

OFFICIAL DOCUMENT PACKAGE

Manufacturer's Manual

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SIEMENS SIMATIC S7-1500 MFP

6ES7518-4AX00-1AC0

SIMATIC S7-1500 CPU 1518-4 PN/DP MFP BUNDLE

Selected official pages retain the original technical tables, ratings, notes and pagination.

OFFICIAL SOURCE

Siemens DS 07/2025; MFP manual A5E40882737-AE 09/2025; system manual 11/2025

Bundle DS pp. 1-2,5-6,9; included 1AB0 CPU manual selected runtime/wiring pages; rail guidance

This technical extract does not replace the complete equipment and system manuals. Check the installed hardware and project before use.



SIMATIC S7-1500, CPU Bundle consisting of: CPU 1518-4 PN/DP MFP (6ES7518-4AX00-1AB0), including C/C++ Runtime and OPC UA Runtime license, 6 MB work memory for program and 60 MB for data, 1st interface: PROFINET IRT with 2-port switch, 2nd interface: PROFINET RT, 3rd interface: PROFINET basic services, 4th interface: PROFIBUS, 1 ns bit performance, SIMATIC Memory Card (min. 2 GB) required

General information	
Product type designation	CPU 1518-4 PN/DP MFP
HW functional status	FS04
Firmware version	V3.0
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	Yes; Distributed and central; with minimum OB 6x cycle of 125 µs (distributed) and 1 ms (central)
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V18 (FW V3.0); V15 (FW V2.5) or higher
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	6.1 cm
Control elements	
Number of keys	6
Mode selector switch	1
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
• Mains/voltage failure stored energy time	5 ms
• Repeat rate, min.	1/s
Input current	
Current consumption (rated value)	1.7 A
Current consumption, max.	2 A
Inrush current, max.	2 A; Rated value
I ² t	0.4 A ² ·s
Power	
Infeed power to the backplane bus	12 W
Power consumption from the backplane bus (balanced)	35 W
Power loss	
Power loss, typ.	29 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
• integrated (for program)	6 Mbyte

- integrated (for data) - integrated (for CPU function library of CPU Runtime)	60 Mbyte 50 Mbyte; Note: The "CPU function library of the CPU" are C/C++ blocks for the user program that were created using the SIMATIC ODK 1500S or Target 1500S.
Working memory for additional functions	
- Integrated (for C/C++ Runtime application) - available (for Linux runtime application)	1 024 Mbyte 1 Gbyte
Load memory	
Plug-in (SIMATIC Memory Card), max.	32 Gbyte; the memory card must have at least 2 GB of space on it
Backup	
maintenance-free	Yes
CPU processing times	
for bit operations, typ.	1 ns
for word operations, typ.	2 ns
for fixed point arithmetic, typ.	2 ns
for floating point arithmetic, typ.	6 ns
CPU-blocks	
Number of elements (total)	20 000; Blocks (OB, FB, FC, DB) and UDTs
DB	
- Number range - Size, max.	1 ... 60 999; subdivided into: number range that can be used by the user: 1 ... 59 999, and number range of DBs created via SFC 86: 60 000 ... 60 999 16 Mbyte; For DBs with absolute addressing, the max. size is 64 KB
FB	
- Number range - Size, max.	0 ... 65 535 1 Mbyte
FC	
- Number range - Size, max.	0 ... 65 535 1 Mbyte
OB	
- Size, max. - Number of free cycle OBs - Number of time alarm OBs - Number of delay alarm OBs - Number of cyclic interrupt OBs - Number of process alarm OBs - Number of DPV1 alarm OBs - Number of isochronous mode OBs - Number of technology synchronous alarm OBs - Number of startup OBs - Number of asynchronous error OBs - Number of synchronous error OBs - Number of diagnostic alarm OBs	1 Mbyte 100 20 20 20; with minimum OB 3x cycle of 100 µs 50 3 3 2 100 4 2 1
Nesting depth	
per priority class	24
Counters, timers and their retentivity	
S7 counter	
Number	2 048
Retentivity	
— adjustable	Yes
IEC counter	
Number	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
S7 times	
Number	2 048
Retentivity	
— adjustable	Yes
IEC timer	
Number	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes

• PROFINET IO Controller	Yes
• PROFINET IO Device	Yes
• SIMATIC communication	Yes
• Open IE communication	Yes; Optionally also encrypted
• Web server	Yes
• Media redundancy	No
PROFINET IO Controller	
Services	
— PG/OP communication	Yes
— Isochronous mode	No
— Direct data exchange	No
— IRT	No
— PROFINergy	Yes; per user program
— Prioritized startup	No
— Number of connectable IO Devices, max.	128; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
— Number of connectable IO Devices for RT, max.	128
— of which in line, max.	128
— Number of IO Devices that can be simultaneously activated/deactivated, max.	8; in total across all interfaces
— Number of IO Devices per tool, max.	8
— Updating times	The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data
Update time for RT	
— for send cycle of 1 ms	1 ms to 512 ms
PROFINET IO Device	
Services	
— PG/OP communication	Yes
— Isochronous mode	No
— IRT	No
— PROFINergy	Yes; per user program
— Prioritized startup	No
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— activation/deactivation of I-devices	Yes; per user program
— Asset management record	Yes; per user program
3. Interface	
Interface types	
• RJ 45 (Ethernet)	Yes; X3
• Number of ports	1; C/C++ Runtime can also be reached via this port
• integrated switch	No
Protocols	
• IP protocol	Yes; IPv4
• PROFINET IO Controller	No
• PROFINET IO Device	No
• SIMATIC communication	Yes
• Open IE communication	Yes
• Web server	Yes
4. Interface	
Interface types	
• RS 485	Yes; X4
• Number of ports	1
Protocols	
• PROFIBUS DP master	Yes
• PROFIBUS DP device	No
• SIMATIC communication	Yes
PROFIBUS DP master	
• Number of connections, max.	48; for the integrated PROFIBUS DP interface
• max. number of DP devices	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
Services	

— PG/OP communication	Yes
— Equidistance	Yes
— Isochronous mode	Yes
— activation/deactivation of DP devices	Yes
Interface types	
RJ 45 (Ethernet)	
• 100 Mbps	Yes
• 1000 Mbps	Yes; Only possible at the X3 interface of the CPU 1518
• Autonegotiation	Yes
• Autocrossing	Yes
• Industrial Ethernet status LED	Yes
RS 485	
• Transmission rate, max.	12 Mbit/s
Protocols	
PROFIsafe	No
Number of connections	
• Number of connections, max.	384; via integrated interfaces of the CPU and connected CPs / CMs
• Number of connections reserved for ES/HMI/web	10
• Number of connections via integrated interfaces	320
• Number of S7 routing paths	64; in total, only 16 S7-Routing connections are supported via PROFIBUS
Redundancy mode	
• H-Sync forwarding	Yes
Media redundancy	
— Media redundancy	only via 1st interface (X1)
— MRP	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0, MRP Manager; MRP Client
— MRP interconnection, supported	Yes; as MRP ring node according to IEC 62439-2 Edition 3.0
— MRPD	Yes; Requirement: IRT
— Switchover time on line break, typ.	200 ms; For MRP, bumpless for MRPD
— Number of stations in the ring, max.	50
SIMATIC communication	
• PG/OP communication	Yes; encryption with TLS V1.3 pre-selected
• S7 routing	Yes
• Data record routing	Yes
• S7 communication, as server	Yes
• S7 communication, as client	Yes
• User data per job, max.	See online help (S7 communication, user data size)
Open IE communication	
• TCP/IP	Yes
— Data length, max.	64 kbyte
— several passive connections per port, supported	Yes
• ISO-on-TCP (RFC1006)	Yes
— Data length, max.	64 kbyte
• UDP	Yes
— Data length, max.	2 kbyte; 1 472 bytes for UDP broadcast
— UDP multicast	Yes; 128 multicast circuits (of which max. 5 via X1)
• DHCP	Yes
• DNS	Yes
• SNMP	Yes; disconnected by default
• DCP	Yes
• LLDP	Yes
• Encryption	Yes; Optional
Web server	
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
OPC UA	
• Runtime license required	Yes; "Large" license required
• OPC UA Client	Yes; Data Access (registered Read/Write), Method Call
— Application authentication	Yes
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256

Ambient temperature during storage/transportation			
• min.	-40 °C		
• max.	70 °C		
Altitude during operation relating to sea level			
• Installation altitude above sea level, max.	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual		
configuration / header			
configuration / programming / header			
Programming language			
— LAD	Yes		
— FBD	Yes		
— STL	Yes		
— SCL	Yes		
— CFC	Yes		
— GRAPH	Yes		
Know-how protection			
• User program protection/password protection	Yes		
• Copy protection	Yes		
• Block protection	Yes		
Access protection			
• protection of confidential configuration data	Yes		
• Password for display	Yes		
• Protection level: Write protection	Yes		
• Protection level: Read/write protection	Yes		
• Protection level: Complete protection	Yes		
programming / cycle time monitoring / header			
• lower limit	adjustable minimum cycle time		
• upper limit	adjustable maximum cycle time		
Open Development interfaces			
• Size of ODK SO file, max.	9.8 Mbyte		
Dimensions			
Width	175 mm		
Height	147 mm		
Depth	129 mm		
Weights			
Weight, approx.	2 093 g		
Classifications			
		Version	Classification
	eClass	14	27-24-22-07
	eClass	12	27-24-22-07
	eClass	9.1	27-24-22-07
	eClass	9	27-24-22-07
	eClass	8	27-24-22-07
	eClass	7.1	27-24-22-07
	eClass	6	27-24-22-07
	ETIM	9	EC000236
	ETIM	8	EC000236
	ETIM	7	EC000236
	IDEA	4	3565
	UNSPSC	15	32-15-17-05
Approvals / Certificates			
General Product Approval			For use in hazardous locations

[Miscellaneous](#)

[Manufacturer Declaration](#)



[Miscellaneous](#)



With SDK, you can program:

- C/C++ Runtime applications running in SIMATIC S7-1500 MFP C/C++ Runtime, independent of the STEP 7 user program

You can use C/C++ Runtime applications to implement parallel processes to the STEP 7 user program, for example, for pre-processing or transmitting data via Industrial Ethernet. A CPU can simultaneously perform more tasks, the complexity of functions is reduced and the time required for implementation decreased.

You can reuse existing C/C++ algorithms. To continue using existing technological know-how, you can integrate the existing C/C++ code via the Open Development Kit:

- In the runtime environment of the CPU or
- As C/C++ Runtime applications into the SIMATIC S7-1500 MFP C/C++ Runtime

Once you integrate the C/C++ sources, you can execute them on the CPU.

You can find a description of the Open Development Kit in the SIMATIC S7-1500 ODK 1500S (<https://support.industry.siemens.com/cs/ww/en/ps/13914/man>) Programming and Operating Manual, V2.5 and higher, edition 12/2017. The sections that describe the CPU function library for CPU Runtime and the C/C++ Runtime applications apply to the CPU 1518-4 PN/PN/DP MFP.

The work memory and the load memory of the CPU 1518-4 PN/DP MFP are divided as follows:

Work memory for:

- The STEP 7 user program
- for CPU function library for CPU Runtime
- for C/C++ Runtime applications

Load memory for:

- the STEP 7 user program including CPU function library for CPU Runtime
- for C/C++ Runtime applications

Security Integrated

In conjunction with STEP 7, each CPU offers password-based know-how protection against unauthorized reading out or modification of the program blocks.

Copy protection provides reliable protection against unauthorized reproduction of program blocks. With copy protection, individual blocks on the SIMATIC Memory Card can be tied to their serial number so that the block can only be run if the configured memory card is inserted into the CPU.

In addition, all project users can be managed with the local user management. Rights, such as access rights, can be set individually for each user.

Improved tamper protection allows changed or unauthorized transfers of engineering data to be detected by the controller.

The use of an Ethernet CP (CP 1543-1) provides you with additional access protection through a firewall or options for establishing secure VPN connections.

Properties

The CPU 1518-4 PN/DP MFP has the following properties:

Property	Description	Additional information
CPU display	All CPUs of the SIMATIC S7-1500 product series feature a display with plain text information. The display provides information on order numbers, firmware version and serial numbers of all connected modules. In addition, you can set the IP address of the CPU and make additional network settings. The display shows error messages directly as plain text. In addition to the functions listed here, a multitude of other functions that are described in the SIMATIC S7-1500 Display Simulator are shown on the display.	- S7-1500/ET 200MP System Manual (https://support.industry.siemens.com/cs/ww/en/view/59191792) - SIMATIC S7-1500 Display Simulator (https://support.industry.siemens.com/cs/ww/en/view/109761758)
Supply voltage	The 24 V DC supply voltage is fed via a 4-pin plug located on the front of the CPU.	- Section Connecting up (Page 40) - S7-1500/ET 200MP System Manual (https://support.industry.siemens.com/cs/ww/en/view/59191792)
PROFINET IO		
PROFINET interface (X1 P1 R and X1 P2 R)	The interface has two ports. In addition to basic PROFINET functionality, it also supports PROFINET IO RT (real time) and IRT (isochronous real time).	PROFINET Function Manual (https://support.industry.siemens.com/cs/ww/en/view/49948856)
PROFINET interface (X2 P1)	The interface has one port. In addition to basic PROFINET functionality, it also supports PROFINET IO RT (real time).	
PROFINET interface (X3 P1)	The interface is (typically) used to: - Link development tools for C/C++ applications - Connect the TIA Portal to the development of STEP 7 applications - Communicate with the "outside world" from C/C++ Runtime - Communicate internally between C/C++ and CPU Runtime (via virtual network)	SIMATIC S7-1500 SDK Manual
Operation of the CPU as - IO controller - I-device	IO controller: As an IO controller, the CPU addresses the connected IO devices I-device As an I-device (intelligent IO device), the CPU is assigned to a higher-level IO controller and is used as an intelligent pre-processing unit for subroutines	PROFINET Function Manual (https://support.industry.siemens.com/cs/ww/en/view/49948856)
PROFIBUS DP		
PROFIBUS interface (X4)	The interface is used for connecting to a PROFIBUS network.	PROFIBUS Function Manual (https://support.industry.siemens.com/cs/ww/en/view/59193579)
Operation of the CPU as a DP master	In the role as a DP master, the CPU addresses the connected DP slaves. It is not possible for the CPU to take the role of a DP slave.	

Accessories

You can find information on "Accessories/spare parts" in the S7-1500/ET 200MP System Manual (<https://support.industry.siemens.com/cs/ww/en/view/59191792>).

3.4 Firmware functions

Function	Description	Additional information
Integrated safety		
Secure PG/HMI communication	With STEP 7 and WinCC, SIMATIC S7-1500 CPUs and ET 200 CPUs support innovated and standardized secure PG/PC and HMI communication – referred to as Secure PG/HMI communication for short.	Communication Function Manual (https://support.industry.siemens.com/cs/de/de/view/59192925/en)
Protection of confidential configuration data	You have the option of assigning a password for protecting confidential configuration data of the respective CPU. This refers to data such as private keys that are required for the proper functioning of certificate-based protocols.	
Integrity protection	The CPUs feature an integrity protection function by default. This helps to detect any engineering data tampering on the SIMATIC Memory Card or during data transfer between the TIA Portal and the CPU, and to check communication from a SIMATIC HMI system to the CPU for possible manipulation of engineering data. The user receives a corresponding message about manipulation of engineering data detected by the integrity protection.	S7-1500/ET 200MP System Manual (https://support.industry.siemens.com/cs/ww/en/view/59191792)
Know-how protection	The know-how protection protects user blocks against unauthorized access and modifications.	
Copy protection	Copy protection links user blocks with the serial number of one or more SIMATIC Memory Cards or the serial number of one or more CPUs. User programs cannot run without the corresponding SIMATIC Memory Card or CPU.	
Local user management (as of FW version V3.1)	Improved management of users, roles, and CPU function rights (User Management & Access Control, UMAC). You can use the local user management in the editor to manage all project users along with their rights (e.g. access rights) for users and roles of the project in the TIA Portal.	
Access protection (up to FW version V3.0)	You can assign separate rights to different users via authorization levels.	
Password provider	As an alternative to manual password entry, you can link a password provider to STEP 7. A password provider provides the following advantages: • Convenient handling of passwords. STEP 7 automatically reads in the password for the blocks. This saves you time. • Optimal block protection, since the users do not know the password themselves.	

3.4.1 Quick start instructions for commissioning C/C++ Runtime

NOTE

Commissioning the C/C++ Runtime

You require experience in working with Linux systems to commission the C/C++ Runtime.

Two IP addresses of the PROFINET interface X3 P1

The PROFINET interface X3 P1 is (typically) used to:

- Link development tools for C/C++ Runtime applications
- Connect the TIA Portal
- Develop STEP 7 applications
- Communicate from C/C++ Runtime
- Communicate internally between C/C++ and CPU Runtime (via virtual network)

The PROFINET interface X3 P1 is split internally for the CPU Runtime and the C/C++ Runtime. Therefore, there is one IP address for the CPU and one IP address for the C/C++ Runtime.

- Set the IP address of the CPU in STEP 7.

You can find additional information in the online help for STEP 7.

- Set the IP address of the C/C++ Runtime in the configuration file of the C/C++ Runtime (see the section "Initial commissioning").

Note the following restrictions when configuring the PROFINET interface X3 P1 with STEP 7:

- The configuration of the "Transmission rate/duplex" has no effect on the connection to the PROFINET interface X3 P1 and the C/C++ Runtime.
- The "Monitor" option is not supported.
- Topology configuration is not supported.

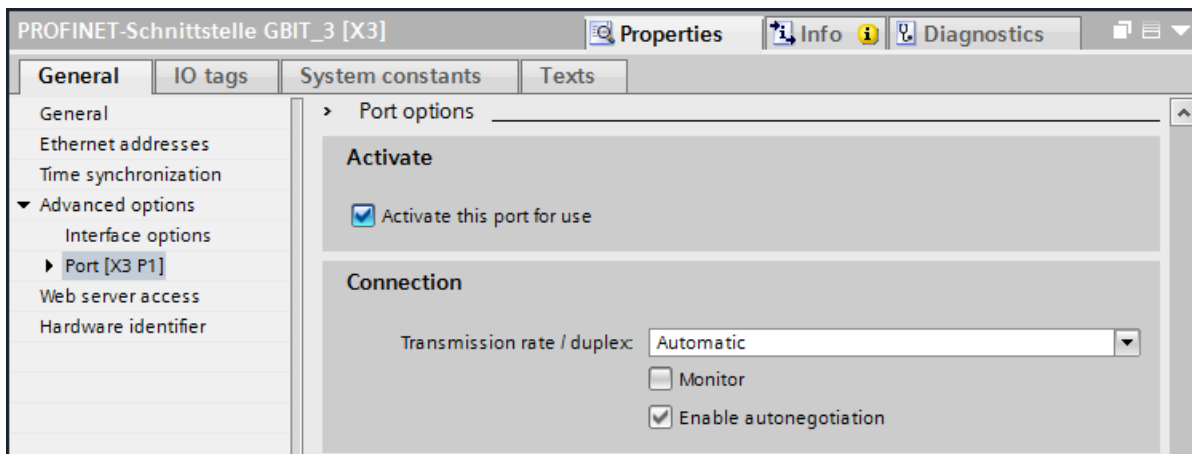


Figure 3-3 Port options in STEP 7

NOTE

Availability of the X3 interface

Interface X3 is available only after approximately 1 to 2 minutes after POWER ON of the CPU.

Initial commissioning

Minimum requirement

SIMATIC Memory Card with a capacity of at least 2 GB.

Procedure

Proceed as follows to commission the C/C++ Runtime:

1. Start a secure shell client in Linux or Windows, or in PuTTY.
2. Connect the secure shell client to the CPU 1518(F)-4 PN/DP MFP via the destination address (default address: 192.168.15.18).
3. Type in the user name and password and establish a Secure Shell Connection.
The default user name is "root". The default password is displayed under "Overview > MFP > Default Password".
4. Change the default password after the first startup of the CPU.
5. Change the IP address or configure DHCP using the "bridge.network" script in the "/etc/systemd/network" directory by entering the following commands in the given sequence.
 - "cd /etc/systemd/network" to switch to the specified directory.
 - "ls -l" to list all the files/directories in this directory.
 - "pico bridge.network" to open the script "bridge.network" in the Pico text editor.
 - Change the IP address settings in the script.
 - Press CTRL + X to exit the text editor.
 - Press CTRL + Y to select overwriting of the script.
 - Press ENTER to save the change and close the text editor.
6. Transfer your configuration to the memory card and load the "systemd networkd" module once again by calling "sync && systemctl restart systemd-networkd" as the root user.
7. Create your own user account in the Linux subsystem without root privileges. Work with this user account.

NOTE

Extending the service life of storage media

When you modify files in the Linux file system, use the "sync" command to write important data immediately to the containers of the memory card.

If you do not use the "sync" command, the changed data will be automatically transferred to the memory card with a delay of approximately 40 seconds. In this way, you can extend the service life of your SIMATIC Memory Card.

Security information

NOTE

- Follow the Principle of Least Privilege.
 - Start your application as a user without root privileges.
 - Configure the SSH server in Linux Runtime in such a way that it only permits certificate-based authentication. Disable password-based authentication for all users.
 - Change the user passwords regularly and use secure passwords.
-

NOTE

IPv6 protocol

Note that for the CPU 1518(F)-4 PN/DP MFP, the IPv6 protocol is deactivated by default in the configuration file (/usr/share/netfilter-persistent/plugins.d/12-ipv6-disable). To use IPv6, remove this configuration file. Then carry out a restart so that the changes come into effect.

Ensure that your system is protected against unauthorized access by implementing appropriate protective measures, e.g. the use of firewalls. If you do not use the IPv6 protocol for communication, we recommend that you leave IPv6 deactivated.

Mass storage concept

Note the following information on the storage locations on the SIMATIC Memory Card.

The following C/C++ Runtime containers are available in the "/CppEnv1.MFP" directory on the SIMATIC Memory Card and are mounted in the file system in Linux as described:

- User.img (50 MB) → Mount point: "/home" (home directory of the user, for example, for C/C++ Runtime application)
- Data.img (200 MB) → mount point: "/" (root) as overlays

Performing bulk operations

To use the same C/C++ Runtime application for other CPUs, transfer the C/C++ Runtime application to the home directory. The home directory is available in the "User.img" file on the SIMATIC Memory Card.

To use the C/C++ Runtime application on other CPUs, copy the "User.img" file to the corresponding SIMATIC Memory Card.

Work memory for C/C++ Runtime

The RAM is 1 GB including the RAM disk.

Procedure for updates

For firmware updates, create a container backup on the SIMATIC Memory Card in the "/CppEnv1.MFP" directory.

1. Perform the firmware update. Format the SIMATIC Memory Card or delete the container from the "/CppEnv1.MFP" folder.
2. After starting the Linux subsystem, configure the subsystem according to your requirements.
3. Copy your application into the "/home/user" directory, from where you then start the application.

So that a C/C++ Runtime application is compatible with the updated C/C++ Runtime, compile the C/C++ Runtime application again.

NOTE

Recompilation after the firmware update.

If you have performed an update to firmware version V3.1.5, you have to recompile the user applications with the SDK.

Procedure for downgrades

Please note: If you downgrade the firmware version of the CPU from V3.1.5 to an older version, you should not make any changes to the encryption. Doing so would block access to the C/C++ Runtime.

Use one of the following two methods to ensure access to the C/C++ Runtime after downgrading the firmware version:

1. Resetting the C/C++ factory settings after a downgrade
 - After the downgrade, perform a factory reset of the C/C++ Runtime. You will find a description of this at the end of this chapter.
 - When performing a factory reset, all data in the C/C++ Runtime is lost. It is strongly recommended that you back up your user data before resetting.
2. Using an outdated encryption
 - Before you start the firmware downgrade, change the encryption method from the current "yescrypt" encryption to the older "sha512" encryption. To do this, following the instructions in the "/etc/pam.d/common-password" file and replace the current "yescrypt" encryption configuration with "sha512".
 - Info: After changing the encryption method, user passwords must be reset in order to activate them again with the outdated "sha512" method.
 - Warning: Note that using outdated encryption methods such as "sha512" is less secure than using new ones such as "yescrypt". This can expose the system to increased security risks and vulnerabilities. Consider the security implications before deciding to use older encryption techniques.

Autostart of user programs

You can start applications automatically using systemd services. You can find examples of this in the official Systemd Manual (<https://www.freedesktop.org/software/systemd/man/systemd.service.html#Examples>).

Special features

NOTE

Initial startup with an empty SIMATIC Memory Card

When the CPU starts up for the first time with an empty SIMATIC Memory Card, the card is prepared for use with C/C++ Runtime. This process takes up to three minutes. Do not turn off the CPU during this phase; the STOP LED flashes.

NOTE

Defective C/C++ Runtime containers

The three C/C++ Runtime containers are available in the "/CppEnv1.MFP" directory on the SIMATIC Memory Card.

If the C/C++ Runtime containers are damaged or lost when the CPU is switched off, a diagnostic entry is created in the diagnostic buffer of the CPU the next time the CPU is started up. C/C++ Runtime cannot be reached, and the ERROR LED is flashing.

If automatic repair of the containers by the automation system is not possible, the containers can no longer be used by the Linux file system. The automation system starts C++ Runtime in root mode.

A new logon with the standard user and password is possible. However, you cannot make any permanent changes to the automation system, e.g:

- Change the password
- Save data
- Change system settings

Solution:

- Copy a previously created backup copy of the C/C++ Runtime containers to the SIMATIC Memory Card.
or
 - Delete the affected C/C++ Runtime container from the SIMATIC Memory Card. The automation system then recreates the container during the next startup.
-

NOTE

Affecting the performance of the CPU

Depending on the type of programming, C/C++ Runtime applications, such as mass storage accesses to the SIMATIC Memory Card, can affect the performance of the CPU.

Resetting C/C++ Runtime to factory settings

NOTE

Save all user data before resetting C/C++ Runtime to the factory settings.

The following options are available for resetting C/C++ Runtime:

- Formatting the SIMATIC Memory Card

Format the SIMATIC Memory Card via the CPU display or via the TIA Portal. You can find more information in the S7-1500/ET 200MP Automation system

(<https://support.industry.siemens.com/cs/us/en/view/59191792>) System Manual.

NOTE

Formatting the SIMATIC Memory Card on a PC is not recommended as the S7-1500 CPU-compatible folder structure is lost in the process.

- Removing the container from the CppEnv1.MFP folder

If you prefer not to format the SIMATIC Memory Card, you can also reset the C/C++ Runtime by deleting the container in the "CppEnv1.MFP" folder on the SIMATIC Memory Card.

Warning: Removing the container permanently deletes all configurations and data relating to the C/C++ Runtime.

3.4.2 Brief instructions for the Software Development Kit

1. Download the Software Development Kit. You can find the download here (<https://support.industry.siemens.com/cs/ww/en/view/109995059>).

2. Unzip the contents.

You will get the following structure:

- **SDK/**: Main folder. Contains the Toolchain
- **example/helloworld/.vscode/settings.json**: Visual Studio Code configuration for global development variables
- **example/helloworld/.vscode/tasks.json**: Visual Studio Code task definition for handling build and debugging instructions
- **example/helloworld/.vscode/c_cpp_properties.json**: Visual Studio Code configuration for paths encompassing IntelliSense
- **example/helloworld/src/helloworld.cpp**: Source code for the "Hello World" sample program

3. Install Visual Studio Code

Use the latest 64-bit version for optimum compatibility and functional scope.

4. Install the following recommended extensions:

- C/C++: Required for code creation and navigation
- C/C++ Extension Pack: Has additional useful functionality.
- C/C++ topics: Improvement of the user interface

Connecting up

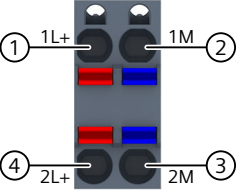
This section provides information on the terminal assignment of the individual interfaces and the block diagram of the CPU 1518-4 PN/DP MFP.

24 V DC supply voltage (X80)

The connector for the power supply is plugged in when the CPU ships from the factory.

The following table shows the signal names and the descriptions of the pin assignment for a 24 V DC supply voltage.

Table 4-1 Pin assignment 24 V DC supply voltage

View	Signal name ¹⁾		Designation
Connector			
	1	1L+	+ 24 V DC of the supply voltage
	2	1M	Ground of the supply voltage
	3	2M	Ground of the supply voltage for loop-through ²⁾
	4	2L+	+ 24 V DC of the supply voltage for loop-through ²⁾

¹⁾ 1L+ and 2L+ as well as 1M and 2M are bridged internally.

²⁾ Maximum 10 A permitted

If the CPU is supplied by a system power supply, it is not necessary to connect the 24 V supply.

PROFINET interface X1 with 2-port switch (X1 P1R and X1 P2R)

The assignment corresponds to the Ethernet standard for a RJ45 connector.

- When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).
- When autonegotiation is activated, autocrossing is in effect and the RJ45 socket is allocated either as data terminal equipment (MDI) or a switch (MDI-X).

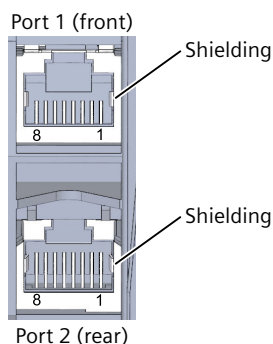


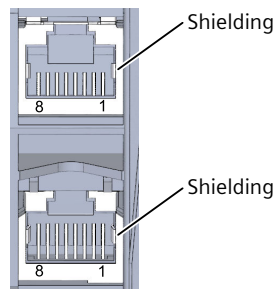
Figure 4-1 Interface assignment X1

PROFINET interface X2 and X3 with 1 port (X2 P1, X3 P1)

The assignment corresponds to the Ethernet standard for a RJ45 connector.

Autocrossing is always active on X2 and X3. This means the RJ45 socket is allocated either as data terminal equipment (MDI) or a switch (MDI-X).

X2 Port 1(front)



X3 Port 1(rear)

Figure 4-2 Interfaces X2 and X3

NOTE

PROFINET interface X3 with a transmission rate of 1000 Mbps

The PROFINET interface X3 supports a maximum transmission rate of 1000 Mbps.

Requirements:

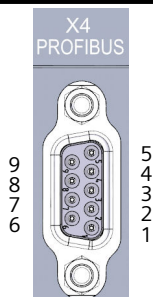
- Devices on the PROFINET segment must support the 1000 Mbps transmission rate.
- The network infrastructure (network cables and outlets) must be category CAT 5e or higher.
- The "Transmission rate" parameter in the properties of the port (X3) must be set as follows in STEP 7:
 - The "Autonegotiation" check box is selected
 - "Automatic" is selected in the drop-down list

PROFIBUS interface X4

The table below shows the terminal assignment of the PROFIBUS interface. The assignment corresponds to the standard assignment of an RS485 interface.

Table 4-2 PROFIBUS interface terminal assignment

View	Signal name		Designation
	1	-	-
	2	-	-
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Data reference potential (from station)
	6	P5V2	Supply plus (from station)

View	Signal name		Designation
	7	-	-
	8	RxD/TxD-N	Data line A
	9	-	-

NOTE**Supply of I/O devices**

The CPU 1518-4 PN/DP MFP does not provide a 24 V DC power supply on the PROFIBUS interface. I/O devices (for example, PC adapter USB 6ES7972-0CB20-0XA0) are only operational on the interface in conjunction with a plug-in power supply set for external power supply.

The innovative successor product, PC adapter USB A2, receives the required power supply via the USB port. This means it does not need a 24 V DC supply voltage and can be operated **without** a plug-in power supply set for external power supply.

Reference

You can find additional information on the topics of "Connecting the CPU" and "Accessories/spare parts" in the S7-1500, ET 200MP (<https://support.industry.siemens.com/cs/ww/en/view/59191792>) system manual.

Assignment of the MAC addresses

The CPU 1518-4 PN/DP MFP has three PROFINET interfaces. The first interface is an interface with 2-port switch. The PROFINET interfaces each have a MAC address, and each of the PROFINET ports has its own MAC address. The CPU 1518-4 PN/DP MFP therefore has seven MAC addresses in total.

The MAC addresses of the PROFINET ports are needed for the LLDP protocol, for example for the neighborhood discovery function.

The number range of the MAC addresses is sequential. The first and last MAC addresses are lasered on the rating plate on the right side of each CPU 1518-4 PN/DP MFP.

The table below shows how the MAC addresses are assigned.

Table 4-3 Assignment of the MAC addresses

	Assignment	Labeling
MAC address 1	PROFINET interface X1 (visible in STEP 7 for accessible devices)	- Front printed - Right side printed (start of number range)
MAC address 2	Port X1 P1R (required for LLDP, for example)	---
MAC address 3	Port X1 P2R (required for LLDP, for example)	---

	Assignment	Labeling
MAC address 4	PROFINET interface X2 (visible in STEP 7 for accessible devices)	Front printed
MAC address 5	Port X2 P1 (required for LLDP, for example)	---
MAC address 6	PROFINET interface X3 (visible in STEP 7 for accessible devices)	Front printed
MAC address 7	Port X3 P1 (for C/C++ Runtime applications)	• Front printed • Right side printed (end of number range)

7.6 Installing the CPU

Introduction

The CPU executes the user program and supplies the electronics of the modules with power via the backplane bus.

Requirements

The mounting rail is installed.

In a system power supply located on the left next to the CPU, a U connector is inserted on the back right.

NOTE

Protective film

Please note that the CPU is supplied with a removable protective film on the display. You can remove the protective film as required.

Tools required

Screwdriver with 4.5 mm blade

Installing the CPU

Watch video sequence (<https://support.industry.siemens.com/cs/ww/en/view/78027451>)

To install a CPU, follow these steps:

1. Insert a U-connector into the back right on the CPU.
2. Install the CPU to the mounting rail. Also push the CPU to the left system power supply if necessary.
3. Ensure that the U-connector is inserted at the system power supply. Swivel the CPU in to the rear.
4. Screw the CPU tight (tightening torque 1.5 Nm).



Figure 7-11 Installing the CPU

Uninstalling the CPU

The CPU is wired, and is followed by additional modules.

To uninstall a CPU, follow these steps:

1. Open the front cover.
2. Switch the CPU into STOP mode.
3. Turn off the feed supply voltage.
4. Pull off the connector for the supply voltage.
5. Loosen the bus connectors for PROFIBUS/PROFINET with the screwdriver.
6. Disconnect the bus connector from the CPU.
7. Undo the CPU fixing screws.
8. Pivot the CPU out of the mounting rail.