>
<tr>
<td>Table columns</td>
<td></td>
</tr>
<tr>
<td>Static display of the measurement icon</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Display and change options for the name</td>
</tr>
<tr>
<td></td>
<td>Note that the name must be unique.</td>
</tr>
<tr>
<td>Alignment</td>
<td>Alignment of the measurement (only adjustable with the &quot;Trigger/Sample&quot; check box selected).</td>
</tr>
<tr>
<td></td>
<td>Determines the individual zero point for a measurement. All signals for the measurement are displayed in relation to this zero point.</td>
</tr>
<tr>
<td></td>
<td>The following settings are possible:</td>
</tr>
<tr>
<td></td>
<td>• Trigger</td>
</tr>
<tr>
<td></td>
<td>• First sample after the trigger event</td>
</tr>
<tr>
<td></td>
<td>• First sample</td>
</tr>
<tr>
<td></td>
<td>• Last sample</td>
</tr>
<tr>
<td>Offset</td>
<td>Offset related to the time axis</td>
</tr>
<tr>
<td></td>
<td>Moves the measurement left or right by the offset stated on the time axis.</td>
</tr>
<tr>
<td></td>
<td>If you enter solely a numerical value without a unit of measurement, the system automatically assigns the unit &quot;ms&quot; (for example 0=0ms, 100=100ms, 1000=1s, -1001=-1s 1ms, LT#2000ms=2s, LT#-3605000ms=-1h 5s, LT#-1h5s=-1h 5s)</td>
</tr>
<tr>
<td>Time stamp</td>
<td>Display of the trigger time</td>
</tr>
<tr>
<td>Comments</td>
<td>Display and input option for a comment about the signal</td>
</tr>
<tr>
<td>Shortcut menu commands</td>
<td></td>
</tr>
<tr>
<td>&quot;Save as WTRC&quot;</td>
<td>Saves the measurement(s) as a file with the extension .csv, .wtrc (SIMOTION format for saving Trace data) or .ttrecx (TIA Portal format for saving Trace data).</td>
</tr>
<tr>
<td>&quot;Save as CSV&quot;</td>
<td>Exports a measurement as a file with the file extension .csv.</td>
</tr>
<tr>
<td></td>
<td>Note that the command only saves the measured data. The command does not save the diagram, snapshots, markings and calculated signals.</td>
</tr>
<tr>
<td>&quot;Edit name&quot;</td>
<td>Switches the name in editing mode</td>
</tr>
<tr>
<td>&quot;Edit offset&quot;</td>
<td>Switches the offset in editing mode</td>
</tr>
<tr>
<td>&quot;Edit comment&quot;</td>
<td>Switches the comment in editing mode</td>
</tr>
</tbody>
</table>
Settings and displays in the "Calculated signal" tab

You can use this function to calculate new signals based on real signals. The system calculates the Y-values of the signal points in the process.

To parameterize the signals to be calculated, open the "Calculated signal" tab.

In the "General" section specify the name, the data type and color of a signal to be calculated. Note that the name of the signal to be calculated must differ from the name of a real signal.

Figure 3-62 "General" section of the "Calculated signal" tab

Add the basic signals in the "Basic signals" section. The basic signals form the basis for calculating the new signal. You can change the default name of the variable in the "Name" column. You select real signals for the specification of the number of signal points to be calculated in the "Signal" column.

Figure 3-63 "Basic signals" section of the "Calculated signal" tab

Enter the code for the calculation of the Y values of the signal points in the "Calculated signal value" section. The section is divided into:

- Basic mode (expression)
- Advanced mode (JavaScript)

Use the JavaScript syntax to enter the code for both modes. Take into account, however, that not the full JavaScript functionality is supported.
Basic mode (expression)

In this mode you use the following to create your code:

- Standardized JavaScript expressions and operators (for example +, -, /, *, %, ~, &, |, ?, !)
- Standardized math libraries
- The tag names specified under "Basic signals"
  (the system writes the Y-value directly to the variable name)

Figure 3-64 Basic mode (expression)
Advanced mode (JavaScript)

This mode offers you an advanced functional scope for the calculation of the Y value by means of a complex JavaScript code. You can, for example, specify own static tags for the iteration of code sections:

The following table shows all the elements that you can use for your code:

<table>
<thead>
<tr>
<th>Reserved words (case-sensitive)</th>
<th>if</th>
<th>var</th>
<th>Math</th>
<th>Array</th>
<th>catch</th>
<th>typeof</th>
<th>unescape</th>
</tr>
</thead>
<tbody>
<tr>
<td>encodeURI</td>
<td>in</td>
<td>for</td>
<td>else</td>
<td>break</td>
<td>escape</td>
<td>delete</td>
<td></td>
</tr>
<tr>
<td>Infinity</td>
<td>do</td>
<td>Date</td>
<td>case</td>
<td>false</td>
<td>String</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Object</td>
<td>continue</td>
<td>parseInt</td>
<td>try</td>
<td>null</td>
<td>isNaN</td>
<td>throw</td>
<td></td>
</tr>
<tr>
<td>return</td>
<td>Number</td>
<td>do</td>
<td>new</td>
<td>case</td>
<td>true</td>
<td>while</td>
<td></td>
</tr>
<tr>
<td>switch</td>
<td>default</td>
<td>undefined</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Operators                     | %  | - | *= | != | <= | |= |
|------------------------------|----|---|----|----|----|----|
|                             | !==| + | -= | /= | >  | =  |
| ^                            | ===| ++| -= | /= | >= | == |
| &                            | ~  | +=| *= | !  | <  | | |
| &=                           | ?  |   |    |    |    |    |

<table>
<thead>
<tr>
<th>Delimiters</th>
<th>(</th>
<th>)</th>
<th>{</th>
<th>}</th>
<th>[</th>
<th>]</th>
<th>.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>,</td>
<td>:</td>
<td>;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comments</th>
<th>/*</th>
<th>*/</th>
</tr>
</thead>
</table>
Every signal point consists of the following attributes:

1. x (measuring point)
2. t (relative time in milliseconds)
3. y (Y value)
4. points (number of signal points that are available for the calculation of a new signal)

In "Advanced mode (JavaScript)" you can access all four attributes (e.g. "$1.y", 485 "$1.t", "$1.x", $1.points[i].y, ...).

The following function tables support you in writing expressions or complex code in JavaScript. The function table contains the functions used most often:

![Figure 3-66 "Calculated signal" tab with function table]
You also have the possibility to generate the JavaScript code of a real signal from the "Signals" tab. Alternatively you can also select one of predefined templates of the function table, change the code and generate a calculated signal.

The following templates are available in the function table:

- Numerical differentiation
- Numerical integration
- Arithmetic mean

To check the syntax click the symbol "Check syntax" or generate the signal by clicking the icon in the toolbar. If the code has any errors, these are displayed to the right of the "Check syntax" icon in red lettering. If the code does not have any errors, the "Syntax check successful" message is displayed.
How does the system calculate a new signal?

The system checks:

- Whether you have selected a basic signal for the calculation of a new signal
- The name of the signal to be calculated
- The syntax of your JavaScript code

Subsequently the system defines the counting of the measuring points and executes the code for each measuring point to be calculated. In each iteration the system stores the measuring points of the new signal on the basis of the following four attributes:

- Measuring point
- Relative time
- Calculated Y value
- Signal point with x-, t, y-values

The course is displayed after calculation has been completed.

Example for calculating on the basis of a basic signal

You use a single basic signal to calculate the new signal. The basic signal consists of 1000 measuring points.

In this case the system carries out your written code a thousand times. The calculated signal then consists of 1000 calculated signal points with the same x- and t-values, but with own y-values.

Importing/exporting settings

You can import/export certain parameters (formulas, calculation method, signal type and signal name. To import parameters click the icon in the toolbar of the "Calculated signal" tab. To export parameters click the icon in the toolbar of the "Calculated signal" tab.
**Settings and displays of the Snapshot icon**

With the "Snapshot" icon in the toolbar of the trend diagram you save the current signal course in the form of a snapshot.

To create a snapshot of the signal course click the icon. To manage the created snapshots click the arrow on the left next to the "Snapshot" icon and select the entry "Manage snapshots".

![Managing snapshots](image)

**Figure 3-69 Managing snapshots**

The following table shows the settings and displays of the "Managing snapshots" window.

<table>
<thead>
<tr>
<th>Column</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![icon]</td>
<td>Static display of the snapshot icon</td>
</tr>
<tr>
<td>Name</td>
<td>Display and change options for the name</td>
</tr>
<tr>
<td>Time stamp</td>
<td>Display of the creation time of the snapshot</td>
</tr>
<tr>
<td>Comments</td>
<td>Display and input option for a comment</td>
</tr>
</tbody>
</table>

Several rows can be selected.

The following table shows the possible shortcut menu commands:

<table>
<thead>
<tr>
<th>Shortcut menu command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Restore snapshot&quot;</td>
<td>Shows the measurement with the saved view in the &quot;Diagram&quot; tab.</td>
</tr>
<tr>
<td>&quot;Remove snapshot&quot;</td>
<td>Deletes the snapshot.</td>
</tr>
<tr>
<td>&quot;Edit name&quot;</td>
<td>Switches the name in editing mode</td>
</tr>
<tr>
<td>&quot;Edit comment&quot;</td>
<td>Switches the comment in editing mode</td>
</tr>
</tbody>
</table>

Several rows can be selected.

**Note**

**Delete measurement**

If you delete a measurement of a calculated signal, all the associated snapshots are also deleted.
3.18 Reading out service data

The Web server gives you the option to save service data. In addition to the content of the diagnostic buffer, they include additional information on the internal status of the CPU. If you should encounter a problem with the CPU that cannot be resolved otherwise, you therefore have the option to submit the service data to the Service&Support team.

Procedure

1. Enter the following address in the address bar of your web browser:
   "http://<CPU IP address>/save_service_data", e.g.,
   "http://192.168.3.141/save_service_data"
2. Your screen displays the service data page with a button for saving the service data.
3. Save the service data locally on your display device by clicking "Save ServiceData".

Result

The data is saved into a .dmp file with the following naming convention: "<MLFB><serial number><time stamp>.dmp". The user can change the file name at a later time.

Note

If you have defined your user page as the start page, observe the note on reading out service data in section Defining the user page as start page (Page 98).
3.19 Basic websites

Web pages with reduced contents

Basic websites are offered for display devices with smaller screens, for example HMI, on the Web server.
Basic websites are web pages with reduced content that are adapted to the requirements of small screens with low resolution.
These sites do not support JavaScript for the sake of fast access. This means that not all standard websites are available as basic websites. The basic website can also have fewer functions than the standard website.

The switch to basic websites takes place automatically for HMI devices.
You access basic websites from other end devices by entering the IP address of the configured and the extension "/basic" in the address bar of the Web browser, for example http://192.168.3.141/basic or https://192.168.3.141/basic.

The following standard websites are also available as basic websites:

- Start page (in Basic: "Status")
- Diagnostics (without the "Program protection", "Runtime information" and "Fail-safe" tabs)
- Diagnostics buffer
- Memory usage
- Module information
- Alarms (without acknowledgment option)
- Communication
- Tag status
- Watch tables
- User pages
- Filebrowser (read access only)
- DataLogs
- Intro
The basic websites are displayed as follows:

**Figure 3-70  Example basic websites, "Status" web page**
Glossary

Automation system
An automation system is a programmable logic controller that consists of at least one CPU, various input and output modules, as well as operating and monitoring devices.

AWP
Automation Web Programming

AWP commands
Special command syntax for data exchange between CPU and HTML file.

Configuration
Systematic arrangement of individual modules (design).

CSS
A CSS (Cascading Style Sheet) specifies how an area or content marked up in HTML is displayed.

Device
Device that can send, receive or amplify data via the bus, e.g., IO controller.

Diagnostics
The detection, localization, classification, visualization and further evaluation of errors, malfunction and alarms.
Diagnostics provides monitoring functions that run automatically during plant operation. This increases the availability of plants by reducing commissioning times and downtimes.

Firewall
A firewall is used to restrict the network access based on sender or target address of the used services. The firewall decides based on specified rules which of the network packets it handles are forwarded and which are not. This way the firewall tries to prevent unauthorized network access.
It is not the function of a firewall to detect attacks. It only implements rules for network communication.
HTTP


HTTPS


Identification data

Identification data is stored on a module, and contains information which supports the user in:

- Checking the system configuration
- Locating hardware changes in a system
- Correcting errors in a system

Modules can be clearly identified online using the identification data.

Master

The master in possession of the token is an active device. This master has the option to receive data from other devices and to send data to other devices.

PROFIBUS

PROcess Field BUS. process and field bus standard specified in standard IEC 61784-1:2002 Ed1 CP 3/1. It specifies functional, electrical, and mechanical properties for a bit-serial field bus system.

PROFIBUS is available with the protocols DP (= Distributed I/O), FMS (= Fieldbus Message Specification), PA (= Process Automation), or TF (= Technological Functions).

PROFINET

Within the framework of Totally Integrated Automation (TIA), PROFINET represents the consistent continuation of:

- PROFIBUS DP, the established field bus
- Industrial Ethernet, the communications bus for the cell level

Experience gained from both systems was and is being integrated into PROFINET.

PROFINET as an Ethernet-based automation standard from PROFIBUS International (previously PROFIBUS User Organization) defines a vendor-independent communication, automation, and engineering model.
PROFINET component

A PROFINET component includes the entire data of the hardware configuration, the parameters of the modules, and the corresponding user program. The PROFINET component is made up as follows:

- Technological Function
  The (optional) technological (software) function includes the interface to other PROFINET components in the form of interconnectable inputs and outputs.

- Device
  The device is the representation of the physical programmable controller or field device including the I/O, sensors and actuators, mechanical parts, and the device firmware.

PROFINET IO

As part of PROFINET, PROFINET IO is a communication concept that is used to implement modular, distributed applications.

PROFINET IO allows you to create automation solutions which are familiar to you from PROFIBUS.

PROFINET IO is implemented by the PROFINET standard for automation devices on the one hand, and on the other hand by the engineering tool STEP 7.

That is, you have the same application view in STEP 7, regardless of whether you configure PROFINET or PROFIBUS devices. Programming your user program is essentially the same for PROFINET IO and PROFIBUS DP if you use the extended blocks and system status lists for PROFINET IO.

PROFINET IO controller

Device used to address connected I/O devices. This means that the IO controller exchanges input and output signals with assigned field devices. The IO controller is often the controller on which the automation program runs.

PROFINET IO device

A distributed field device that is assigned to one of the IO controllers (e.g., remote IO, valve terminals, frequency converters, switches).

URL

Uniform Resource Locator (URL). Identifies and localizes a source, such as a web page, uniquely via the method of access used and the location of the source in computer networks.
UTF-8

Abbreviation for 8-bit UCS (Universal Character Set) transformation format. Most popular coding of Unicode characters.

Each Unicode character is assigned a specially coded byte string of variable length in this format. UTF-8 supports up to four bytes on which all Unicode characters can be mapped.

Web browser

Web browsers are visualization programs for web pages and can communicate with Web servers.

Typical web browsers are, for example:

- Microsoft Internet Explorer
- Mozilla Firefox
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