SIEMENS

SIMATIC NET

S7-1500 - TeleControl
SIMATIC TIM 1531 IRC

Equipment Manual

Preface

Application and functions 1

LEDs, connectors, switches, card slot 2

Installation, connection, commissioning, removal 3

Configuration 4

The Web server (WBM) 5

Diagnostics and upkeep 6

Technical specifications 7

Approvals 8

Dimension drawings A

Accessories B

Encryption methods (Ciphers) C

Documentation references D

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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.

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Preface

CAUTION

To prevent injury, read the manual before use.

Validity of this manual

This manual is valid for the following product:

TIM 1531 IRC
Article number: 6GK7 543-1MX00-0XE0
Hardware product version 1
Firmware version V2.3

Communications module for SIMATIC S7-1500 / S7-400, S7-300, ET 200SP, with SINAUT ST7, DNP3 and IEC 60870-5-101/104, three RJ45 interfaces for communication via IP-based networks (WAN / LAN), one RS-232/RS-485 interface for communication via classic WAN networks



Figure 1 TIM 1531 IRC

You will find the article number of the device on the top right of the housing.

You will find the hardware product version of the device printed as a placeholder "X" on the right of the device (for example X 2 3 4). In this case, "X" would be the placeholder for hardware product version 1.

You will find the MAC addresses of the three Ethernet interfaces at the front in the middle of the housing.

New in this edition

- New firmware version V2.3 with the following new functions:
  - TLS extension for the protocol DNP3
  - TLS extension for the protocol IEC 60870-5-104
  - Secure authentication for the protocol IEC 60870-5-101/104

  For a description of the functions, refer to the respective configuration manual; see "Structure of the documentation" below.
- New configuration software

  STEP 7 Professional V18 with the following functions relevant for the product:
  - Configurability of the functions specified above
  - Changed handling of certificates
- New approvals (CCC / UKEX)

Current manual edition on the Internet

You will also find the current version of this manual on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/24710/man)

Replaced manual edition

Edition 05/2021

New contents in the edition 05/2021:

New firmware version 2.2 with the following new functions, among others:

- Extension of the telecontrol protocols IEC 60870-5-101/104 by:
  - Support of sequence number SQ=1 for events without time stamp to save data volume
  - Configurable delay time to send an event
  - Configurable fill degree of the event buffer as trigger condition to send the event
- TLS communication with S7-1500 as of firmware version V2.9
- Partner-specific assignment when configuring alarms with the trigger condition "Partner reachable/unreachable"
- Switch-off of integrative threshold method
- Local logging of security and audit events
- Central logging of security and audit events via a Syslog server
- Bugs fixed

For firmware version 2.1:

- Operation on SIMATIC S7-1500 R/H CPUs as of V2.6 and ET 200SP CPUs as of V2.5
- DNP3: Connections with redundant master group (3 servers)

Structure of the documentation

The documentation for the SIMATIC NET communications modules consists of the following manuals in each case:

- Manual or operating instructions
- One or more configuration manuals

The documentation for the TIM 1531 IRC consists of the following manuals and contents:

- **Manual**

  Valid for: TIM 1531 IRC

  – Application and functions
  – Requirements (CPUs, configuration software, etc.)
  – Hardware description
  – Installation, wiring, commissioning, operation
  – Diagnostics, maintenance
  – Technical specifications, approvals, accessories

- **SINAUT ST7 system manual**

  – **Volume 3 - Configuration under STEP 7 Professional (TIA Portal)**

    Valid for all ST7-capable communications modules

- **Configuration Manual DNP3**

  Configuration and diagnostics in STEP 7 Professional (TIA Portal)

  Valid for all SIMATIC NET communications modules that support the DNP3 protocol.

- **Configuration Manual IEC**

  Configuration and diagnostics in STEP 7 Professional (TIA Portal)

  Valid for all SIMATIC NET communications modules that support the protocol IEC 60870-5-101/104.

You can find the Internet links for the manuals in the Documentation references (Page 123).

Required experience

To install, commission and operate the device, you require experience in the following areas:

- Setting up industrial networks with security functions
- Data transfer via WAN networks
- SIMATIC STEP 7 Professional

Notes on this document

Product name/abbreviations

The following abbreviations/acronyms are frequently used in this manual:

- **TIM / module / device**

  The names are used instead of the full product name "TIM 1531 IRC" of the device.

- **ST7**

  Short form for the telecontrol protocol "SINAUT ST7"

- **WBM**

  "WBM" is the acronym for the "Web Based Management", the pages of the TIM Web server for configuration and diagnostics data.

Cross-references

In this manual, there are often cross-references to other sections.

To return to the original page after jumping to a cross-reference, some PDF readers support the command <Alt>+<Left arrow>.

Search

To display all instances of a search term in a list, some PDF readers support the command <Ctrl>+<Shift>+<F>.

Sources of information and other documentation

You can find an overview of further reading and references in the Appendix of this manual.

License conditions

Note

Open source software

The product contains open source software. Read the license conditions for open source software carefully before using the product.

You will find the license conditions on the supplied data medium:

- OSS_TIM1531IRC_99.pdf
- OSS_TIM1531IRC-TI_76.pdf

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.

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Link: (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.

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

See also:
Security functions (Page 18)
Security recommendations (Page 57)

Firmware

The firmware is signed and encrypted. This ensures that only firmware created by Siemens can be downloaded to the device.

Note on firmware/software support

Check regularly for new firmware/software versions or security updates and apply them. After the release of a new version, previous versions are no longer supported and are not maintained.

Device defective

If a fault develops, please send the device to your Siemens representative for repair. Repairs on-site are not possible.

Decommissioning

Shut down the device properly to prevent unauthorized persons from accessing confidential data in the device memory.

To do this, restore the factory settings on the device.

You achieve this by resetting the CPU using the online functions of STEP 7.

Also restore the factory settings on the storage medium.

Recycling and disposal



The product is low in pollutants, can be recycled and meets the requirements of the WEEE directive 2012/19/EU "Waste Electrical and Electronic Equipment".

Do not dispose of the product at public disposal sites. For environmentally friendly recycling and the disposal of your old device contact a certified disposal company for electronic scrap or your Siemens contact.

Keep to the local regulations.

You will find information on returning the product on the Internet pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/view/109479891)

Training, Service & Support

You will find information on training, service and support in the multilanguage document "DC_support_99.pdf" on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/view/38652101)

SIMATIC NET glossary

The SIMATIC NET glossary describes terms that may be used in this document.

You will find the SIMATIC NET glossary in the Siemens Industry Online Support at the following address:

Link: (https://support.industry.siemens.com/cs/ww/en/view/50305045)

Table of contents

Preface **3**

1 Application and functions **13**

1.1 Properties of the TIM 13

1.2 Communications services 15

1.3 PG routing 17
1.3.1 PG-Routing - ST7 17
1.3.2 PG routing - DNP3 18
1.3.3 PG routing - IEC 18

1.4 Security functions 18

1.5 Other services and properties 21

1.6 Planned operating environment - Configuration examples 23

1.7 Performance data and configuration limits 27

1.8 Requirements and compatibility 30
1.8.1 Software requirements 30
1.8.2 Usable CPUs 31

1.9 Expansion of SINAUT projects 31
1.9.1 Modules for new SINAUT projects and those to be expanded 31
1.9.2 Requirements for the expansion 33

2 LEDs, connectors, switches, card slot **35**

2.1 Overview: LEDs, connectors, switches, card slot 35

2.2 LEDs 36

2.3 Electrical connectors 37
2.3.1 Ethernet interfaces (X1, X2, X3) 37
2.3.2 Serial interface X4 38
2.3.3 X80: External power supply 38

2.4 Switch 38

2.5 SD card slot 40

3 Installation, connection, commissioning, removal **43**

3.1 Important notes on using the device 43
3.1.1 Notes on use in hazardous areas 44
3.1.2 Notes on use in hazardous areas according to ATEX / IECEx 44
3.1.3 Notes on use in hazardous areas according to UL HazLoc and FM 45

3.2 Installation, removal and repairs in hazardous areas 46

3.3 Installation 47
3.3.1 Installation guidelines for S7-1500 48
3.3.2 Installation 49

3.4 Wiring ... 50
3.5 Inserting the SD card ... 53
3.6 Commissioning ... 54
3.6.1 Commissioning ... 54
3.6.2 Startup - LED pattern ... 54
3.6.3 General requests ... 55
3.7 Disassembly ... 56
4 Configuration ... 57
4.1 Security recommendations ... 57
4.2 STEP 7 Professional ... 60
4.3 Overview of configuration ... 60
4.4 Block library Telecontrol ST7 ... 63
5 The Web server (WBM) ... 65
5.1 Supported Web browsers ... 65
5.2 Establishing a connection to the WBM of the TIM ... 65
5.3 General functions of the WBM ... 66
5.4 Start page ... 67
5.5 System ... 69
5.5.1 Device info ... 69
5.5.2 SD card ... 69
5.5.3 System time ... 70
5.5.4 NTP ... 70
5.5.5 Web server ... 70
5.5.6 DNS configuration ... 71
5.6 Maintenance ... 71
5.6.1 Firmware ... 71
5.6.2 Operating status ... 72
5.7 Diagnostics ... 73
5.7.1 Events ... 73
5.7.2 Notifications ... 75
5.8 LAN ... 75
5.8.1 Ethernet interface [Xn] ... 75
5.9 Telecontrol ... 77
5.9.1 Partner information ... 77
5.9.1.1 Connection overview ... 77
5.9.1.2 Send buffer ... 82
5.9.2 Data points ... 83
5.10 Logging ... 84
6 Diagnostics and upkeep ... 85
6.1 Diagnostics ... 85
6.1.1 Diagnostics options ... 85
6.1.2 Online functions ... 87

6.2 Maintenance ... 88
6.2.1 Update firmware ... 89
6.2.2 Resetting to factory settings ... 91
6.2.3 SNMP ... 93
6.2.4 Processing status of the messages (SMS / e-mail) ... 95
6.2.5 Module replacement ... 97
7 Technical specifications ... 99
7.1 Technical specifications ... 99
7.2 Ambient temperature ... 100
7.3 Pinout of the Ethernet interfaces ... 101
7.4 Pin assignment of the serial interface ... 102
8 Approvals ... 103
A Dimension drawings ... 109
B Accessories ... 111
B.1 Mounting rails ... 111
B.2 Power supply ... 111
B.3 SD cards ... 112
B.4 Formatting the SD card ... 112
B.5 Routers, modems, antennas ... 113
B.5.1 Dedicated line and dialup network modems ... 113
B.5.2 MODEM MD720 ... 114
B.5.3 IP-based routers ... 115
B.5.4 Mobile wireless antennas ... 115
B.6 Cables, connecting cables ... 117
B.6.1 Connecting cables for connecting modems ... 117
B.6.2 Accessories for RS-485 connection ... 119
C Encryption methods (Ciphers) ... 121
D Documentation references ... 123
Index ... 127

Application and functions

1

1.1 Properties of the TIM

Application and telecontrol protocols

The TIM 1531 IRC is a telecontrol communications module for the following SIMATIC automation systems:

- S7-300
- S7-400
- S7-1500
- ET 200SP

The TIM serves as the connection of the SIMATIC stations via public or private infrastructures to a telecontrol master station. Precisely one local CPU is assigned to the TIM.

As a standalone device it is not dependent on the S7 device family or rack type of the assigned CPU.

The following protocols can be selected for the telecontrol communication:

- SINAUT ST7
- DNP3
- IEC 60870-5

You will find the supported transmission protocols and network types in the section Communications services (Page 15).

Due to the capability of the TIM to establish redundant transmission paths between stations and to the master station and the option of storing process values the communication has a high degree of reliability.

Master station types

- SINAUT ST7

  As the connection partner of the TIM in a telecontrol master station, the following computer assisted applications are supported:

  – SINAUT ST7cc
  – SINAUT ST7sc
  – ST7 ScadaConnect
  – SIMATIC PCS 7 / WinCC TC
  – SIMATIC WinCC OA

  If no master station PC is used, the TIM can be used as a master station. For visualization, for example, an HMI panel can be used via the CPU.

- DNP3

  DNP3 master
- IEC 60870-5

  IEC master

Interfaces of the TIM

The TIM is equipped with the following interfaces:

- **3 x Ethernet interface RJ45**

  Connection to three different subnets

  Telecontrol communication via IP-based WAN/LAN networks
- **1 x serial interface**

  Default can be switched over by configuration: RS-232 ⇔ RS-485

  Telecontrol communication via the following WAN networks:
  - Classic WAN networks: Dedicated line, dialup network
  - IP-based networks (can be switched over by the configuration)

Network node types

With its four interfaces, the TIM can used at the following positions of a WAN network:

- Master station
- Node station
- Station

Expansion of existing SINAUT systems

In existing SINAUT systems with SIMATIC S7-300/400 stations and TIM modules for the telecontrol functions, the TIM 1531 IRC can be used universally for expansions.

Refer to section Expansion of SINAUT projects (Page 31) for more information on this.

1.2 Communications services

The following communications services are supported:

Telecontrol communication

Network types

The TIM makes telecontrol communication possible via the following network types:

- Industrial Ethernet
- Dedicated line / wireless network
- Analog dial-up network, ISDN network
- Mobile wireless networks
  - GSM / GPRS (2G) with MODEM MD720 (only ST7)
  - UMTS (3G) / HSPA+ with SCALANCE M router
  - LTE (4G) with SCALANCE M router
- IP-based wireless networks

You will find an overview of the transmission paths and network types, as well as the interfaces that can be used in each case, in the relevant configuration manual.

Telecontrol communication

For telecontrol communication via telecontrol networks, the TIM uses one of the above-named protocols on the application layer (OSI layer 7).

The following functions and services are supported:

- **Communication with the control center**

  The TIM communicates via LAN or WAN with an application in the master station.

  You will find the supported master station types in the section Properties of the TIM (Page 13).

- **Direct communication**

  In dial-up networks, mobile wireless networks and Ethernet networks, there is direct communication between the subscribers.

- **Inter-station communication**

  In dedicated line networks and with communication via the Internet with a mobile wireless network (GSM/MSC), the TIM supports inter-station communication between S7 stations via the master station.

  With inter-station communication, the TIM establishes a connection to the master station. The master station forwards the frames to the destination station.

- **Messages: SMS / e-mail**

  When configurable events occur, the TIM can send SMS messages to cell telephones and e-mails to PCs with an Internet connection.

  – When the ST7 protocol is used, SMS messages can be sent if the TIM is connected to a mobile wireless network via the serial interface and a GSM or GPRS module (MODEM MD720).

  – If the TIM is connected, e-mails can be sent via the Ethernet interface.

    You configure the e-mail protocol to be used and the server access in STEP 7 in the parameter group "E-mail configuration".

  You configure the messages in the message editor. The use of program blocks is not necessary for this.

Protocols with security functions

- **MSC**

  For secure telecontrol communication, the transmission protocol "MSC" (OSI layer 3) is available for the ST7 telecontrol protocol. MSC can be used for communication between two TIM modules (not between the TIM and a master station application).

  MSC is IP-based and can be used in the following networks:

  – Ethernet

  – Internet (DSL)

  – Mobile wireless network (GSM) and Internet

  The following variants of the protocol are available:

  – MSC

    Simple Internet communication via the Internet (DSL)

  – MSCsec

    Secure Internet communication when security requirements are higher.

- **IPsec / VPN (via router SCALANCE M)**

  VPN stands fro highly secure communication via mobile wireless and the Internet (DSL) using a SCALANCE M mobile wireless router.

For a description of the protocols, refer to the configuration manual.

S7 communication

For reading / writing data from and to the local CPU via S7 connections, the following services are supported.

- **PG communication**

  Communication with an engineering station

- **PG routing**

  S7 communication across subnetwork boundaries

- **PUT/GET**

  To exchange data with a local S7-300/400 CPU the TIM supports communication using the the program blocks PUT/GET as client and server.

- **READ/WRITE**

  To exchange data with a local S7-1500 CPU the TIM supports communication using the the program blocks READ/WRITE as client and server.

The Ethernet interfaces of the TIM must be configured with the network type "Neutral" for the S7 communications services.

You will find information on the communications functions and the program blocks in the STEP 7 information system.

Web server connections (WBM)

- **HTTP/HTTPS**

  The TIM has an integrated Web server with which you can connect from a PC via HTTP/HTTPS. Connections are possible via LAN or WAN

  The Web pages display diagnostics information and configuration data.

  You will find information on the content and operation in the section The Web server (WBM) (Page 65).

1.3 PG routing

PG routing between telecontrol modules

PG routing is supported between the modules listed in the table and via the specified media.

A requirement is that the options "S7 communication" and "Online functions" are enabled in the "Communication types" parameter group.

1.3.1 PG-Routing - ST7

"RS-232" means communication via dedicated line or dialup network.

Module Medium (protocol)	TIM 1531 IRC	TIM 4R-IE	TIM 3V-IE / TIM 3V-IE Advanced	CP 1243-8 IRC	CP 1542SP-1 IRC
TIM 1531 IRC	Ethernet (S7) Ethernet (MSC) * RS-232	Ethernet (S7) Ethernet (MSC) * -	Ethernet (S7) Ethernet (MSC) * -	Ethernet (S7)	Ethernet (S7)
TIM 4R-IE	Ethernet (S7) Ethernet (MSC) * -	Ethernet (S7) Ethernet (MSC) * RS-232	Ethernet (S7) Ethernet (MSC) * RS-232	-	-

Module Medium (protocol)	TIM 1531 IRC	TIM 4R-IE	TIM 3V-IE / TIM 3V-IE Advanced	CP 1243-8 IRC	CP 1542SP-1 IRC
TIM 3V-IE / TIM 3V-IE Advanced	Ethernet (S7) Ethernet (MSC) * -	Ethernet (S7) Ethernet (MSC) * RS-232	Ethernet (S7) Ethernet (MSC) * RS-232	-	-
CP 1243-8 IRC	Ethernet (S7)	-	-	-	-
CP 1542SP-1 IRC	Ethernet (S7)	-	-	-	-

* As of STEP 7 V18, it may be possible that CPU data cannot be loaded via CP routing when using the MSC protocol. In this case use a direct connection to the CPU to load data to the CPU.

See the performance data and the configuration limits for the number of supported connections.

1.3.2 PG routing - DNP3

Module Medium	TIM 1531 IRC	CP 1243-8 IRC	CP 1542SP-1 IRC
TIM 1531 IRC	Ethernet (S7)	Ethernet (S7)	Ethernet (S7)
CP 1243-8 IRC	Ethernet (S7)	-	-
CP 1542SP-1 IRC	Ethernet (S7)	-	-

Max. number of S7 routing connections: 4

1.3.3 PG routing - IEC

Module Medium	TIM 1531 IRC	CP 1243-8 IRC	CP 1542SP-1 IRC
TIM 1531 IRC	Ethernet (S7)	Ethernet (S7)	Ethernet (S7)
CP 1243-8 IRC	Ethernet (S7)	-	-
CP 1542SP-1 IRC	Ethernet (S7)	-	-

Max. number of S7 routing connections: 4

1.4 Security functions

Security functions of the transmission protocols

The transmission protocols that can be used for telecontrol communication support the following security functions:

ST7

- **MSC**

  The MSC protocol supports authentication of the communications partners and simple encryption of data. A user name and a password are included in the encryption. An MSC tunnel is established between the MSC station and MSC master station.

- **MSCsec**

  MSCsec supports authentication of the communications partners and data encryption with a user name and password.

  In addition to this, the shared automatically generated key is renewed between the communications partners at a configurable Key exchange interval.

DNP3

- The TIM supports the use of TLS connections as well as secure authentication according to IEEE 1815.

IEC 60870-5-101 / 104

- The TIM supports the use of the following functions:
  - IEC 60870-5-101 / 104

    Secure authentication according to IEC 60870-5-7
  - IEC 60870-5-104

    TLS connections

TLS

For information on the versions and methods, see appendix Encryption methods (Ciphers) (Page 121).

Further security functions of the TIM

The TIM also supports the following security functions:

- **NTP (secure)**

  For secure transfer during time-of-day synchronization

- **STARTTLS / SSL/TLS**

  For the secure transfer of e-mails

- **HTTPS**

  For secure access to the Web server of the TIM

- **SNMPv3**

  For secure transmission of network analysis information safe from eavesdropping

Note
Plants with security requirements - recommendation

Use the following options:

- If you have systems with high security requirements, use the secure protocols, for example HTTPS or SNMPv3.
- If you connect to public networks, you should use security modules with a firewall, see below.

Refer to the information in the section Security recommendations (Page 57).

Additional protection be using security modules

With Industrial Ethernet Security, individual devices, automation cells or network segments of an Ethernet network can be protected. The following security modules are suitable for connecting the TIM to public networks:

- SCALANCE M800

  Routers for IP-based data transfer via DSL or mobile networks of the standards GPRS, EGPRS, UMTS, LTE

- SCALANCE S

  Security modules for connection to Ethernet networks

The data transfer of the TIM along with a security module can be protected from the following attacks by a combination of different security measures:

- Data espionage
- Data manipulation
- Unwanted access

Secure underlying networks can be operated via additional Ethernet interfaces of the TIM or CPU.

Using the security modules mentioned above SCALANCE M / SCALANCE S the following additional security functions can be used:

- **Firewall**
  - IP firewall with stateful packet inspection (layer 3 and 4)
  - Firewall also for "non-IP" Ethernet frames according to IEEE 802.3 (layer 2)
  - Limitation of the transmission speed to restrict flooding and DoS attacks ("Define IP packet filter rules")
  - Global firewall rule sets
- **Protection for devices and network segments**

  The protection provided by the firewall can cover individual devices, several devices or even entire network segments.

- **Communication made secure by IPsec tunnels (VPN)**

  VPN tunnel communication allows the establishment of secure IPsec tunnels for communication with one or more security modules.

  VPN can be used for communication via mobile wireless and the Internet (DSL) along with a SCALANCE M router. The SCALANCE M800 product line includes various VPN routers with encryption software and a firewall.

  The router can be put together with other modules to form VPN groups during configuration. IPsec tunnels (VPN) are created between all security modules of a VPN group. All internal nodes of these security modules can communicate securely with each other through these tunnels.

- **Logging**

  To allow monitoring, events can be stored in log files that can be read out using the configuration tool or can be sent automatically to a Syslog server.

You will find additional information on the functionality and configuration of the security functions in the STEP 7 information system.

1.5 Other services and properties

Other services and properties

- **Data point configuration**

  Due to the data point configuration in STEP 7, programming program blocks in order to transfer the process data is unnecessary. The process data is configured as individual data points and transferred one-to-one to the communications partner.

- **Saving frames**

  Data frames that cannot be transferred to the communications partner due to connection disruptions are saved:

  – With the default setting, frames are temporarily saved in the frame memory (send buffer).

  – If an SD card is used, frames can also be saved temporarily on the SD card when a partner cannot be reached.

  You can find the maximum number in the section Performance data and configuration limits (Page 27).

  See also section SD card slot (Page 40).

- **IP configuration**

  The TIM supports IP addresses according to IPv4 and IPv6.

  Address assignment:

  – The IP address, the subnet mask and the address of a gateway can be set manually in the configuration.

  – As an alternative, the IP address can be obtained from a DHCP server or by other means outside the configuration.

- **Time-of-day synchronization**

  On every interface the TIM provides the option of receiving and forwarding the time of day.

  Synchronization method NTP (Network Time Protocol) via Industrial Ethernet:

  – NTP

  – NTP (secure)

  You can find information in the configuration manual.

  For information on the format of the time stamps of the frames, refer to the configuration manual.

- **Access to the Web server of the TIM**

  With the aid of the Web server, you can display module and diagnostics data.

- **Storage and event-driven transfer of process data**

  The TIM can store events of different classes and transfer the corresponding process values individually or bundled together to the communications partner. The transfer can be triggered by various triggers.

- **Analog value processing**

  Analog values can be preprocessed in the TIM according to various methods, see configuration manual.

- **Online functions**

  From an engineering station (ES) on which STEP 7 is installed, you can use the online functions of STEP 7 via an Ethernet interface of the TIM to access the S7 CPU if the station is located in the same IP subnet.

  The following online functions are available:

  – Downloading project or program data from the STEP 7 project to the station

  – Querying diagnostics data on the station

  – Downloading firmware files to the TIM

- **SNMP**

  As an SNMP agent, the TIM supports data queries using SNMPv1 and SNMPv3 (Simple Network Management Protocol).

  You can find more information in the configuration manual.

1.6 Planned operating environment - Configuration examples

Below, you will find configuration examples for the TIM.

Sending SMS messages

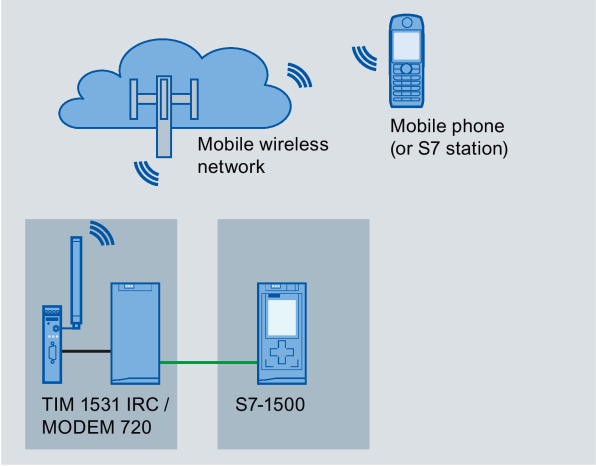


Figure 1-1 Sending messages by SMS

When the ST7 protocol is used, the TIM can send SMS to cell phones. SMS messages are generated and sent due to events.

Communication via Ethernet / Internet, sending e-mails

In the sample configuration shown, S7 stations communicate with a redundant master station via the Ethernet interfaces of the TIM.

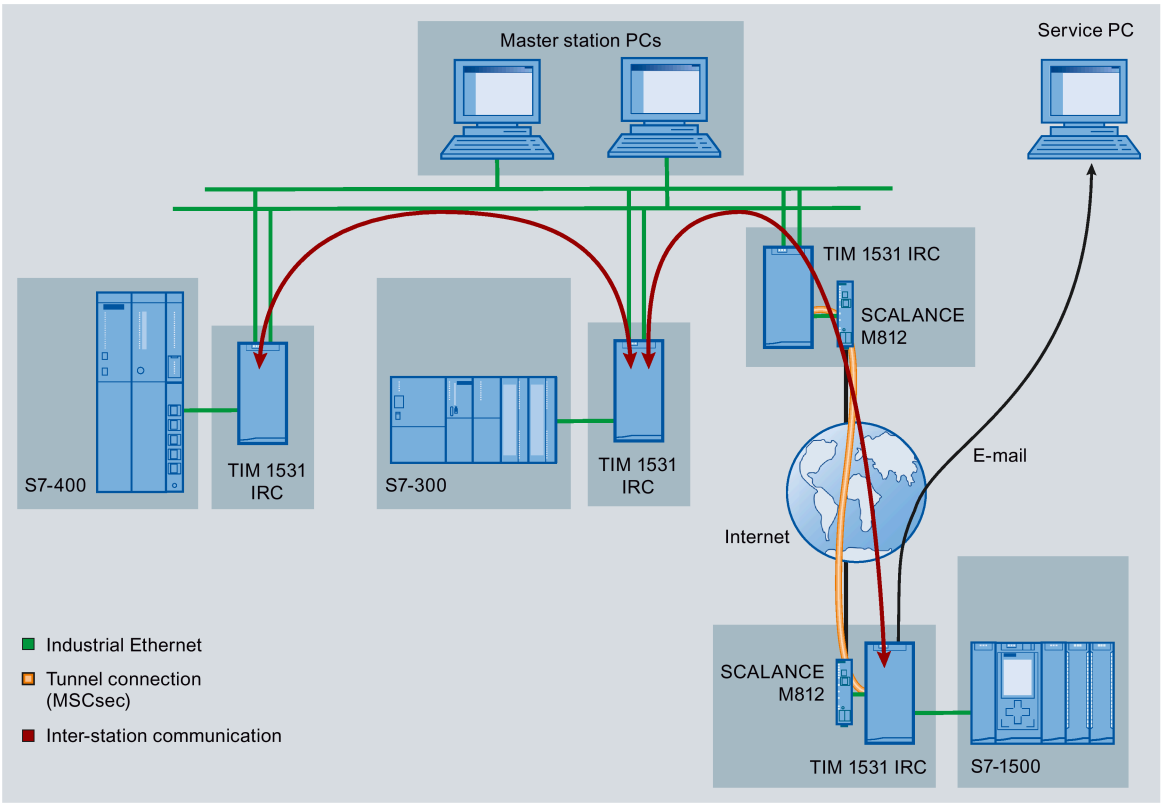


Figure 1-2 Communication via Ethernet / Internet

E-mails

The TIM can generate and send e-mails due to events. The following recipients are possible:

- PCs with an Internet connection
- Cell phones
- SIMATIC stations with the appropriate program blocks

Inter-station communication

Direct inter-station communication between S7 stations with a TIM is possible via IP-based and conventional WAN networks.

Inter-station communication via mobile wireless and dedicated lines runs via a master station that forwards the frames to a target subscriber.

Path redundancy using the serial interface

In the following example in addition to the Ethernet interface, the serial interface of the TIM is also used. This allows redundant transmission paths to be set up.

The figure shows two examples in which the following interfaces are used:

- Ethernet interface for communication via Ethernet / Internet

  The TIM modules use the transmission protocol MSC or MSCsec.

- Serial interface for communication via a WAN network (dedicated line or dialup network)

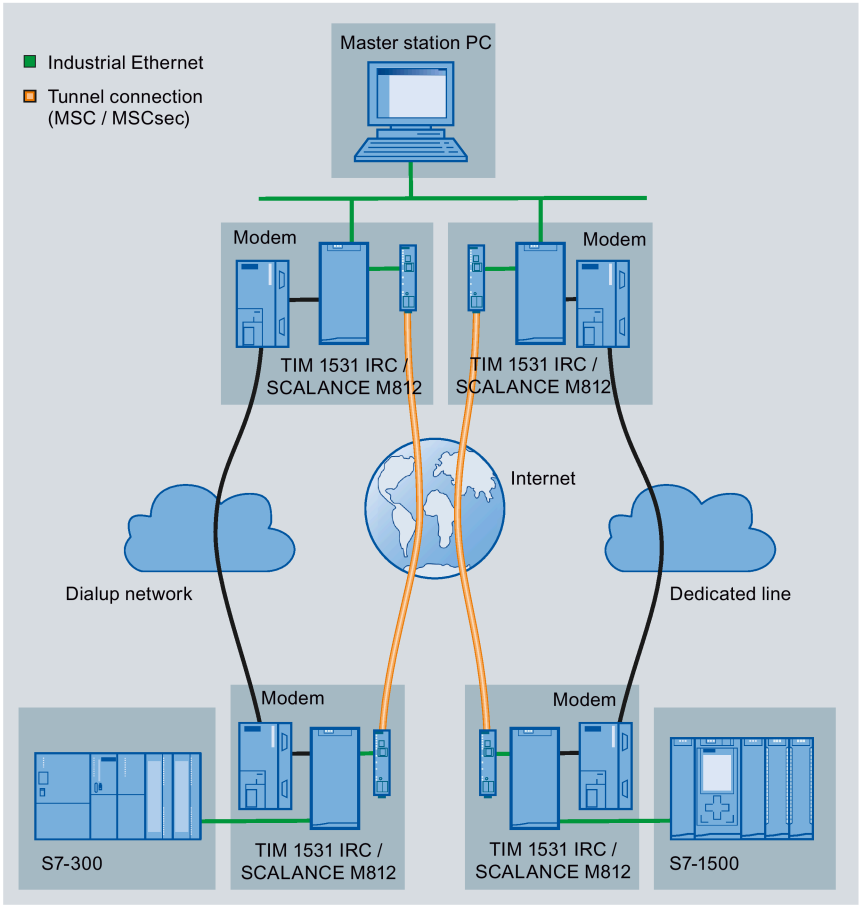


Figure 1-3 Communication via redundant paths

Path redundancy is also possible over two Ethernet networks.

Telecontrol communication via mobile wireless and wireless networks

Mobile wireless

In these examples the TIM modules of the master communicate with the station or node station TIMs via mobile wireless:

- Left: Use of the Ethernet interface with VPN
- Right: Use of the serial interface and the transmission protocol MSCsec

Private wireless networks

The left station TIM is configured as a node station. Underlying this an analog wireless network with several stations is connected via the serial interface. An IP-based wireless network could also be connected via the Ethernet interface.

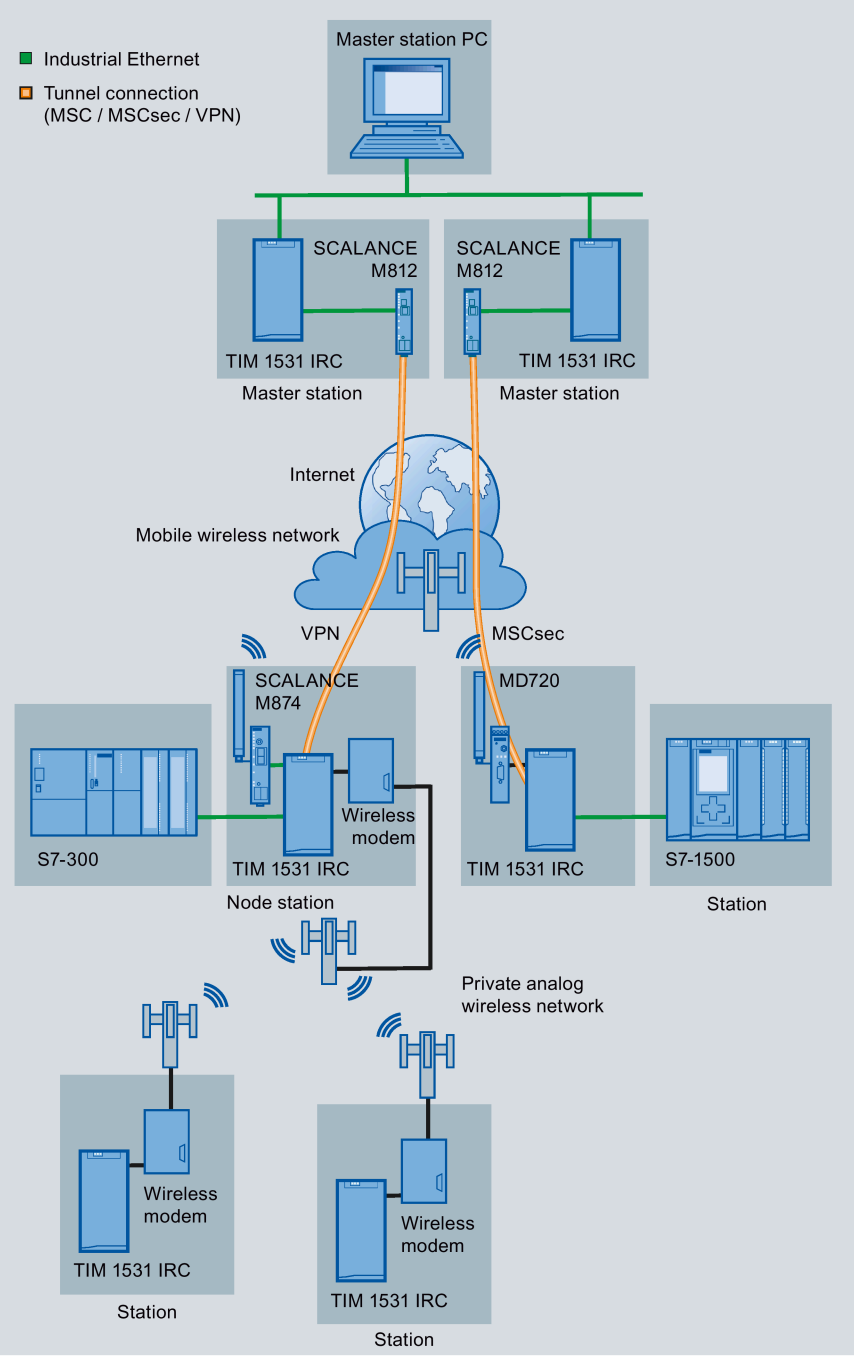


Figure 1-4 Communication using mobile wireless (at the top) and wireless (at the bottom)

1.7 Performance data and configuration limits

Telecontrol connections

The number of connections or communications partners is limited for the two interface types and every individual interface.

Note that redundant connection paths of a connection between two partners require two connection resources on each partner.

The maximum number of connections depends on the protocol used.

Telecontrol connections - ST7

Max. number of connections: 128

When the ST7 protocol is used, distribution over the 4 interfaces depends on the network node type of the interface, the WAN type and the network type.

Refer to the following tables for the connection configuration limits of the TIM with use in the plant hierarchy as master station, as node station and as station.

Table 1- 1 ST7 connections: TIM 1531 IRC as master station

Max. number overall	Network node type	WAN type	Network type	Max. number	Interface
128 *	Master station	IP-based	MSC	127	Ethernet X1
			• Neutral (S7) • Mobile wireless via VPN	128	Ethernet X1 / X2 / X3
		Classic WAN	• Dedicated line • Dialup network	32	Serial X4

Table 1- 2 ST7 connections: TIM 1531 IRC as node station

Max. number overall	Network node type	WAN type	Network type	Max. number	Interface
128 *	Master station (Interface with connection to the station)	IP-based	MSC	127	Ethernet X1
			• Neutral (S7) • Mobile wireless via VPN	128 *	Ethernet X1 / X2 / X3
		Classic WAN	• Dedicated line • Dialup network	32	Serial X4
	Node station (Interface with connection to the master station)	IP-based	MSC	1	Ethernet X1
			• Neutral (S7) • Mobile wireless via VPN	128 *	Ethernet X1 / X2 / X3
		Classic WAN	• Dedicated line • Dialup network	16	Serial X4

Table 1- 3 ST7 connections: TIM 1531 IRC as station

Max. number overall	Network node type	WAN type	Network type	Max. number	Interface
128	Station	IP-based	MSC	1	Ethernet X1
			• Neutral (S7) • Mobile wireless via VPN	128 *	Ethernet X1 / X2 / X3
		Classic WAN	• Dedicated line • Dialup network	16	Serial X4

*** TIM 1531 IRC with S7-300-CPU and TD7onCPU**

If you use TD7onCPU in the TIM 1531 IRC and assign an S7-300 CPU to the TIM, the S7-300 CPU supports up to 16 S7 connections.

Telecontrol connections - DNP3

Max. number of connections: 128

Distribution over 4 interfaces can take place in any way (max. 128 per interface).

Telecontrol connections - IEC 60870-5-101/104

Max. number of connections: 128

Distribution over 4 interfaces can take place in any way (max. 128 per interface).

Further connection resources

- **E-mail / SMS**

  At runtime, a connection can be established to send an e-mail or SMS message.

- **S7 connections**
  - When using ST7 communication:

    Max. 132 connection resources in total incl. telecontrol connections (see above) and incl. max. 4 PG/OP connections (see below)
  - Without using ST7 communication:

    Max. 4 connection resources only for PG/OP connections (see below)

- **PG/OP connections**

  4 connection resources for connections to the engineering station or HMI devices

  (included in the configuration limits of the S7 connections, see above)

- **PG routing**

  Max. 4 connections at the same time

- **Online functions**

  See PG/OP connections
- **HTTP/HTTPS**

  Max. 2 connections per Ethernet interface
- **Connectable control center applications**

  Number of ST7cc / ST7sc SINAUT control centers connectable via Ethernet: Max. 4

Number of data points for the data point configuration

The maximum number of configurable data points is 3000.

Frame memory

Send buffer

The TIM has a frame memory (send buffer) for the values of data points configured as an event.

Due to the different frame structure in the various telecontrol protocols, the send buffer has the following maximum size depending on the protocol:

- ST7: 100000 frames
- DNP3: 250000 events
- IEC: 250000 events

The size of the frame memory is divided equally among all configured communications partners.

You will find details of how the send buffer works (storing and sending events) as well as the options for transferring data in the description of configuring the data points, see /15/ (Page 126).

SD card

You can set saving of frames on an optional SD card in the "Basic settings", see /15/ (Page 126).

The maximum number of frames that can be buffered on an SD card is the same as that in the send buffer (see above).

Messages: E-mail / SMS

Up to 10 messages which the TIM can send as e-mails or SMS messages can be configured in STEP 7.

- Number of characters per SMS message

  Maximum number of characters that can be transferred per SMS message: 160 ASCII characters including any value sent at the same time

- Number of characters per e-mail

  Maximum number of characters that can be transferred per e-mail: 256 ASCII characters including any value sent at the same time

1.8 Requirements and compatibility

1.8.1 Software requirements

Configuration and online functions

STEP 7 as of the following version is required for configuring the entire scope of functions of the TIM:

- STEP 7 Professional V18

STEP 7 as of the following version is required for using the online functions:

- STEP 7 Professional V15.1 or higher

Expansion of SINAUT ST7 plants (optional)

The following configuration tool is required to configure the proxy module in STEP 7 V5 to expand SINAUT systems:

- STEP 7 V5.6

  together with

- SINAUT engineering software V5.5 + SP3

1.8.2 Usable CPUs

Compatible CPUs

The following can be used as the local CPU of the TIM 1531 IRC:

- S7-1500

  All CPUs that can be configured in STEP 7 as of firmware version V2.1 from the following series:

  – Standard CPUs (CPU 15xx)

  – Compact CPUs (CPU 15xxC)

  For TLS communication as of TIM firmware V2.2: All CPUs that can be configured in STEP 7 as of firmware version V2.9

  Redundant CPUs as of firmware version V2.6:

  – H-CPU (CPU 1517H-x PN)

  – R-CPUs (CPU 151xR-x PN)

- ET 200SP

  As of TIM firmware V2.1: All CPUs that can be configured in STEP 7 as of firmware version V2.5

- S7-300

  All CPUs that can be configured in STEP 7 with a PROFINET interface

- S7-400

  All CPUs that can be configured in STEP 7

1.9 Expansion of SINAUT projects

1.9.1 Modules for new SINAUT projects and those to be expanded

New SINAUT projects in the TIA Portal

For new SINAUT projects, the following modules can be configured as of STEP 7 Basic / Professional V15 (TIA Portal) without pre-configuration in STEP 7 V5.

Table 1- 4 Configuration of modules for ST7 projects in STEP 7 Basic / Professional as of V15

Module (firmware version)	STEP 7 catalog module	STEP 7 product
TIM 3V-IE (V2.8)	TIM 3V-IE	STEP 7 Professional
TIM 3V-IE Advanced (V2.7)	TIM 3V-IE Advanced	STEP 7 Professional
TIM 4R-IE (V2.7)	TIM 4R-IE / TIM 4R-IE Stand-alone	STEP 7 Professional

Module (firmware version)	STEP 7 catalog module	STEP 7 product
CP 1243-8 IRC (V3.2)	CP 1243-8 IRC	STEP 7 Basic
TIM 1531 IRC (Vx) *	TIM 1531 IRC	STEP 7 Professional
CP 1542SP-1 IRC (V2.1)	CP 1542SP-1 IRC	STEP 7 Professional

* STEP 7 V15: Firmware V1.0; STEP 7 V15.1: Firmware V2.0; STEP 7 V15.1: Firmware V2.1

Expansion of existing SINAUT ST7 projects in the TIA Portal

SINAUT projects with TIM modules for the SIMATIC S7-300 and S7-400 series, which were configured in STEP 7 V5, can be extended with communications modules of the S7-1200/1500 series which are configured in STEP 7 Basic or STEP 7 Professional in the TIA Portal.

The following modules are available as communications modules for expanding existing SINAUT systems:

- CP 1542SP-1 IRC

  As of STEP 7 Professional V15.1

- CP 1243-8 IRC

  As of STEP 7 Basic V13.0 SP1

- TIM 1531 IRC

  As of STEP 7 Professional V15

To avoid having to create, configure and program the entire STEP 7 V5 project in STEP 7 Professional, the STEP 7 V5 project can be expanded by S7-1200/1500 stations with compatible communications modules.

The procedure for configuration of a communications module for the expansion is as follows:

1. Configuration of a placeholder (proxy) for an S7-1200/1500 module in the STEP 7 V5 project

   The proxy receives the SINAUT-specific communication, connection and address parameters.

2. Export the configuration data (SDBs) of the proxy from STEP 7 V5 as a text file.
3. Import the configuration data of the proxy into a compatible module in STEP 7 Basic / Professional.

   The new module adopts the SINAUT-specific communication, connection and address parameters from STEP 7 V5.

4. Complete the configuration of the new module in STEP 7 Basic / Professional.

This procedure is supported by the following modules:

Table 1- 5 Module migration from STEP 7 V5 to STEP 7 Basic / Professional (TIA Portal)

Module for STEP 7 V5 project expansion			**Module in STEP 7 Basic / Prof. V17**	
TIM (function) for expansion	**Proxy to be used in the catalog**		**Compatible modules**	**Required STEP 7 version**
TIM 3V-IE Advanced	PROXY CP1243-8 IRC	⇒	CP 1243-8 IRC	STEP 7 Basic
			CP 1542SP-1 IRC	STEP 7 Professional
TIM 4R-IE	PROXY TIM 1531 IRC	⇒	TIM 1531 IRC	STEP 7 Professional
TIM 4R-IE Stand-alone	PROXY TIM 1531 IRC	⇒	TIM 1531 IRC	STEP 7 Professional

Note

TIM 4R-IE Stand-alone for S7-400 becomes TIM 1531 IRC

A TIM 4R-IE Stand-alone required in STEP 7 V5 that is assigned to a CPU-400 must be replaced by a TIM 1531 IRC for the expansion of classic SINAUT projects in STEP 7 Professional.

A TIM 4R-IE Stand-alone can only be created in new projects that are configured exclusively in STEP 7 Professional.

You can find details on configuration in /14/ (Page 126).

1.9.2 Requirements for the expansion

Furthermore, the following requirements apply to importing configuration data from STEP 7 V5 to STEP 7 Basic / Professional.

Additional modules that are not listed here are available for new projects in STEP 7 Basic / Professional.

Requirements: Software versions

The above-mentioned configuration tools are required in the specified versions for expansion of SINAUT projects.

- **STEP 7 V5 project**

  A configuration file of the communications module from a consistent STEP 7 V5 project is required.

Requirements: Firmware versions/module update

- **Firmware of the communications modules**

  The following firmware versions are required:

  – **TIM 1531 IRC - V2.3**

    A TIM 1531 IRC V1.x can be exchanged for a TIM 1531 IRC V2.3, but not the other way round.

    The mode of the "Telecontrol configuration" ("Basic settings") is set to "Configure". The existing data is adopted.

  – **CP 1542SP-1 IRC - V2.0**

    Adoption of the data from STEP 7 V5 without the option of making changes

  – **CP 1243-8 IRC - V2.1**

    Adoption of the data from STEP 7 V5 without the option of making changes

    A physical V2.1 CP can be exchanged for a V3.1 CP but not the other way round. The CP used must have hardware product version 2. The existing data is adopted.

Requirements: TIM 1531 IRC

- **Communication partner of the TIM 1531 IRC**

  Requirements for importing ST7 connections between a TIM 1531 IRC and a CPU 1500:

  – The CPU 1500 must have at least the firmware version V2.5.

  – TIM and CPU must be networked in STEP 7 Professional before the import.

  – When using TD7onCPU, the CPU must not yet be assigned to the TIM in STEP 7 Professional.

  Requirements for ST7 connections between a TIM 1531 IRC and a PC application:

  – Prior to import, the TIM and the PC station must be networked in STEP 7 Professional.

  IP addresses of a CPU 1500 or a PC station as ST7 communication partner of the TIM 1531 IRC:

  – The IP address in the STEP 7 Professional project must be identical to the address of the respective CPU or PC station configured in STEP 7 V5.

LEDs, connectors, switches, card slot

2

2.1 Overview: LEDs, connectors, switches, card slot

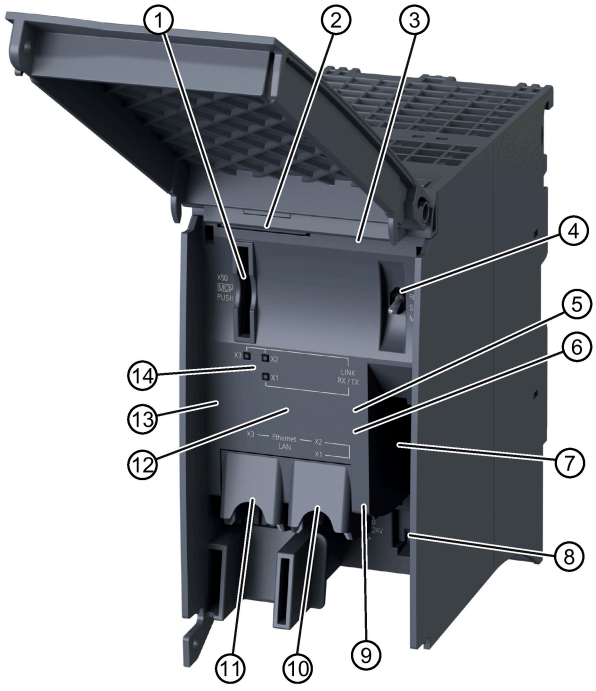


Figure 2-1 Location of the elements LEDs, connectors, switches, SD card slot

Table 2- 1 Meaning of the number symbols

①	X50: Receptacle for SD card	⑧	X80: Power supply (socket)
②	Status/diagnostic LEDs: RUN, ERROR, CONNECT	⑨	X1: Ethernet interface (Gigabit Ethernet)
③	Article number (covered)	⑩	X2: Ethernet interface (Fast Ethernet)
④	Switch	⑪	X3: Ethernet interface (Fast Ethernet)
⑤	MAC address Ethernet interface X2	⑫	Serial number (2D matrix code, alphanumeric)
⑥	MAC address Ethernet interface X1	⑬	MAC address Ethernet interface X3
⑦	X4: Serial interface, plug (RS-232/RS-485)	⑭	LEDs for Ethernet communication status: X1, X2, X3

2.2 LEDs

At the top on the front of the TIM there are the status and diagnostics LEDs that can also be seen when the front cover is closed.

Position	LED name	Meaning
Left	**RUN**	Operating mode
Middle	**ERROR**	Error
Right	**CONNECT**	Connection status (to the CPU / to the communications partner)

Below the front cover there are LEDs for the communication status of the Ethernet interfaces:

LED name	Meaning
X1 / X2 / X3	Communication status of Ethernet interface, X1, X2 and X3

The LED symbols have the following meaning:

Table 2- 2 Legend for the tables

Symbol				-
Meaning / LED status	ON (LED lit)	OFF	LED flashes	Any

Status and diagnostics LEDs

Table 2- 3 Meaning of the LED patterns in productive operation *

RUN (yellow/green)	ERROR (red)	CONNECT (green)	Meaning
			No supply voltage or supply voltage too low
	-	-	TIM in RUN mode
	-	-	TIM in STOP mode
	-	-	Missing configuration data
-	-		All configured connections established **
-	-		No configured connections established **
-	-		At least one configured connection aborted **
		-	Incorrect configuration
-		-	Duplicate IP address detected

***** During startup and during the firmware update the TIM shows deviant LED patterns.

****** Relates to connections both to the CPU and to the communications partner.

- **Startup**

  For the LED pattern see section Startup - LED pattern (Page 54).
- **Firmware update**

  For the LED pattern see section Update firmware (Page 89).

LEDs of the Ethernet interfaces

Every interface has an LED that informs about the connection status with Ethernet and the message traffic of the port.

Table 2- 4 Meaning of the LED statuses

X1 / X2 / X3 (yellow/green)	Meaning
○	No connection to the Ethernet network
●	Ethernet connection without data transfer
●	Ethernet connection with data transfer

2.3 Electrical connectors

2.3.1 Ethernet interfaces (X1, X2, X3)

Ethernet interfaces

The Ethernet connectors are located behind the cover of the enclosure. The interfaces are RJ-45 jacks according to IEEE 802.3.

Note

Connection to subnets

The three Ethernet interfaces are not designed as a switch, but are intended for connection to different networks. Operation in the same physical network is not permitted.

The pin assignment of the Ethernet interfaces and other data can be found in the section Technical specifications (Page 99).

2.3.2 Serial interface X4

Serial interface X4

The serial interface is designed as 9-pin D-sub miniature male connector.

The interface can be operated in the two following standards:

- RS-232

  or

- RS-485

You specify the standard to be used in the STEP 7 configuration of the serial interface.

You will find the pinout of the interface in the section Pin assignment of the serial interface (Page 102).

2.3.3 X80: External power supply

External power supply

The connector X80 (socket) for the external 24 VDC power supply is located on the front of the TIM.

The power supply is connected to the TIM with the supplied plug-in terminal block. The plug-in terminal block is designed so that it can only be plugged in in one position in the X80 socket of the TIM.

The connector X80 has electronic reverse polarity protection.

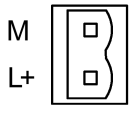


Figure 2-2 Connector X80 for the power supply

Table 2- 5 Pin assignment of the socket for the external power supply

Labeling	Function
M	Reference ground
L+	24 VDC

For information on the connector, refer to the section "Wiring (Page 50)".

You will find further data on the power supply in section Technical specifications (Page 99).

2.4 Switch

Operating status switch

WARNING
EXPLOSION HAZARD
Do not press the button if there is a potentially explosive atmosphere.

The switch is a combined element with switch and button functions. It has three settings:

- **RUN**

  RUN mode

  This is the basic setting for productive operation.

- **STOP**

  STOP mode

  Set the TIM to STOP before disconnecting the power supply. Setting to STO may also be necessary if an error/fault occurs to be able to restart the TIM afterwards.

  In STO mode, the following functions are disabled:

  – Telecontrol operation of the TIM
  – Time-of-day synchronization via Telecontrol connections
  – S7 connections are terminated.

  The following functions remain enabled:

  – Access to the WBM of the TIM
  – Time-of-day synchronization with NTP
  – Diagnostic functions of the TIM

- **MRES**

  Maintenance status

  The setting "MRES" is adopted by pressing and holding down the switch in this position (button function).

  By pressing the switch for at least 5 seconds, the functions described below are triggered. If you release the switch before the 5 seconds have elapsed, the TIM shows no reaction.

  Functions:

  – Restart

    When the switch is pressed in STOP mode

    The TIM restarts.

  – Reset to factory settings

    Only when the switch is pressed during a restart

    The TIM is reset to the factory settings. Note the effects of the reset, particularly the deletion of the configuration data.

    For information on the effects of resetting, refer to the section Resetting to factory settings (Page 91).

Functions in the setting "MRES"

Functions when holding the switch in the "MRES" setting for at least 5 seconds:

Table 2- 6 Button functions

Function	Previous setting or action	Effect
Restart	Pressing the switch from the "STOP" setting	The TIM restarts. Release the switch at the beginning of the restart.
Reset	Pressing the switch after triggering a restart	The TIM is reset to the factory settings. All the configuration data is deleted.

For the relevant LED patterns see the following section:

- Startup - LED pattern (Page 54)
- Resetting to factory settings (Page 91)

2.5 SD card slot

"X50": Slot for an optional SD card

You have the option of using an SD card as an exchangeable storage medium for storing important data.

- Configuration data
- Process data

  Values of data points configured as an event.

An SD card does not ship with the TIM.

Compatible cards

You will find a list of compatible SD cards in the appendix SD cards (Page 112).

Use one of the SD cards listed there.

The minimum size is 24 MB. If you use an SD card with less storage space, it is possible that not all process data (see below) can be saved retentively.

Card errors / diagnostics

Card errors are indicated by entries in the diagnostics buffer.

Inserting the card

Inserting the SD is described in the section Inserting the SD card (Page 53).

Retentive storage of important data on the SD card

The SD card is an exchangeable storage medium for storing the following data safe from power failure.

- **Configuration data**

  The configuration data is backed up on the SD card following every change in a configuration file. Storing configuration data on the SD card serves the following purpose:

  – Device replacement without engineering station

    If the TIM needs to be replaced for maintenance purposes or another location, by transferring the SD card from the previous to the new TIM, the configuration data can be made available to the new TIM. In this case, you do not need an engineering station with a STEP 7 project.

  The configuration data is saved on the SD card when the TIM starts up.

  For information on device replacement refer to section Module replacement (Page 97).

- **Process data**

  If an SD card is used, frames can also be saved temporarily on the SD card when a partner cannot be reached. The frames remain saved until the connection is established again.

  Configuration files are saved on the SD card in the following cases:

  – In the event of connection disruptions

  – In the event of a power failure

  You can specify whether values of events are saved in the configuration of the "Basic settings".

  There are further options for storing on the SD card for every data point created as an event.

Installation, connection, commissioning, removal 3

3.1 Important notes on using the device

Safety notices on the use of the device

Note the following safety notices when setting up and operating the device and during all associated work such as installation, connecting up or replacing the device.

⚠ WARNING

Accessories: Personal injury and property damage can occur.

The installation of expansions that are not approved for SIMATIC NET products or their target systems may violate the requirements and regulations for safety and electromagnetic compatibility.

Only use expansions that are approved for the system.

Overvoltage protection

NOTICE

Protection of the external power supply

If power is supplied to the module or station over longer power cables or networks, the coupling in of strong electromagnetic pulses onto the power supply cables is possible. This can be caused, for example by lightning strikes or switching of higher loads.

The connector of the external power supply is not protected from strong electromagnetic pulses. To protect it, an external overvoltage protection module is necessary. The requirements of EN61000-4-5, surge immunity tests on power supply lines, are met only when a suitable protective element is used. A suitable device is, for example, the Dehn Blitzductor BVT AVD 24, article number 918 422 or a comparable protective element.

Manufacturer:
DEHN+SOEHNE GmbH+Co.KG Hans Dehn Str.1 Postfach 1640 D-92306 Neumarkt, Germany

3.1.1 Notes on use in hazardous areas

WARNING

EXPLOSION HAZARD

Do not open the device when the supply voltage is turned on.

WARNING

The device may only be operated in an environment with pollution degree 1 or 2 as described in EN/IEC 60664-1, GB/T 16935.1.

WARNING

EXPLOSION HAZARD

Do not connect or disconnect cables to or from the device when a flammable or combustible atmosphere is present.

WARNING

EXPLOSION HAZARD

Do not press the button if there is a potentially explosive atmosphere.

3.1.2 Notes on use in hazardous areas according to ATEX / IECEx

WARNING

Requirements for the cabinet

To comply with EU Directive 2014/34 EU (ATEX 114), UK Regulation SI 2016/1107 or the conditions of IECEx or CCC-Ex, the housing or cabinet must meet the requirements of at least IP54 (according to EN/IEC 60529, GB/T 4208) in compliance with EN IEC/IEC 60079-7, GB 3836.8.

WARNING

Suitable cables at high ambient temperatures in hazardous area

At an ambient temperature of ≥ 60 °C, use heat-resistant cables designed for an ambient temperature at least 20 °C higher. The cable entries used on the enclosure must comply with the IP degree of protection required by EN IEC / IEC 60079-0, GB 3836.1.

WARNING

Transient overvoltages

Take measures to prevent transient overvoltages of more than 40% of the rated voltage (or more than 119 V). This is the case if you only operate devices with SELV (safety extra-low voltage).

3.1.3 Notes on use in hazardous areas according to UL HazLoc and FM

This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only.

This equipment is suitable for use in Class I, Zone 2, Group IIC or non-hazardous locations only.

WARNING

When used in hazardous environments corresponding to Class I, Division 2 or Class I, Zone 2, the device must be installed in a cabinet or a suitable enclosure.

WARNING

Wall mounting is only permitted if the requirements for the housing, the installation regulations, the clearance and separating regulations for the control cabinets or housings are adhered to. The control cabinet cover or housing must be secured so that it can only be opened with a tool. An appropriate strain-relief assembly for the cable must be used.

WARNING

Substitution of components may impair suitability for Division 2.

WARNING

If the device is installed in a cabinet, the inner temperature of the cabinet corresponds to the ambient temperature of the device.

WARNING

EXPLOSION HAZARD

The equipment is intended to be installed within an ultimate enclosure. The inner service temperature of the enclosure corresponds to the ambient temperature of the module. Use installation wiring connections with admitted maximum operating temperature of at least 30 °C higher than maximum ambient temperature.

3.2 Installation, removal and repairs in hazardous areas

WARNING

Impermissible accessories and spare parts

Risk of explosion in hazardous areas

- Only use original accessories and original spare parts.
- Observe all relevant installation and safety instructions described in the manuals for the device or supplied with the accessories or spare parts.

WARNING

Unsuitable cables or connectors

Risk of explosion in hazardous areas

- Only use connectors that meet the requirements of the relevant type of protection.
- If necessary, tighten the connector screw connections, device fastening screws, grounding screws, etc. according to the specified torques.
- Close unused cable openings for electrical connections.
- Check the cables for a tight fit after installation.

WARNING

Improper installation of shielded cables

There is a risk of explosion due to equalizing currents between the hazardous area and the non-hazardous area.

- Ground shielded cables that cross hazardous areas at one end only.
- Lay a potential equalization conductor when grounding at both ends.

WARNING

Lack of equipotential bonding

If there is no equipotential bonding in hazardous areas, there is a risk of explosion due to equalizing current or ignition sparks.

- Ensure that equipotential bonding is available for the device.

WARNING

Unprotected cable ends

There is a risk of explosion due to unprotected cable ends in hazardous areas.

- Protect unused cable ends according to IEC/EN 60079-14.

WARNING

Insufficient isolation of intrinsically safe and non-intrinsically safe circuits

Risk of explosion in hazardous areas

- When connecting intrinsically safe and non-intrinsically safe circuits, ensure that the galvanic isolation is performed properly in compliance with local regulations (e.g. IEC 60079-14).
- Observe the device approvals applicable for your country.

WARNING

Unauthorized repair of devices in explosion-proof design

Risk of explosion in hazardous areas

- Repair work may only be performed by personnel authorized by Siemens.

3.3 Installation

NOTICE

Improper mounting

Improper mounting may damage the device or impair its operation.

- Before mounting the device, always ensure that there is no visible damage to the device.
- Mount the device using suitable tools. Observe the information in the respective section about mounting.

WARNING

Open equipment

The devices are "open equipment" acc. to the standard IEC 61010-2-201 or UL 61010-2-201 / CSA C22.2 No. 61010-2-201. To fulfill requirements for safe operation with regard to mechanical stability, flame retardation, stability, and protection against contact, the following alternative types of installation are specified:

- Installation in a suitable cabinet.
- Installation in a suitable enclosure.
- Installation in a suitably equipped, enclosed control room.

3.3.1 Installation guidelines for S7-1500

Documentation

When installing, connecting and commissioning the TIM, observe the following documentation for the S7-1500 system and for network components.

Installation guidelines for S7-1500 and network components

Topic / Documentation	Most important contents
Installation, wiring, commissioning, description of the system	
S7-1500 automation system, system manual See Link: (https://support.industry.siemens.com/cs/ww/en/view/59191792)	• Application planning • Installation • Connection • Commissioning
Designing interference-free controllers, function manual See Link: (https://support.industry.siemens.com/cs/ww/en/view/59193566)	• Basics • Electromagnetic compatibility • Lightning protection • Housing selection
Communication	
SIMATIC NET - Industrial Ethernet / PROFINET, system manual • Industrial Ethernet • Passive network components See /4/ (Page 124)	• Ethernet networks • Network configuration • Network components

3.3.2 Installation

NOTICE

Install and remove the TIM only when the power is off

Switch off the power supply of the TIM before you install or remove the TIM. Installing and removing modules with the power supply on can lead to damage to the modules and to loss of data.

NOTICE

Installation location - Dependency of the temperature range

Note the dependency of the permitted temperature range on the installation location:

- Horizontal installation of the rack (DIN rail) means a vertical position of the modules.
- Vertical installation of the rack (DIN rail) means a horizontal position of the modules.

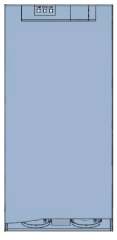
You will find the permitted temperature ranges in the section Technical specifications (Page 99).

Minimum clearances

Mount the TIM so that its upper and lower ventilation slits are not covered, allowing adequate ventilation as protection from overheating.

Keep to the following minimum clearances for the circulation of air when the rack is installed horizontally:

- Above the TIM: At least 33 mm
- Below the TIM: At least 25 mm

Installation of the rack	Installation position of the modules
Horizontal installation of the rack	
Vertical installation of the rack	

Installation on a DIN rail

A mounting rail from the S7-1500 range of accessories is required to install the TIM. For information on the article numbers, refer to the appendix Mounting rails (Page 111).

Note

Protecting the modules from slipping on the DIN rail

If you install the modules in an area with mechanical load, use suitable clamping devices at both ends of the device group to secure the modules on the DIN rail, e.g. Siemens and retainer 8WA1808.

The end retainers prevent the modules separating under mechanical load.

1. Hang the TIM on the mounting rail.
2. Tilt the TIM towards the back.
3. Screw the TIM at the bottom using the securing screws (tightening torque 1.5 Nm).
4. Ground the mounting rail, see next section.

Grounding

For reasons of electrical safety, the DIN rail must be connected to the protective conductor system (PE) of the electrical system.

You will find details on grounding and installation in the SIMATIC S7-1500/ET 200MP Manual Collection, see /2/ (Page 123).

Removal from the DIN rail

Follow the steps below to remove the TIM from the DIN rail:

1. Switch the TIM to STOP.
2. Turn off the power supply to the TIM.
3. Pull off the Ethernet cables and the serial bus.
4. Release the securing screws of the TIM.
5. Tilt the TIM out of the standard rail.

3.4 Wiring

WARNING

Power supply

The device is designed for operation with a directly connectable safety extra-low voltage (SELV) and protective extra-low voltage (PELV) according to IEC 60364-4-41.

Note

Protective ground

A PELV circuit contains a connection to protective ground. Without a connection to protective ground, or in case there is a fault in the connection to the protective ground, the voltage for the circuit is not stabilized.

NOTICE

Suitable fusing for the power supply cable

The current at the connecting terminals must not exceed 4 A. Use a fuse for the power supply that protects against currents > 4 A.

The fuse has to be designed for protection of DC power supply circuits as well as for the following requirements.

- In areas used according to NEC or CEC:
  - Suitable for DC (min. 60 V / max. 4 A)
  - Cut-off voltage min. 10 kA
  - UL/CSA listet (UL 248-1 / CSA 22.2 No. 248.1)
  - Classes R, J, L, T or CC
- In other areas:
  - Suitable for DC (min. 60 V / max. 4 A)
  - Cut-off voltage min. 10 kA
  - Approved for power supply circuits (branch circuits) according to local regulations (e.g. IEC 60127-1, EN 60947-1)
  - Breaking characteristics: B or C circuit breakers and fuses

You do not need a fuse for the power supply cable if you use a voltage source according NEC Class 2 or a power supply from the range of accessories, see attachment Power supply (Page 111).

WARNING

LAN connection (Local Area Network)

A LAN or LAN segment with all the interconnected devices should be contained completely in a single low voltage power distribution system in a building. The LAN is designed either for “Environment A” according to IEEE802.3 or "Environment 0" according to IEC TR 62102.

Do not connect any electrical connectors directly to the telephone network (Telephone Network Voltage) or a WAN (Wide Area Network).

Order of the work

NOTICE
Connection only with power off Only connect the TIM with the power switched off.

The device can be disconnected from the power supply with the terminal block.

Requirement: The TIM is mounted.

1. Connect the external power supply to the terminal block of connector X80.
2. Connect the lines of the (different) Ethernet networks to the desired ports of the TIM.

   Note the permitted combinations of the Ethernet connectors in the section Ethernet interfaces (X1, X2, X3) (Page 37).
3. Plug the cable to the modem in the serial connector of the TIM.

   When connecting a star shaped network, remember to connect the terminating resistor for RS-485 operation of the interface. See also the section below.

NOTICE
Contacting the shield of the cable on the plug The shield of the cable must be contacted. To do this, strip the insulation from the end of the cable and connect the shield to functional earth.

For the network connection products from the Siemens accessories program are recommended, see Appendix Cables, connecting cables (Page 117)

Turn the power supply on only after the TIM has been completely wired and connected.

The further procedure is described in the section Commissioning (Page 54).

Power supply at connector X80

Recommendation: Use the same power supply as the CPU if this is in the vicinity of the TIM.

The 2-terminal plug-in terminal block with polarity reversal protection has the following pin assignment for the X80 socket:

Terminal	Assignment
L+	24 VDC
M	Ground

You will find information about the connectable cable cross sections, power consumption and further technical details in section Technical specifications (Page 99).

RS-485: Connection of the terminating resistor

If you connect a star-shaped network with several dedicated line or dialup network modems to the serial interface of the TIM then operate the serial interface with the RS-485 standard.

You set the RS-485 standard in the configuration of the TIM. With a network operating according to RS-485 you also need to activate the cable terminating resistor of the bus cable in the configuration.

3.5 Inserting the SD card



Figure 3-1 Slot for the SD card (yellow frame)

You will find the SD cards supported by the TIM in the appendix SD cards (Page 112).

NOTICE
Only remove / insert the SD card when the power is off You can only remove or insert the SD card when the TIM is not supplied with power. If you remove or insert the SD card during operation, data on the card can be damaged.

Inserting the SD card

1. Insert the SD card into the compartment until you can feel the card lock in place.

Removing the SD card

1. By pressing, unlock the card.
2. After unlocking it takes the card out of the slot.

3.6 Commissioning

3.6.1 Commissioning

Requirement

Requirements for commissioning the TIM are as follows:

- The TIM is mounted and connected up.
- The TIM is fully configured in STEP 7, refer to the section Configuration (Page 57).
- The STEP 7 project with the TIM is open on the engineering station.
- For loading, the engineering station is connected to an Ethernet interface of the TIM.

Downloading the configuration data

To start productive operation the TIM requires the STEP 7 configuration data.

To download the configuration data, follow the steps outlined below:

1. Change the switch of the TIM to the RUN setting.
2. Turn on the power supply to the TIM.

   The TIM starts up with the factory defaults and remains standing with a yellow flashing RUN LED.

   You will find information on the LED displays during startup in the section Startup - LED pattern (Page 54).
3. Start by downloading the configuration data.

You will find more detailed information on loading in the following sections of the STEP 7 information system:

- "Loading project data"
- "Using online and diagnostics functions"

On completion of the download close the front cover of the TIM.

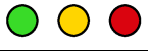
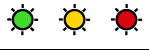
3.6.2 Startup - LED pattern

During startup the TIM shows different LED patterns than at runtime. You will find the LED patterns at runtime in the section LEDs (Page 36).

LED patterns at startup / restart

The LED symbols have the following meaning:

Table 3- 1 Legend for the tables

Symbol				-
Meaning / LED status	ON (LED lit)	OFF	LED flashes	Any

The table below describes the LED patterns in the individual startup phases of the TIM.

Table 3- 2 Meaning of the LED patterns at startup

Startup phase	RUN (yellow/green)	ERROR (red)	CONNECT (green)	Meaning
1				Hardware initialization and downloading the operating system
2				Downloading the firmware
3				Downloading the configuration data
4				Startup successful / start of productive operation
Startup aborted				
4				The startup was incorrect and was aborted. *

* If the startup is incorrect, note which phase (1, 2, 3) is reached and when it is aborted. You may be able to localize the error.

3.6.3 General requests

General request (GR)

On startup of a system, a general request (GR) is sent from most process control systems to all connected stations so that the master station is updated with the current process state of the stations. This means that conventional control center systems can update their process image and supply their archives with data.

The mechanisms of a GR depend on the protocol and the control system used.

General request with ST7

Standard general request

When a TIM is connected to the SINAUT ST7cc control center system, a GR can be triggered as follows:

- If a station connected to SINAUT ST7cc returns following a disruption, ST7cc sends a GR to the station to update itself with the current process state of the station.
- If ST7cc itself fails and starts up again, it sends a GR to all connected stations to bring its process data up to date.
- In addition to these automatically triggered GRs, you can also manually send a GR to a station in ST7cc.

In response to a standard GR, the queried station enters all its data frames along with the current process values in the send buffer of the station TIM. The data is transferred according to the first in/first out principle. The advantage of the standard GR is that the data is transferred in the correct chronological order.

Accelerated general request

If you require the current process image more quickly, you can trigger an accelerated GR. In an accelerated GR, the frames with the requested process image are entered at the start of the send buffer of the TIM; in other words, before any other frames still buffered in the TIM.

An accelerated GR is supported by:

- SINAUT ST7cc
- Ethernet TIM with TD7onTIM

  (Stations with TD7onCPU answer an accelerated GR like a standard general request.)

It may make sense to trigger an accelerated GR in the case of stations connected via dialup network, for example, because the master station is not always supplied with the current data of the station in this case. One example application would be a situation whereby you inform yourself of the current status of the station with an accelerated GR prior to a switching action or setpoint change. This would allow you to enter the command or setpoint faster and inform yourself of the current response of the process in the station by means of another accelerated GR.

You can find additional information in the SINAUT ST7cc manual.

3.7 Disassembly

⚠ WARNING

Improper disassembly

Improper disassembly may result in a risk of explosion in hazardous areas.

For proper disassembly, observe the following:

- Before starting work, ensure that the electricity is switched off.
- Secure remaining connections so that no damage can occur as a result of disassembly if the system is accidentally started up.

Configuration

4

4.1 Security recommendations

Observe the following security recommendations to prevent unauthorized access to the system.

General

- You should make regular checks to make sure that the device meets these recommendations and other internal security guidelines if applicable.
- Evaluate your plant as a whole in terms of security. Use a cell protection concept with suitable products.
- Do not connect the device directly to the Internet. Operate the device within a protected network area.
- Keep the firmware up to date. Check regularly for security updates of the firmware and use them.
- Check regularly for new features on the Siemens Internet pages.
  - You can find information on Industrial Security here:
    Link: (http://www.siemens.com/industrialsecurity)
  - You can find information on security in industrial communication here:
    Link: (http://w3.siemens.com/mcms/industrial-communication/en/ie/industrial-ethernet-security/Seiten/industrial-security.aspx)
  - You will find a publication on the topic of network security (6ZB5530-1AP0x-0BAx) here:
    Link:
    (http://w3app.siemens.com/mcms/infocenter/content/en/Pages/order_form.aspx?nodeKey=key_518693&infotype=brochures)
    Enter the following filter: 6ZB5530

Physical access

Restrict physical access to the device to qualified personnel.

Network attachment

Do not connect the TIM directly to the Internet. If a connection of the TIM to the Internet is required, use the security variants of the telecontol protocols or use protection mechanisms in front of the TIM. Protection mechanisms are for example a SCALANCE M router or a SCALANCE S security module with firewall.

Security functions of the product

Use the options for security settings in the configuration of the product. These includes among others:

- Protection levels and security functions of the CPU

  Configure access to the CPU under "Protection and Security".

  Use the other security functions of the CPU to prevent unauthorized access to the station.

  You will find information on this in the information system of STEP 7.
- Security function of the communication
  - Using the security functions of the telecontrol protocols.
  - Use the secure protocol variants for example NTP (secure) or SNMPv3.
  - Leave access to the Web server deactivated.

Passwords

- Define rules for the use of devices and assignment of passwords.
- Regularly update the passwords to increase security.
- Only use passwords with a high password strength. Avoid weak passwords for example "password1", "123456789" or similar.
- Make sure that all passwords are protected and inaccessible to unauthorized personnel.
- Do not use one password for different users and systems.

Protocols

Secure and non-secure protocols

- Only activate protocols that you require to use the system.
- Use secure protocols when access to the device is not prevented by physical protection measures.
  - The NTP protocol provides a secure alternative with NTP (secure).
  - The HTTP protocol provides a secure alternative with HTTPS when accessing the Web server.
- Deactivate DHCP at interfaces to public networks such as the Internet, for example, to prevent IP spoofing.

Table: Meaning of the column titles and entries

The following table provides you with an overview of the open ports on this device.

- **Protocol / function**

  Protocols that the device supports.
- **Port number (protocol)**

  Port number assigned to the protocol.

- **Default of the port**
  - Open

    The port is open at the start of the configuration.
  - Closed

    The port is closed at the start of the configuration.
- **Port status**
  - Open

    The port is always open and cannot be closed.
  - Open after configuration

    The port is open if it has been configured.
  - Open (login, when configured)

    As default the port is open. After this port is configured, the communications partner needs to log in.
  - Closed after configuration

    The port is closed because the TIM is always client for this service.
- **Authentication**

  Specifies whether or not the protocol authenticates the communications partner during access.

Protocol / function	Port number (protocol)	Default of the port	Port status	Authentication
S7 and online connections	102 (TCP)	Open	Open after configuration	Yes
ST7	102 (TCP)	Closed	Open after configuration	No
MSC	26382 (TCP) - configurable in master station (1024 .. 65535)	Closed	Open after configuration	No
DNP3	20000 (TCP/UDP) Can be set	Closed	Open after configuration	Yes, when Secure Authentication is enabled.
DNP3 with TLS	19999 (TCP) Can be set	Closed	Open after configuration	Yes, when Secure Communication is enabled.
IEC 60870-5-104	2404 (TCP) Can be set	Closed	Open after configuration	No
IEC 60870-5-104 with TLS	19998 (TCP) Can be set	Closed	Open after configuration	Yes
HTTP	80 (TCP)	Closed	Open after configuration	Yes
HTTPS	443 (TCP)	Closed	Open after configuration	Yes
SNMP	161 (UDP)	Closed	Open after configuration	Yes (with SNMPv3)

Ports of communication partners and routers

Make sure that you enable the required client ports in the corresponding firewall on the communications partners and in intermediary routers.

These can be:

- MSC / 26382 (TCP) - configurable with a central interface: 1024 .. 65535
- NTP / NTP (secure) / 123 (UDP)
- DNS / 53 (UDP)
- DHCP / 67, 68 (UDP)
- SMTP / 25 (TCP), SMTP / 465 (TCP), SMTP / 587 (TCP)
- Syslog / 514 (UDP)

4.2 STEP 7 Professional

Configuration in STEP 7

You configure the modules and networks in STEP 7 Professional.

You will find the required STEP 7 version in the section Software requirements (Page 30).

For a description of the configuration, refer to the configuration manual for the respective protocol:

- SINAUT ST7
- DNP3
- IEC 60870-5

You can also find configuration manuals on the Internet:
/15/ (Page 126).

Note the structure of the documentation in this case, see Preface (Page 3).

4.3 Overview of configuration

Components of a rack

The TIM is configured as a standalone device. No further devices may be configured in the station of the TIM.

The assigned CPU with which the TIM exchanges data is configured in a separate rack. You will find the compatible CPUs in the section Usable CPUs (Page 31).

Configuration - overview

Configuration involves the following steps:

1. Create a STEP 7 project with security functions activated.

   The configuration of the TIM is only possible with activated security functions. Also for access to the Web server of the TIM, the users must be created in "Global security settings".

   Note

   Activated security functions

   If you have not yet activated any security functions or have logged on in "Global security settings", you first need to log on as a security user. The following roles must be assigned to the user:

   - Engineering administrator
   - NET Administrator

2. Insert the required SIMATIC stations with CPU, communications modules (TIM, CP), input/output modules and the other required modules and configure them.
3. Create PLC tags or DB variables for the data to be transferred in the CPU.

   The input and output data of the station is not addressed directly by the TIM but via PLC or DB variables. You require these for the data points of the TIM (see below).

   ⚠ WARNING

   Writing values to outputs

   - PLC tags

     When referencing to PLC tags, note that the values are written immediately to the outputs of the CPU without first being processed by the user program with write access.

     Writing values has a direct influence on the process.
   - DB variables

     When referencing to DB variables, written values are only used when processed by the user program.

   All variables intended to be used for data point configuration must have the attribute "Reachable from HMI/OPC UA/Web API".

   For writable variables, the "Writable from HMI/OPC UA/Web API" attribute also needs to be enabled.

   Address areas of the PLC tags are input, output or memory areas on the CPU.
4. Create the necessary networks for networking the interfaces.
   - The "Neutral" network type is configured in the WAN settings of the interface of a TIM 1531 IRC for connection with its CPU.
   - The "Neutral" network type is also configured in the interface of a module for connection with the CP of a PC station with the "ST7 ScadaConnect" application.

5. Assign a TIM 1531 IRC to the CPU, configure the station or subscriber number and any required security options.

   You will find details in the ST7 configuration manual (SINAUT system manual volume 3); see /15/ (Page 126).

6. Create telecontrol connections for the telecontrol communication.
7. Create the required data points and messages.
8. Complete the configuration of the modules and networks and compile the stations.

Download

For complete commissioning of the TIM, you need to download the configuration data to the relevant TIM.

You will find information on loading in the STEP 7 information system.

The configuration data is stored in the work memory of the TIM.

When using an optional SD card, the configuration data is stored on the SD card of the TIM, see section Commissioning (Page 54).

Copy functions for larger projects

The copying functions of STEP 7 reduce configuration effort. Use the copying functions in particular in large projects with several identical or similar stations:

- Copying devices and stations

  If you use several similar TIM modules or CPUs in a project, it is advisable to configure the first device first and then to copy the entire configuration data. This can include the following objects:

  – The user program of CPUs
  – PLC tags of CPUs
  – Data points of TIM modules

  After copying the address parameters and other various parameters need to be adapted.

  Recommendation:
  Network the interfaces only after copying the devices.

- Copying PLC tags

  If you use several similar items of input and output data, you can copy PLC tags in the tag table.

  After copying you only need to adapt the address parameters.

- Copying data points

  In much the same way as with PLC tags, you can also copy data points.

You will find a detailed description of functions in the configuration manual.

4.4 Block library Telecontrol ST7

ST7 - SINAUT TD7

Two versions of the SINAUT TD7 software are available to you for the SINAUT communication of the ST7 protocol:

- **TD7onTIM**

  TD7onTIM is part of the TIM firmware; it is configured in the TIM and runs in productive mode in the TIM.

  It is configured in STEP 7.

- **TD7onCPU**

  TD7onCPU is implemented via program blocks for the CPU.

  The program blocks of the "Telecontrol ST7" library are used as a global library for STEP 7.

  For a description of the program blocks, refer to the ST7 configuration manual (SINAUT System Manual Volume 3):
  /15/ (Page 126)

The Web server (WBM) 5

5.1 Supported Web browsers

Web browser

For secure access to the Web server of the TIM the following Web browsers are suitable:

- Internet Explorer (version 11)
- Google Chrome (version 68)
- Firefox (version 62)

You will find the specified Web browsers, information and any necessary addons on the Internet.

5.2 Establishing a connection to the WBM of the TIM

Possible connections

You can establish a connection between a PC and the TIM using the HTTP/HTTPS protocol:

- LAN connection

  With a local connection from the PC to the TIM you can connect directly.

- Connection via WAN (Internet/mobile wireless)

  The TIM must be reachable via a fixed IP address.

  With connections via the Internet / mobile wireless network you need to use the security protocol "HTTPS".

Requirements

Requirements for access to the TIM:

- The TIM must be reachable via an IPv4 address.
- The PC must be in the same subnet as the TIM.
- The TIM must be reachable.

Connection to the Web server of the TIM

Follow the steps below to connect the PC to the Web server of the TIM:

1. Open the Web browser.
2. Enter the address (IP address / host name) of the TIM (or the router) in the address line of the Web browser either via the HTTP or HTTPS protocol:
   - http://<Address>
   - https://<Address>

   When selecting the protocol, make sure that it is released in the configuration of the TIM ("Web server" tab).

   With HTTPS connections via the Internet when you log in the first time, a warning can appear that the Web page is not secure or that the certificate is not trustworthy. If you are sure that you have entered the correct address, ignore the message. If necessary add the connection to the exceptions (depending on the Web browser).

   The logon window of the TIM opens.
3. In the "User name" input box, enter the name of a user or administrator configured in STEP 7.

   The rights assigned in "Global security settings" of the STEP 7 project apply.
4. Enter the corresponding password in the "Password" input box.
5. Click the "Log in" button.

   The Web server opens with the start page:

5.3 General functions of the WBM

You set the WBM language with the setting of the browser being used.

The following languages are supported:

- German
- English

Displays and symbols in the title bar

The displays and symbols in the WBM title bar have the following meaning:

Symbol	Function
User: 1	Name of the currently logged in user
Log out	User logout
Number of active sessions: 1	Number of connections to a PC
2015-01-28 14:30:37	Date and time of the last page update of the WBM in local time of the TIM (yyyy-mm-dd hh:mm:ss)

Symbol	Function
	The automatic update of the WBM display is enabled. The data is fetched at the interval configured under "System > Web server".
	The automatic update of the WBM display is disabled.
Turn on	Switches on the automatic update of the WBM display.
Turn off	Switches off the automatic update of the WBM display.
	Prints out the current WBM page

5.4 Start page

After logging in to the WBM, the start page appears.

On the left you will find the navigation area with the main levels of the WBM.

Navigation in the WBM

By clicking on an entry in the navigation area on the left open the WBM page you want for further information or on which you want to configure or program.

The WBM opens the first tab of the entry.

On other pages with several tabs change to the relevant tab by clicking on the tab name.

Start page



Figure 5-1 Start page of the WBM

The page shows general data of the module.

General

- **Station name**

  Parameter configured in STEP 7
- **Module name**

  Parameter configured in STEP 7
- **Module type**
- **Article number**

Status

- **Operating status**

  Current operating status of the TIM
- **Status**

  Status of the firmware startup of the TIM:
  - TIM started up free of errors
  - Startup aborted with error
- **Firmware date**

  Date the firmware currently being used was generted

  Format: MMM DD YYYY, hh:mm:ss

5.5 System

5.5.1 Device info

Module

- Short designation
  Parameter configured in STEP 7
- Article number
- Hardware product version
- Firmware version
- Rack
- Slot

Module information

- Module name
  Parameter configured in STEP 7

Vendor information

- Vendor
- Serial number
  Serial number of the device

5.5.2 SD card

SD card

SD card

- **SD card inserted**
  yes / no
- **Free memory space / total**
  Display of the free memory space still available and the total usable memory capacity
- **Content**
  Display of the messages and files saved on the SD card

5.5.3 System time

System time

The current system time of the TIM is displayed in the title bar of the WBM.

- **Input box for time**

  Format: YYYY-MM-DD hh:mm:ss

  In the input box, you can manually enter the time and transfer it to the TIM.

  When making your entry, keep to the specified format.

  Month, day, and hour can also be entered as single digits. Example: March is accepted as "03" or as "3".

- **Apply time of day**

  When you click this button, you transfer the time entered above to the TIM.

- **Adopt PC time**

  When you click this button, the TIM adopts the time of day from the connected PC.

5.5.4 NTP

NTP

- **NTP server list**

  Shows the addresses of the configured NTP servers.

5.5.5 Web server

Web server

- **Disable Web server**

  Disables the Web server of the TIM. The setting is adopted in the configuration data of the TIM.

  Note
  No HTTP/HTTPS connection to the TIM

  If you disable the Web server of the TIM, you lose the possibility to access the TIM via HTTP/HTTPS.

  Access is only possible again after loading the configuration data (with enabled Web server access).

- **Automatic update**

  Enable the option if the contents of the Web pages are to be updated automatically.

  If the option is disabled, the pages are updated at the interval you configured in STEP 7.
- **Update interval (s)**

  Here, the update interval configured in STEP 7 is displayed

  in seconds.

  If the option is enabled (above) you can enter the desired update interval manually.
- **Save**

  Applies the update interval entered manually.

5.5.6 DNS configuration

DNS server list

- **List of configured DNS servers**

  Servers configured in STEP 7

5.6 Maintenance

5.6.1 Firmware

Firmware

This page displays the most important version data of the firmware currently being used.

If a new firmware version is available for the TIM, you will find this on the Internet pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21764/dl)

If a new firmware version is available, you can download the firmware file from the PC to the TIM via this WBM page.

Note

Digitally signed and encrypted firmware prevents manipulation by third parties

To be able to check the authenticity of the firmware, the firmware is digitally signed by Siemens. This allows manipulation by third parties to be detected and prevented.

Note
Do not operate during the update

During the update of the firmware until the TIM restarts, the WBM is not blocked.

Do not perform any operations during this time (e.g. no restart).

Note
Do not switch off the power supply

During activation of the firmware do not switch off the power supply. This avoids the occurrence of inconsistent statuses.

Firmware

The following information is shown:

- **Firmware version**

  Version of the firmware currently being used by the TIM.

- **Date**

  Date the firmware was generated

Firmware update

Download the firmware file to the file system of your connected PC.

- **File**

  After selecting a firmware file stored on the PC using the "Browse" button, the file name is displayed here.

- **Browse**

  Searches the file system of the PC for a firmware file saved there that is intended to be loaded on the TIM.

- **Load on device**

  By clicking the button, download the selected firmware file to the TIM.

  Note that updating the firmware can take a while. You can recognize the current status of the firmware download based on the LED pattern, see section Update firmware (Page 89).

After updating the firmware the TIM starts up again automatically.

5.6.2 Operating status

Operating statuses

Apart from using this WBM page, you can also execute the functions described below using the switch of the TIM, see Switch (Page 38).

The buttons have the following functions:

- **Run a restart**

  When restarting, existing telecontrol connections are interrupted and cyclic processing stops. The TIM restarts.

- **Reset to factory settings**

  Resets the TIM to the factory settings. During this all parameters are reset to the initial statuses as shipped and the TIM restarts.

  If you use an SD card and you want to reset the TIM to the factory settings, you must pull the SD card before resetting. If the SD card remains inserted, the TIM starts up again with the configuration data on the SD card.

  When pulling the SD card, please note: Inserting the SD card (Page 53)

Note
Data loss: Note the effects of resetting

Before you reset, note the effects, see section Resetting to factory settings (Page 91). There, you will also find the LED patterns during the reset.

5.7 Diagnostics

5.7.1 Events

Diagnostics messages

Table

The table lists the last diagnostics events to occur on the TIM with the following information:

- **Number**

  Consecutive number

- **Time**

  Time of the diagnostics event

- **Date**

  Date of the diagnostics event

- **Event type**

  The diagnostics messages are classified as follows:

  – INFO

    Information about a special event

  – WARNING

    Warning of a possibly unwanted event

  – ERROR

    Internal error. The TIM starts up.

  – FATAL

    Serious error that impairs or interrupts the operation of the TIM.

- **Event**

  Plain text of the diagnostics event

Copy of the diagnostics buffer

Using the button, you save the content of the diagnostics buffer on the PC.

The diagnostics buffer

The diagnostics buffer receives diagnostics messages for internal events and errors. It can hold a maximum of 200 entries. When the maximum number is exceeded, the oldest entries are overwritten.

The entries in the diagnostics buffer contain a consecutive number, a classification, a time stamp and the message text.

Below you will find several examples of events that are entered in the diagnostics buffer:

- TIM startup
- Change to the configuration
- Establishment/abort of the communications connection
- Time-of-day synchronization
- Power failure

5.7.2 Notifications

Messages

Table

The table lists the last messages of the TIM with the following information:

- **Number**

  Consecutive number
- **Time**

  Time of sending
- **Trigger**

  Trigger that fired generation of the message.
- **Recipient**

  Configured recipient of the message
- **Message**

  Message text
- **Processing status**

  Status of the sending of the message

  You will find an overview of the possible statuses in the section Processing status of the messages (SMS / e-mail) (Page 95).
- **Type**

  Type of the message

5.8 LAN

5.8.1 Ethernet interface [Xn]

- The three Ethernet interfaces of the TIM are selected via the upper tabs.
  - X1 ... X3
- The parameters of the selected interface are shown in the lower series of tabs:
  - IPv4 parameters
  - IPv6 parameters
  - Statistics

IPv4 parameters

Network attachment

- **MAC address**

IP parameters

- **IP address**

  Current IP address
- **Subnet mask**

  Default or last configured subnet mask.
- **Default router**

  Configured default router
- **Address assignment**

  Shows how obtaining the IP address is configured in STEP 7:
  - Set IP address in the project
  - IP address from DHCP server
  - Set IP address on the device

    The IP address obtained using other services outside the configuration

Ports

- **Port number**

  Port of the interface
- **Connection status**
  - OK: Existing connection to the network
  - Not OK: No connection
- **Settings**

  Behavior of the network setting:
  - Automatic
  - Manual setting for transmission speed and direction dependency
- **Mode**

  Used transmission speed and direction dependency (duplex/half duplex)
- **Connection medium**

  Connected medium (copper / optical)

IPv6 parameters

- **IPv6 address**

  Currently used IPv6 address

- **Gateway**

  Display of IPv6 addresses of up to two gateways

Statistics

Statistics

The following statistical data of the interface since the TIM last started up is displayed.

- **Bytes received**
- **Received frames discarded**

  Number of messages that were discarded on receipt due to address. protocol or data errors.

- **Error on receipt**

  Number of internal errors on receipt

- **Frames with unknown protocol**

  Number of messages with the wrong protocol

- **Bytes sent**
- **Sent unicast frames**
- **Dropped frames**

  Number of frames that were discarded due to errors when sending.

- **Error sending**

  Number of internal errors when sending

- **Frames in the send mailbox**

  Number of unsent frames waiting for transfer.

5.9 Telecontrol

5.9.1 Partner information

5.9.1.1 Connection overview

The tab shows you information on the communications partners and the connection status of the TIM.

Table

The column headers have the following meaning:

- **Connection status**

  The status of the connections to the assigned CPU and to the remote partners is shown as follows:

  – **Green: Connected**

    All connections are established.

  – **Yellow: Connected**

    Some of the possible connections are established.

  – **Red: Disconnected**

    None of the possible connections is established

- **Partner**

  Possible partner types:

  – Local CPU

    The CPU assigned to the TIM in the configuration.

  – Application

    (e.g. WinCC)

  – TIM

    TIM of the remote station

  – Partner CPU

    CPU of the remote station

  – CP ...

    CP of the remote station (CP 1243-1 / CP 1243-7 LTE / CP 1243-8 IRC / CP 1542SP-1 IRC)

- **Subscriber number**

  Subscriber number of the partner

When you click on the '±' icon in a table row, the relevant parameters are displayed.

The following information is available on each subscriber:

- Information on the subscriber
- Information on the transmission path

Information on the subscriber

Local CPU

- **Status**

  Operating status of the local CPU

- **Number of connections**

  Number of connections between the TIM and local CPU

Remote partner

- **Partner type**
  - Application (e.g. WinCC)
  - CPU

    CPU of the remote station
  - TIM
  - CP ...
- **Subscriber number**

  Subscriber number of the partner
- **Time master**

  Display of the option configured on the partner:

  Yes / No
- **Security options**

  Display of the active access level (protection):

  ON / OFF
- **Connection status**
  - Connected
  - Not connected

  For the meaning of the colors, see above (Connection overview).
- **Frame memory status**

  State of the send buffer, only relevant for a communications module:
  - **Normal operation**

    The send buffer is working normally. The memory space allocation is between 10 and 80 %.
  - **80% limit reached**

    When the ST7 protocol is used, the TIM switches to the forced image mode at 80 % occupation of the send buffer.
  - **Overflow**

    100% occupation of the send buffer

Transmission path

Information on the transmission path

Local CPU

- **Interface ID**
  Ethernet interface of the TIM for connection with the local CPU
  X1 (ETH1) / X2 (ETH2) / X3 (ETH3)
- **CPU type**
  Type of the local CPU
- **Connection status**
  – Connected
  – Not connected
- **CFB reference**
  Local ID (decimal) of the S7 connection
- **Local TSAP**
  Local TSAP of the S7 connection
- **Remote TSAP**
  Remote TSAP of the S7 connection
- **IP address**
  IP address of the CPU

Remote partner

- **Address**
  IP address or WAN address of the interface of the TIM
- **Interface**
  Ethernet interface of the TIM for connection with the remote partner
  X1 (ETH1) / X2 (ETH2) / X3 (ETH3)
- **CFB reference**
  Local ID (decimal) of the S7 connection

- **Connection type**

  Display of several of the following connection properties:

  – PBK connection

    Configured S7 connection

  – ST7

    ST7 connection via classic WAN

  – DNP3

    DNP3 connection via classic WAN network

  – IEC

    IEC 60870-5-101 connection via a classic WAN network

  – MSC connection

    Only ST7: Connection of the MSC protocol for which no S7 connection is required.

  – CR connection

    Read/write connection to the local CPU that does not require an S7 connection.

  – X connection

    Unconfigured S7 connection that uses the SFCs "X_SEND" and "X_RCV".

  – Permanent / temporary

    Permanent or temporary telecontrol connection

  – GPRS / no GPRS

    GPRS connection or no GPRS connection

  – local / remote

    Connection to a local or remote partner

- **Connection status**

  – Connected

  – Disconnected

5.9.1.2 Send buffer

The tab provides information on the send buffer (frame memory) of the local or remote TIM.

Information on the send buffer

Information on the send buffer of the TIM:

- **Size (memory spaces)**

  Configured size of the send buffer as number of memory spaces

  One memory space is reserved per frame.
- **Free (memory spaces)**

  Memory currently free as number of memory spaces
- **Free (%)**

  Currently free memory space in percent

  In brackets: Number of configured events / Max. number of events

Table

The column headers have the following meaning:

- **Source subscriber**

  Subscriber number of source subscriber from which the connection is established.
- **Destination subscriber**

  Subscriber number of destination subscriber to which the connection is established.
- **Number of events**

  Number of configured events of the source subscriber

Parameters

When you click on the '±' icon in a table row, the relevant parameters are displayed.

- **Unconditional spontaneous**

  Number of stored frames to be sent unconditionally and spontaneously (only relevant in dial-up networks).
- **Prioritized**

  Number of stored frames to be sent with high priority.
- **Identification**

  Hexadecimal value that codes the information below.

  – Unconditional spontaneous (9)

    Number of frames with the transmission mode "Spontaneous (unsolicited - direct transfer)"

  – XGA (10)

    Only ST7: Pending general request

– Overflow (11)

  Send buffer overflow prewarning

– Transmission stop (12)

  Sending data to the remote partner is temporarily blocked because the partner cannot be reached or a memory bottleneck has occurred at the partner.

– Forced image mode (14)

  Only ST7: When the send buffer is 80% full, the TIM switches to the forced image mode.

  To prevent a send buffer overflow, all data frames are treated as image frames. Send buffer frames are also treated as image frames; the data is overwritten by newer data.

– Locked (15)

  The send buffer is locked.

5.9.2 Data points

The tab shows you information on the configures data points of the TIM.

Data points

- **Data point number**

  Consecutive number

- **Name & type**

  Name and type of the data point

  When you hold the cursor over the column entries, additional properties of the data points are displayed in tooltips.

- **Type identifier**

  Type of the data point

- **Object number**

  Object number of the ST7 data point

- **Object group**

  Object group (DNP3 / IEC 60870-5; the static variants are displayed with DNP3)

- **Data point index**

  Index of the DNP3/IEC data point

- **Status**

  Occasion of transfer/status of TIM

- **Current value**

  Currently saved value

- **Historical value**

  Last sent value

- **Time stamp**

  Time stamp of last value change

5.10 Logging

Functions of logging

On this page, you can log the data traffic of the TIM using PCAP functionality for diagnostics purposes.

If an error occurs or if the TIM behaves in an unwanted manner, the communication behavior of the TIM can be recorded. The frame traffic of the TIM is recorded for a defined time or for a configurable number of frames.

The log files are stored as PCAP files on the connected PC and can be evaluated with the Wireshark program, for example.

Options:

- **Ethernet Interface X1 / X2 / X3**

  Enable the interfaces for which you want to record data.

- **Data volume (kB)**

  Via the input box, you specify the overall size of the logging file.

  Maximum file size: 10000 kB

- **Recording acc. to time**

  If the option is enabled, the recording is made for a configurable time.

  Via the input box, you specify the recording time in seconds.

  Max. recording duration: 600 s

- **Recording acc. to frames**

  If the option is enabled, the recording is made for a configurable number of frames.

  Via the input box, you specify the number of frames.

  Max. number of frames: 500 s

- **Start**

  With this button you start the logging.

- **Stop**

  With this button you stop the logging.

Diagnostics and upkeep

6

6.1 Diagnostics

6.1.1 Diagnostics options

The following diagnostics options are available.

LEDs of the module

For information on the LED displays, refer to the section LEDs (Page 36).

STEP 7: The "Diagnostics" tab in the Inspector window

If your engineering station is connected to the TIM via Ethernet, here you will receive information about the selected module:

- Connection status of the engineering station with the TIM

STEP 7: Diagnostics functions in the "Online > Online and diagnostics" menu

Using the online functions, you can read various diagnostics information from the TIM from an engineering station on which the STEP 7 project is stored and perform maintenance functions.

You will find additional information on the diagnostics functions of STEP 7 in the STEP 7 information system.

Online access

This is where you establish the online connection to the module.

For the procedure, refer to the section Online functions (Page 87).

Diagnostics

Here, you can obtain the following static information on the selected module:

- **General**

  General information on the module
- **Diagnostics status**

  Information on the diagnostics status
- **Ethernet interface[X1/2/3]**

  Address and statistical information

- **Industrial Remote Communication**

  Here, you obtain WAN-specific information on the TIM module:

  – **Partner**

    Here you will find address and configuration data of the partners, connection statistics and additional diagnostics information. Click on a subscriber to display additional information.

    You will also find information on the partners in the WBM, see below.

  – **Data point list**

    Information on the data points such as configuration data, value, connection status etc.

  – **Telegram protocol diagnostics**

    With this function, you can enable the logging of frames of the TIM and evaluate it using the SINAUT engineering software.

    With the function "Enable protocol trace", the frames received and sent by the module are copied for several seconds.

    With the function "Disable protocol trace", the logging is stopped and the data is written to a logging file.

    With the function "Save", you can save the log file on the engineering station.

    To evaluate the file, you need to rename it to the format "*.7dt". You can decode and analyze the renamed file using the TIM frame monitor of the SINAUT diagnostics tool.

  – **Ethernet diagnostics**

    With the Logging function, you can log the data traffic of the TIM using PCAP functionality for diagnostics purposes.

    If an error occurs or if the TIM behaves in an unwanted manner, the communication behavior of the TIM can be recorded. The frame traffic of the TIM is recorded for a defined time or for a configurable number of frames.

    The log files are stored as PCAP files on the connected PC and can be evaluated with the Wireshark program, for example.

  – **Device-specific events**

    Here you will find diagnostics buffer entries of the TIM and an overview of the sent messages (SMS messages / e-mails).

- **Time**

  Specification of the current time in the module and the time source

Functions

You can run the following functions here:

- **Firmware update**

  For a description, refer to section Update firmware (Page 89).

- **Assign IP address**

- **Assign PROFINET device name**
- **Reset to factory settings**

  For a description, refer to section Resetting to factory settings (Page 91).

Syslog server

Central logging of system and audit events via a Syslog server. You can find more information in the relevant configuration manuals.

Web server (WBM) of the TIM

From a PC you can use HTTP/HTTPS to access the Web pages (WBM) of the TIM. The WBM returns a variety of information.

For access to the content, refer to the section The Web server (WBM) (Page 65).

Partner status and connection status in the WBM

You will see the configured partners and the status of the connections to the local and remote communications partners of the TIM on the page "Telecontrol > Partner information" of the WBM. For details, see section Connection overview (Page 77).

Partner and connection information to the CPU

The TIM can signal the status of the connection and the connection paths to the communications partner to its local CPU via a PLC tag (configuration in the "Communication with the CPU" parameter group).

SNMP

For information on the functions, refer to the section SNMP (Page 93).

6.1.2 Online functions

Online functions

Along with STEP 7 on the engineering station (ES) the TIM provides various diagnostics and maintenance functions. The requirement is that the ES and the TIM are located in the same subnet.

Connection establishment to use the online functions via Ethernet

Procedure:

1. Connect the ES to the network.
2. Open the relevant STEP 7 project on the ES.
3. Select the TIM that you want to update with new firmware.

4. Enable the online functions using the "Connect online" icon.
5. In the "Connect online" dialog, go to the Choose the entry "TeleService via telecontrol" in the "Type of PG/PC interface" drop-down list.
6. In the "PG/PC interface" drop-down list select the entry "TeleService board".
7. In the table select the TIM if it is not already selected.

   The path both via the TIM or also via the CPU is possible.
8. Click on the  icon next to the "PG/PC interface" drop-down list.

   The "Establish remote connection via telecontrol" dialog box opens.
9. Make the necessary entries in this dialog (see below) and click on "Connect".

Terminate online connection

On completion of the online session, terminate the online connection again using the "Disconnect" button.

6.2 Maintenance



CAUTION

Hot surfaces

Risk of burns during maintenance work on parts with a surface temperature above 70 °C (158 °F).

- Take appropriate protective measures, for example, wear protective gloves.
- Once maintenance work is complete, restore the touch protection measures.

WARNING

Cleaning the housing

- **In hazardous areas**

  Only clean the outer parts of the housing with a damp, but not wet, cloth.
- **In non-hazardous areas**

  Only clean the outer parts of the housing with a dry cloth.

Do not use any liquids or solvents.

6.2.1 Update firmware

New firmware versions of the TIM

If a new firmware version is available for the TIM, you will find this on the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/24710/dl)

Firmware files have the file format *.upd.

Save the firmware file on your PC.

There are different ways of loading a new firmware file on the TIM:

- Loading the firmware via the WBM
- Loading the firmware with the online functions of STEP 7 via Ethernet / Internet
- Loading the firmware from an SD card

Note
SD card only for firmware file

For the firmware file you require a separate SD card. This must meet the requirements of the TIM, see SD cards (Page 112).

You cannot use the SD card with the configuration data.

Note
Duration of the firmware update

Downloading a new firmware file can take several minutes.

Always wait until the completion of the firmware update can be recognized from the LEDs (see below).

Loading the firmware via the WBM

Requirements:

The new firmware file is stored on your engineering station.

Procedure:

For a description of the procedure, refer to the section Firmware (Page 71).

Loading the firmware with the online functions of STEP 7 via Ethernet / Internet

Requirements:

- The TIM can be reached using an IP address.
- The engineering station and the TIM are located in the same subnet.

- The new firmware file is stored on your engineering station.
- The engineering station is connected to the network.
- The relevant STEP 7 project is open on the engineering station.

Procedure:

1. Select the TIM that you want to update with new firmware.
2. Enable the online functions using the "Connect online" icon.
3. In the "Connect online" dialog, select the Ethernet interface in the "Type of PG/PC interface" list box.
4. Select the TIM.
5. Click on "Start search" to search for the module in the network and to specify the connection path.

   When the module is found it is displayed in the table.
6. Connect using the "Connect" button.

   The "Connect online" wizard guides you through the remaining steps in installation.
7. In the network view, select the TIM and select the "Online & Diagnostics" shortcut menu (right mouse button).
8. In the navigation panel of the Online & Diagnostics view select the entry "Functions > Firmware update".
9. Using the "Browse" button (parameter group "Firmware loader") search for the new firmware file in the file system of the engineering station.
10. Start to download the firmware with the "Start update" button when the correct version of the signed firmware is displayed in the "Status" output box.

You will find further information on the online functions in the STEP 7 information system.

Loading the firmware via the SD card

Requirements:

- You have copied the new firmware file from your PC to the SD card using a suitable card reader.
- You have saved a backup file of the firmware file currently being used.

Procedure:

1. Turn off the power supply to the TIM.
2. If you use an optional SD card for the configuration data, take the SD card out of the card slot of the TIM.

   See also Switch (Page 38) for information on this.
3. Insert the SD card with the firmware file in the card slot of the TIM.

4. Turn on the power supply to the TIM.

   The TIM starts up with the new firmware from the SD card.

   Wait until the CONNECT LED flashes.
5. Turn off the power supply to the TIM.
6. Remove the SD card with the firmware file from the card slot of the TIM.

   If you use an optional SD card for the configuration data, plug this into the card slot of the TIM.
7. Turn on the power supply to the TIM again.

   The TIM starts up with the new firmware and the configuration data on the SD card.

   The LED pattern shows the end of the startup, see below.

LED patterns when updating the firmware

The table below describes the LED patterns when transferring a firmware file to the TIM.

Table 6- 1 Meaning of the LED patterns

RUN (left)	ERROR (center)	CONNECT (right)	LED pattern / meaning
			The firmware file is transferred. • "RUN" flashes alternately green and yellow. • "ERROR" flashes. • "CONNECT" flashes.
			Startup successfully completed, start of the firmware

For the LED pattern during the restart, refer to the section Startup - LED pattern (Page 54).

6.2.2 Resetting to factory settings

Resetting to factory settings: Effect

Note

Configuration data is deleted

With the functions for resetting to factory settings described here, all configuration data on the TIM is deleted!

- **Deleted data**

  The following data is deleted by resetting to factory settings:

  – Configured IP addresses of the LAN interfaces X1 X2 and X3

  – All other configuration data in the work memory of the TIM

- **Data not deleted**

  The following data is not deleted by resetting to factory settings:

  – MAC addresses of the LAN interfaces

Note

Configuration data when using an SD card

If you use an SD card and you want to reset the TIM to the factory settings, you must pull the SD card before resetting. If the SD card remains inserted, the TIM starts up again with the configuration data on the SD card.

When pulling the SD card, please note: Inserting the SD card (Page 53)

Executing the "Reset to factory settings" function

To reset to factory settings using the switch, follow the steps outlined below:

1. Put the switch to the position "MRES" and hold it in the "MRES" position for at least 5 seconds.

   The TIM restarts.

2. During the restart, continue to hold the switch in the "MRES" position.

   If the LED pattern of step 2 occurs (see below) the TIM is reset.

You can find information on the switch settings in Switch (Page 38).

LED patterns when resetting

The table below describes the LED patterns when resetting the TIM.

Table 6- 2 Meaning of the LED patterns

Step	LED pattern			Meaning
	RUN	ERROR	CONNECT	
1				After holding the switch in the "MRES" position for 5 seconds, chaser lights of the three LEDs appear (flashing alternately). The TIM restarts. Continue to hold switch.
2				As soon as the three LEDs flash three times synchronously the TIM is reset. It adopts the factory settings. You can release the button:

Startup after resetting to factory settings

After resetting return the switch of the TIM back to the "RUN" position.

The TIM restarts again. For the LED pattern, see Startup - LED pattern (Page 54).

When resetting using the WBM, the TIM starts up again automatically.

The remaining behavior depends on the use of an optional SD card:

- **Startup without SD card**

  If you do not use an SD card, the TIM starts up without configuration data with an error.

  You need to reload the configuration data.

  The TIM can be reached via its Ethernet interfaces with default IP address (see above) set in the factory.

  Generally, the default settings apply during initial commissioning; see Commissioning (Page 54).

- **Startup with SD card**

  If the SD card remains inserted, the TIM starts up again with the configuration data on the SD card.

6.2.3 SNMP

SNMP (Simple Network Management Protocol)

SNMP is a protocol for management and diagnostics of networks and nodes in the network. To transmit data, SNMP uses the connectionless UDP protocol.

The information on the properties of SNMP-compliant devices is entered in MIB files (MIB = Management Information Base).

Scope of performance of the TIM as an SNMP agent

The TIM supports data queries in the following SNMP versions:

- SNMPv1 (standard)
- SNMPv3 (Security)

It returns the contents of MIB objects of the standard MIB II according to RFC 1213 and the Siemens Automation MIB.

- **MIB II**

  The TIM supports the following groups of MIB objects:

  – System
  – Interfaces

    The "Interfaces" MIB object provides status information about the TIM interfaces.

  – IP
  – ICMP
  – TCP
  – UDP
  – SNMP

  The following groups of the MIB II standard are not supported:

  – Adress Translation (AT)
  – EGP
  – Transmission

- **Siemens Automation MIB**

  The following exceptions / restrictions apply to the TIM.

  Write access is permitted only for the following MIB objects of the system group:

  – sysContact
  – sysLocation
  – sysName

    A set sysName is sent as the host name using DHCP option 12 to the DHCP server to register with a DNS server.

  For all other MIB objects / MIB object groups, only read access is possible for security reasons.

Traps are not supported by the TIM.

For more detailed information about the MIB files and SNMP, refer to the manual /12/ (Page 125).

Configuration

You will find the description in the relevant configuration manual, see /15/ (Page 126).

6.2.4 Processing status of the messages (SMS / e-mail)

Processing status of messages

If the option "Enable identifier for processing status" option is set in the "Trigger" tab of the STEP 7 message configuration, the module outputs a status.

The processing status provides information about the processing state of the sent message. The status is written to a PLC tag of the type DWORD. Select this tag via the "PLC tag for processing status" box.

The processing status is returned by the module itself or the servers of the service after transfer of a message to be sent.

E-mails sent via program blocks of Open User Communication return a different status via the block (see block help).

The meaning of the statuses is as follows:

Processing status of the telecontrol messages

Table 6- 3 SMS: Meaning of the status ID output in hexadecimal format

Status	Meaning
0000	Transfer completed free of errors
0001	Error in the transfer, possible causes: • SIM card invalid • No network • Wrong destination phone number (number not reachable)

Table 6- 4 E-mail: Meaning of the status ID output in hexadecimal format

Status	Meaning
0000	Transfer completed free of errors
82xx	Other error message from the e-mail server Apart from the leading "8", the message corresponds to the three-digit error number of the SMTP protocol.
8401	No channel available. Possible cause: There is already an e-mail connection via the module. A second connection cannot be set up at the same time.
8403	No TCP/IP connection could be established to the SMTP server.
8405	The SMTP server has denied the login request.
8406	An internal SSL error or a problem with the structure of the certificate was detected by the SMTP client.
8407	Request to use SSL was denied.
8408	The client could not obtain a socket for creating a TCP/IP connection to the mail server.
8409	It is not possible to write via the connection. Possible cause: The communications partner reset the connection or the connection aborted.
8410	It is not possible to read via the connection. Possible cause: The communications partner terminated the connection or the connection was aborted.

Status	Meaning
8411	Sending the e-mail failed. Cause: There was not enough memory space for sending.
8412	The configured DNS server could not resolve specified domain name.
8413	Due to an internal error in the DNS subsystem, the domain name could not be resolved.
8414	An empty character string was specified as the domain name.
8415	An internal error occurred in the cURL module. Execution was aborted.
8416	An internal error occurred in the SMTP module. Execution was aborted.
8417	Requests to SMTP on a channel already being used or invalid channel ID. Execution was aborted.
8418	Sending the e-mail was aborted. Possible cause: Execution time exceeded.
8419	The channel was interrupted and cannot be used before the connection is terminated.
8420	Certificate chain from the server could not be verified with the root certificate of the module.
8421	Internal error occurred. Execution was stopped.
8450	Action not executed: Mailbox not available / unreachable. Try again later.
84xx	Other error message from the e-mail server Apart from the leading "8", the message corresponds to the three-digit error number of the SMTP protocol.
8500	Syntax error: Command unknown. This also includes the error of having a command chain that is too long. The cause may be that the e-mail server does not support the LOGIN authentication method. Try sending e-mails without authentication (no user name).
8501	Syntax error. Check the following configuration data: Alarm configuration > E-mail data (Content): • Recipient address ("To" or "Cc").
8502	Syntax error. Check the following configuration data: Alarm configuration > E-mail data (Content): • Email address (sender)
8535	SMTP authentication incomplete. Check the "User name" and "Password" parameters in the configuration.
8550	SMTP server cannot be reached. You have no access rights. Check the following configuration data: • Module configuration > E-mail configuration: – User name – Password – Email address (sender) • Alarm configuration > E-mail data (Content): – Recipient address ("To" or "Cc").
8554	Transfer failed
85xx	Other error message from the e-mail server Apart from the leading "8", the message corresponds to the three-digit error number of the SMTP protocol.

6.2.5 Module replacement

Startup with configuration data from the SD card

Depending on the use of an optional SD card, the STEP 7 configuration data of the TIM are stored differently.

- No use of an SD card

  The configuration data of the TIM is stored in the work memory of the TIM.

- Use of an SD card

  If an SD card is used, the configuration data is stored on the SC card and read from there each time the TIM starts up.

  If the TIM needs to be replaced, this allows simple replacement of the TIM without needing to download the configuration data again.

  If you insert the SD card of the TIM being replaced in the new TIM, when it restarts it reads the configuration data from the SD card of the replaced TIM.

Technical specifications

7

7.1 Technical specifications

You will find the general technical specifications of the SIMATIC S7-1500 series in the S7-1500/ET 200MP system manual, see /3/ (Page 124).

These also apply to the TIM 1531 IRC, if not specified otherwise below.

Table 7- 1 Technical specifications - TIM 1531 IRC

Technical specifications		
Article number	6GK7 543-1MX00-0XE0	
Attachment to Industrial Ethernet		
Quantity	• 1 x gigabit interface (X1) • 2x Fast Ethernet interface (X2, X3)	
Design	RJ-45 jack, galvanically isolated	
Properties	Half duplex/full duplex, autocrossover, autonegotiation	
Standard / transmission speed	Gigabit interface (X1)	Fast Ethernet interfaces (X2 / X3)
• Standard	• 1000BASE-T, IEEE 802.3ab	• 100BASE-TX, IEEE 802.3-2005
• Transmission speeds	• 10 / 100 / 1000 Mbps	• 10 / 100 Mbps
Permitted cable lengths (Ethernet)	**(Alternative combinations per length range) ***	
0 ... 55 m	• Max. 55 m IE TP Torsion Cable with IE FC RJ45 Plug 180 • Max. 45 m IE TP Torsion Cable with IE FC RJ45 + 10 m TP Cord via IE FC RJ45 Outlet	
0 ... 85 m	• Max. 85 m IE FC TP Marine/Trailing/Flexible/FRNC/Festoon/Food Cable with IE FC RJ45 Plug 180 • Max. 75 m IE FC TP Marine/Trailing/Flexible/FRNC/Festoon/Food Cable + 10 m TP Cord via IE FC RJ45 Outlet	
0 ... 100 m	• Max. 100 m IE FC TP Standard Cable with IE FC RJ45 Plug 180 • Max. 90 m IE FC TP Standard Cable + 10 m TP Cord via IE FC RJ45 Outlet	
Serial interface for connection to the transmission device		
Quantity	1 x serial interface (X4), isolated	
Design	9-pin D-sub male connector	
Standards	RS-232 / RS-485 (can be changed in the configuration)	
Transmission speeds	300 ... 115 200 Bps (depending on the connected modem)	
Power supply		
Design	Socket (X80) with terminal block	1 two-pole terminal block with polarity protection
Power supply	• Type of voltage	• 24 VDC
	• Permitted low limit	• 19.2 V
	• Permitted high limit	• 28.8 V

Technical specifications		
Cable cross-section connectable to the terminal block	• Without wire end ferrule • With wire end ferrule • With TWIN wire end ferrule	• 0.2 .. 2.5 mm² / AWG 24 .. 13 • 0.25 .. 1.5 mm² / AWG 24 .. 16 • 0.5 .. 1.0 mm² / AWG 20 .. 17
Further electrical data		
Details for a TIM with all interfaces connected:		
Current consumption (typical)	160 mA	
Effective power loss (typical)	4 W	
Overvoltage category according to IEC / EN 60664-1	Category II	
Permitted ambient conditions		
Ambient temperature	During operation with the rack installed horizontally	0 °C ... +70 °C
	During operation with the rack installed vertically	0 °C ... +50 °C
	During storage	-40 °C to +70 °C
	During transportation	-40 °C to +70 °C
Relative humidity	During operation	≤ 60 % at 25 °C, no condensation
Permitted contaminant concentration	Corrosive gas test according to ISA-S71.04 severity level G1, G2, G3	
Design, dimensions and weight		
Module format	Compact module S7-1500	
Degree of protection	IP20	
Weight	525 g	
Dimensions (W x H x D)	70 x 147 x 129 mm	
Installation options	DIN rail for SIMATIC S7-1500 (article numbers 6ES7590-1Axx0-0AB0)	
Product functions **		

***** For details, refer to the IK PI catalog, cabling technology
****** You will find further characteristics and performance data in the section Application and functions (Page 13).

7.2 Ambient temperature

Restrictions of the maximum specified ambient temperature

The maximum permissible temperatures of the module for altitudes up to 2000 m can be found above in the technical specifications.

When using the module at higher altitudes, the decrease in the cooling effect due to convection as a result of the lower air pressure must be taken into account. According to IEC 61010-2-201 CD2 2015, the temperature at altitudes > 2000 m must be reduced.

The following derating factors and maximum ambient temperatures apply.

Table 7- 2 Restrictions of the maximum permissible ambient temperature in relation to the installation altitude

Installation altitude (Height above mean sea level)	Derating factor [1]	Maximum ambient temperature when the rack is mounted horizontally
-1000 m to 2000 m	1.00	60 °C
2000 m to 3000 m	0.93	56 °C
3000 m to 4000 m	0.86	52 °C
4000 m to 5000 m	0.78	47 °C

[1] Basic value for applying the derating factor is the maximum permissible ambient temperature in °C for 2000 m.

Note

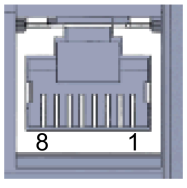
- The derating factors compensate for the decreasing cooling effect of air at higher altitudes due to lower density.
- Linear interpolation between altitudes is permissible.

7.3 Pinout of the Ethernet interfaces

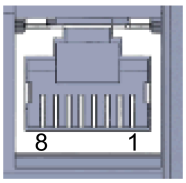
Pinout of the Ethernet interfaces

The tables below show the pin assignment of the Ethernet interfaces.

- **X1**
  Gigabit interface

View of the RJ-45 jack	Pin	Signal name	Assignment
	1	D1+	D1+ bidirectional
	2	D1-	D1- bidirectional
	3	D2+	D2+ bidirectional
	4	D3+	D3+ bidirectional
	5	D3-	D3- bidirectional
	6	D2-	D2- bidirectional
	7	D4+	D4+ bidirectional
	8	D4-	D4- bidirectional

- **X2 / X3**
  Fast Ethernet interfaces

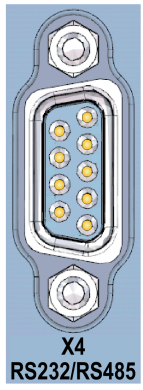
View of an RJ-45 jack	Pin	Signal name	Assignment
	1	Tx+	Transmit Data +
	2	Tx-	Transmit Data -
	3	Rx+	Receive Data +
	4	-	
	5	-	
	6	Rx-	Receive Data -
	7	-	
	8	-	

7.4 Pin assignment of the serial interface

Pin assignment of the serial interface X4 (RS-232 / RS-485)

The table below shows the pin assignment of the 9-pin D-sub miniature plug of the serial interface. The interface corresponds to the connector assignment of a standardized PC connector.

Table 7- 3 Pinout of the plug of the serial interface

Illustration	Pin no.	Signal name	Meaning / remarks	Signal direction
	1	DCD	Received signal level The DCE reports the input of data to be sent to the DTE (connection establishment). [1], [2]	Input
	2	RxD	Received data (DCE → DTE) Switchover to RS-485 by configuration [3]	Input
	3	TxD	Send data (DTE → DCE) Switchover to RS-485 by configuration [3]	Output
	4	DTR	DTE signals readiness to sent to DCE.	Output
	5	GND	Reference mass of the interface	
	6	DSR	DCE reports readiness for operation to DTE.	Input
	7	RTS	Turn on transmitter The DTE requests the DCE to send data on the data cable. The DTE waits for confirmation of the readiness to to send (CTS) of the DCE.	Output
	8	CTS	Ready to send The DCE can transfer the data coming from the DTE.	Input
	9	-	-	-
	Schirm	-	On connector housing	-
	;[1] DCE = data communication equipment (connected modem) ;[2] DTE = data terminal equipment (TIM / CP) [3] RS-232 ↔ RS-485 switchover in the configuration			

For information on connecting modems and cabling the serial interface, see appendix Cables, connecting cables (Page 117).

Approvals

8

Approvals issued

Note

Issued approvals on the type plate of the device

The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

Scope of validity of the approvals

The approvals listed below are only valid for the TIM module.

The products of the accessories program have their own approvals, that are not listed here.

Documents on the Internet

You will find the declarations of conformity listed below and certificates of the product on the Internet at the following address:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/24710/cert)

You can view the considered standards in the respective certificate, which is available on the Internet at the address listed above.

Address for declarations of conformity

The EU and the UK declarations of conformity are available to all responsible authorities at:

Siemens Aktiengesellschaft
Digital Industries
P.O. Box 48 48
90026 Nuremberg
Germany

EC declaration of conformity

CE

The product meets the requirements and safety objectives of the following EC directives and it complies with the harmonized European standards (EN) for programmable logic controllers which are published in the official documentation of the European Union.

- **2014/34/EU (ATEX explosion protection directive)**

  Directive of the European Parliament and the Council of 26 February 2014 on the approximation of the laws of the member states concerning equipment and protective systems intended for use in potentially explosive atmospheres, official journal of the EU L96, 29/03/2014, pages. 309-356

- **2014/30/EU (EMC)**

  EMC directive of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the member states relating to electromagnetic compatibility; official journal of the EU L96, 29/03/2014, p. 79-106

- **2011/65/EU (RoHS)**

  Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, official journal of the EC L174, 01/07/2011, page 88-110

UK Declaration of Conformity

Importer UK:

Siemens plc
Sir William Siemens House
Princess Road
Manchester
M20 2UR

The product meets the requirements of the following directives:

- UKEX Regulations

  SI 2016/1107 The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, and related amendments.

- EMC Regulations

  SI 2016/1091 The Electromagnetic Compatibility Regulations 2016, and related amendments.

- RoHS Regulations

  SI 2012/3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, and related amendments.

ATEX / IECEx / UKEX / CCC-Ex

Observe the information in the "Use of subassemblies/modules in a Zone 2 Hazardous Area" document, which you will find here:

- On the documentation DVD supplied with the product, under:
  "All documents" >"Use of subassemblies/modules in a Zone 2 Hazardous Area"
- On the Internet at the following address:
  Link: (https://support.industry.siemens.com/cs/ww/en/view/78381013)

The conditions must be met for safe usage of the product according to the section Notes on use in hazardous areas according to ATEX / IECEx (Page 44).

The product meets the explosion protection requirements outlined below.

IECEx

Classification: Ex ec IIC T4 Gc, Certificate no.: IECEx DEK 18.0019X

The product meets the requirements of the standards:

- IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- IEC 60079-7 - Explosive Atmospheres - Part 7: Equipment protection by increased safety 'e'

ATEX

Classification: II 3 G Ex ec IIC T4 Gc, Certificate no.:DEKRA 18ATEX0027 X

The product meets the requirements of the standards:

- EN IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-7 - Explosive Atmospheres - Part 7: Equipment protection by increased safety 'e'

UKEX

Classification: II 3 G Ex ec IIC T4 Gc, Certificate no.:DEKRA 21UKEX0001 X

The product meets the requirements of the standards:

- EN IEC 60079-0 - Explosive atmospheres - Part 0: Equipment - General requirements
- EN 60079-7 - Explosive Atmospheres - Part 7: Equipment protection by increased safety 'e'

Importer UK: Siemens plc (see above)

CCC-Ex

Classification:Ex ec IIC T4 Gc

The product meets the requirements of the following standards:

- GB 3836.1

  Explosive atmospheres - Part 0: Equipment - General requirements
- GB 3836.8

  Explosive atmospheres - Part 8: Equipment protection by type of protection 'n'

EMC

The product meets the requirements of the EC Directive 2014/30/EU "Electromagnetic Compatibility" (EMC directive).

Applied standards:

- EN 61000-6-4

  Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- EN 61000-6-2

  Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

RoHS

The product meets the requirements of the EC directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Applied standard:

- EN IEC 63000

c(UL)us

Applied standards:

- Underwriters Laboratories, Inc.: UL 61010-1 (Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements)
- IEC/UL 61010-2-201 (Safety requirements for electrical equipment for measurement, control and laboratory use. Particular requirements for control equipment)
- Canadian Standards Association: CSA C22.2 No. 142 (Process Control Equipment)

Certificate Number: 20130830-E85972

cULus Hazardous (Classified) Locations

HAZ. LOC.

Underwriters Laboratories, Inc.: CULUS Listed E223122 IND. CONT. EQ. FOR HAZ. LOC.

Applied standards:

- ANSI ISA 12.12.01
- CSA C22.2 No. 213-M1987

APPROVED for Use in:

- Cl. 1, Div. 2, GP. A, B, C, D T4
- Cl. 1, Zone 2, GP. IIC T4

Ta: Refer to the temperature class on the type plate

Note the conditions for the safe deployment of the product according to the section Notes on use in hazardous areas according to UL HazLoc and FM (Page 45).

FM

FM APPROVED

Factory Mutual Approval Standard Class Number 3600, 3611, 3810
FM16US0205X

Equipment rating:
Class I, Division 2, Group A, B, C, D, Temperature Class T4, Ta = 0..50/70 °C *****
Class I, Zone 2, Group IIC, Temperature Class T4, Ta = 70 °C
ANSI/ISA-61010-1 (82.02.01)

***** Remember that the permitted ambient temperature depends on the mounting position; see section Technical specifications (Page 99).

Ta: Refer to the temperature class on the type plate

Note the conditions for the safe deployment of the product according to the section Notes on use in hazardous areas according to UL HazLoc and FM (Page 45).

Australia - RCM

The product meets the requirements of the AS/NZS 2064 standards (Class A).

Marking for the customs union

EAC (Eurasian Conformity)

Customs union of Russia, Belarus and Kazakhstan

Declaration of the conformity according to the technical regulations of the customs union (TR CU)

MSIP 요구사항 - For Korea only

Registration Number: MSIP REI S7M

A급 기기(업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외의 지역에서 사용하는것을 목적으로 합니다.

Current approvals

SIMATIC NET products are regularly submitted to the relevant authorities and approval centers for approvals relating to specific markets and applications.

If you require a list of the current approvals for individual devices, consult your Siemens contact or check the Internet pages of Siemens Industry Online Support:

Link: (https://support.industry.siemens.com/cs/ww/en/ps/21764/cert)

Dimension drawings

A

All dimensions in the dimension drawings are in millimeters.

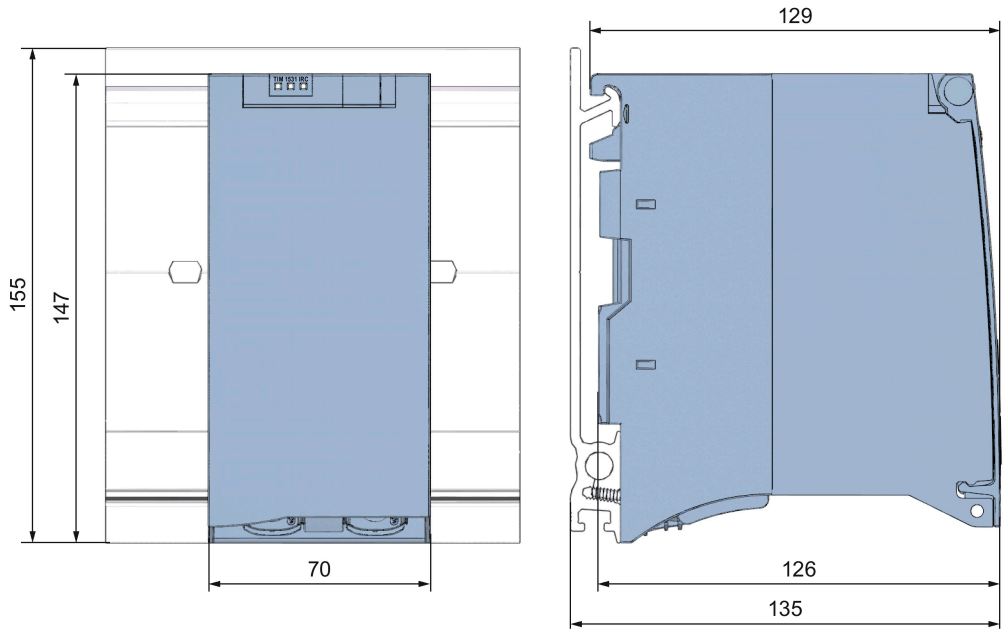


Figure A-1 TIM 1531 IRC: Front view and side view

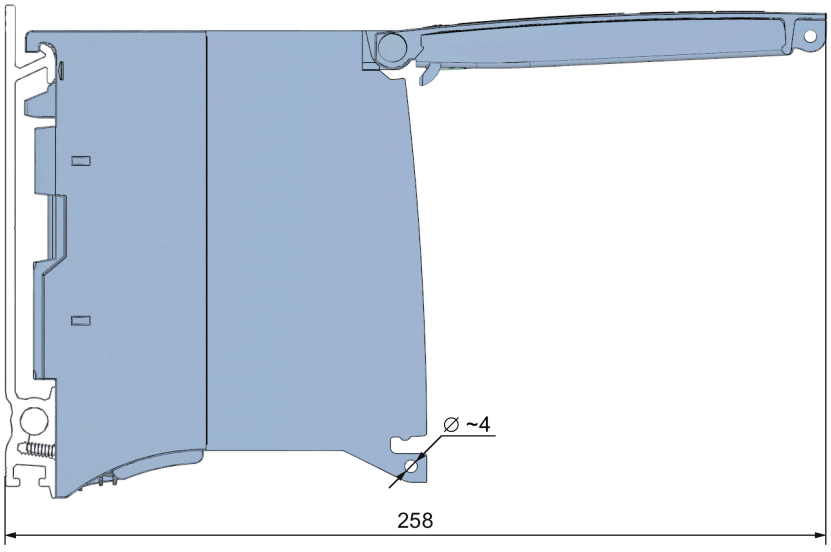


Figure A-2 TIM 1531 IRC: Side view with cover open

Accessories

B

B.1 Mounting rails

Mounting rails for DIN rail mounting

A mounting rail from the S7-1500 range of accessories is required to install the TIM (article numbers 6ES7590-1Axx0-0AA0).

DIN rails with the following article numbers are suitable:

- 6ES7590-1AB60-0AA0

  Length 160 mm
- 6ES7590-1AC40-0AA0

  Length 245 mm
- 6ES7590-1AE80-0AA0

  Length 482.6 mm
- 6ES7590-1AF30-0AA0

  Length 530 mm
- 6ES7590-1AJ30-0AA0

  Length 830 mm

B.2 Power supply

Power supplies for the TIM

Excerpt from the Siemens program for power supplies SITOP and S7-1500:

- SITOP PSU100C

  24 V / 0.6 A stabilized power supply, input: AC 120/230 V, output: DC 24 V / 0.6 A

  Article number: 6EP1331-5BA00
- SIMATIC PM 1507 24 V / 3 A

  Stabilized power supply for SIMATIC S7-1500, input: AC 120/230 V, output: DC 24 V / 3 A

  Article number: 6EP1332-4BA00
- SIMATIC PM 1507 24 V / 8 A

  Stabilized power supply for SIMATIC S7-1500, input: AC 120/230 V, output: DC 24 V / 8 A

  Article number: 6EP1333-4BA00

B.3 SD cards

Compatible SD cards

To store configuration data and firmware files you have the option of using an SD card. To achieve the number of frames specified in the section Performance data and configuration limits (Page 27), the card should have a minimum size of 24 MB.

Note

Temperature range of the SD card

When using an SD card, make sure that this is suitable for the industrial temperature range from -40 ... +85 °C.

The following card formats can be used:

- Size: 24 x 32 mm
- Standard and capacity:
  - SDSC (SD 1.0 / SD 1.1)

    24 MB ... 2 GB
  - SDHC

    4 ... 32 GB
- Speed classes: Class 0, 2, 4, 6, 10
- File system: FAT32

You will find information on using the SD card in the section SD card slot (Page 40).

B.4 Formatting the SD card

Formatting the SD card

The SD card of the TIM 1531 IRC must have the following formatting to be able to save configuration data.

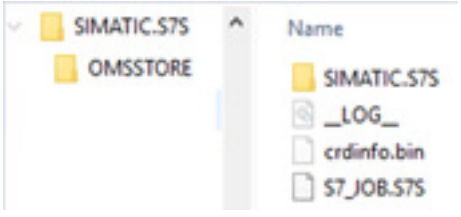


Figure B-1 Formatting the SD card

You can find information on formatting the SD card in the STEP 7 information system under the search term "Formatting the S7-1500 memory card".

SIMATIC S7 - Memory Card (SMC)

The SMC is available with various capacities. The recommended memory capacity is in the range between 24 MB and 32 GB. SMCs up to 32 GB memory capacity are supported.

Article numbers: 6ES7954-8Lx02-0AA0
x is a placeholder for: F / L / P / T

You will find the cards on the pages of the Siemens Industry Mall using the search term "6ES7954".

B.5 Routers, modems, antennas

B.5.1 Dedicated line and dialup network modems

Modems for dedicated line and dialup networks

Note
Discontinuation of modules

The following products have the product status "type discontinued" but if they exist can be operated with the communications moduel:

- Modem MD2
  Dedicated line modems
  Product notification on the Internet:
  Link: (https://support.industry.siemens.com/cs/ww/en/view/109740149)
- Modem MD3
  Modems for analog dialup networks
  Product notification on the Internet:
  Link: (https://support.industry.siemens.com/cs/ww/en/view/109740148)
- Modem MD4
  Modems for ISDN networks
  Product notification on the Internet:
  Link: (https://support.industry.siemens.com/cs/ww/en/view/67637816)

When using the serial interface for dedicated line and dialup networks, use suitable products of other vendors.

B.5.2 MODEM MD720

MODEM MD720

Article number: 6NH9720-3AA01-0XX0



Use in SIMATIC S7 stations that are part of a telecontrol or remote maintenance system and for communication with other stations in the network or an OPC server in the master station.

The MD720 supports the following types of communication:

- IP-based communication with the control center using GPRS and the MSC protocol or the MSCsec secure protocol
- SMS messages from or to a mobile telephone
- CSD communication for maintenance and for data connections

Technical specifications (excerpt)

Connection to Industrial Ethernet		
X1 interface	Number:	1
	Implementation:	D-sub 9-pin, female
	Characteristics:	RS-232 Control using AT commands
	Transmission speed:	19200 bps Permitted range: 300 ... 57600 bps
Wireless interface		
Antenna connector	Number:	1
	Implementation:	SMA socket
	Impedance:	50 Ω nominal
Frequency bands	GPRS / CSD:	Quad band: 850, 900, 1800, 1900 MHz

GPRS	Characteristics:	Maximum of 5 time slots at the same time, of which: • Up to 2 uplinks • Up to 4 downlinks
	Transmission speed • Uplink (modem → Internet) • Downlink (Internet → modem)	Gross values: • Max. 42 kbps • Max. 54 kbps The net values (user data) are approximately 30% lower.
CSD	Characteristics:	MTC (Mobile Terminated Call)
	Transmission speed:	9600 bps
SMS (TX)	Characteristics:	Text mode

B.5.3 IP-based routers

Routers for IP-based communication

To connect a communications module to IP-based infrastructure networks, various routers are available from Siemens.

Information on the devices can be found on the following Siemens Internet pages.

Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15982)

Siemens Industry Mall at:

(https://mall.industry.siemens.com/mall/en/WW/Catalog/Products/10215915?tree=CatalogTree)

B.5.4 Mobile wireless antennas

GSM/GPRS antennas

The following antennas are available for use in GSM/GPRS networks and can be installed both indoors and outdoors. The antennas must be ordered separately.

Quadband antenna ANT794-4MR

You will find detailed information in the device manual. You will find this on the Internet on the pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/view/23119005)



Figure B-2 ANT794-4MR GSM/GPRS antenna

Short name	Article number	Explanation
ANT794-4MR	6NH9 860-1AA00	Quadband antenna (900, 1800/1900 MHz, UMTS); weatherproof for indoor and outdoor areas; 5 m connecting cable connected permanently to the antenna; SMA connector, including installation bracket, screws, wall plugs

Flat antenna ANT794-3M

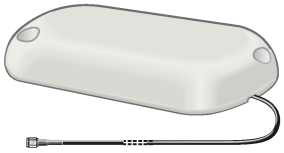


Figure B-3 Flat antenna ANT794-3M

Short name	Article number	Explanation
ANT794-3M	6NH9 870-1AA00	Flat antenna (900, 1800/1900 MHz); weatherproof for indoor and outdoor areas; 1.2 m connecting cable connected permanently to the antenna; SMA connector, including adhesive pad, screws mounting possible

You will find detailed information in the device manual. You will find this on the Internet on the pages of Siemens Industry Online Support:
Link: (https://support.industry.siemens.com/cs/ww/en/view/48729835)

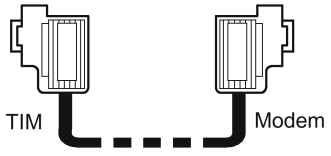
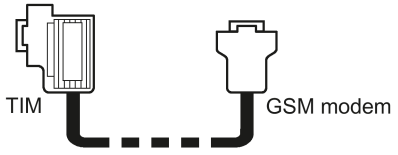
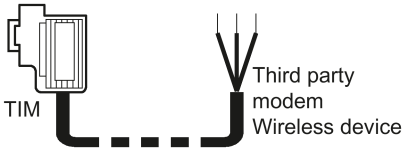
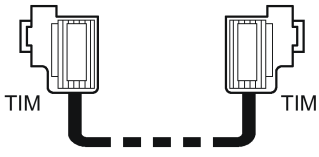
B.6 Cables, connecting cables

B.6.1 Connecting cables for connecting modems

Standard connecting cables (RS-232)

The following connecting cables do not ship with the TIM.

Table B- 1 Standard connecting cables for connecting TIM and modem

Article number	Description	Illustration
6NH7701-4AL	Connecting cable for connecting the serial interface of the TIM (RS-232) with a modem D-sub male connector Cable length 1.5 m Suitable for the connection of the following modems: • Modem for a dedicated line (MD2) • Modem for analog dialup network (MD3) • Modem for analog dialup network (MD4) • GSM mobile wireless modem MODEM MD720 (can be used for MD720 with the supplied gender changer)	
6NH7701-5AN	Connecting cable for connecting the serial interface of the TIM (RS-232) with a GSM mobile wireless modem 1 D-sub male connector, 1 D-sub female connector Cable length 2.5 m Suitable for the connection of the following modems: • GSM mobile wireless modem MODEM MD720 (can be used without gender changer) • Third-party modems with RS-232 connector • Wireless devices with RS-232 connector	
6NH7701-4BN	Connecting cable open at one end for connecting the serial interface of the TIM (RS-232) with a third-party modem Cable length 2.5 m	
6NH7701-0AR	Test cable Crossover connecting cable for connection of two TIM modules via their RS-232 interface (without the interposition of a null modem) Cable length 6 m	

Plug pin assignment of the standard connecting cables

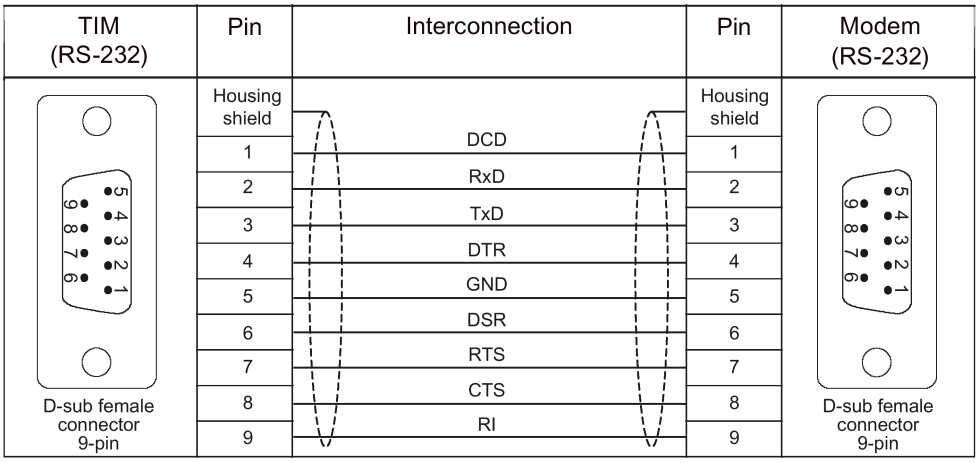


Figure B-4 6NH7701-4AL

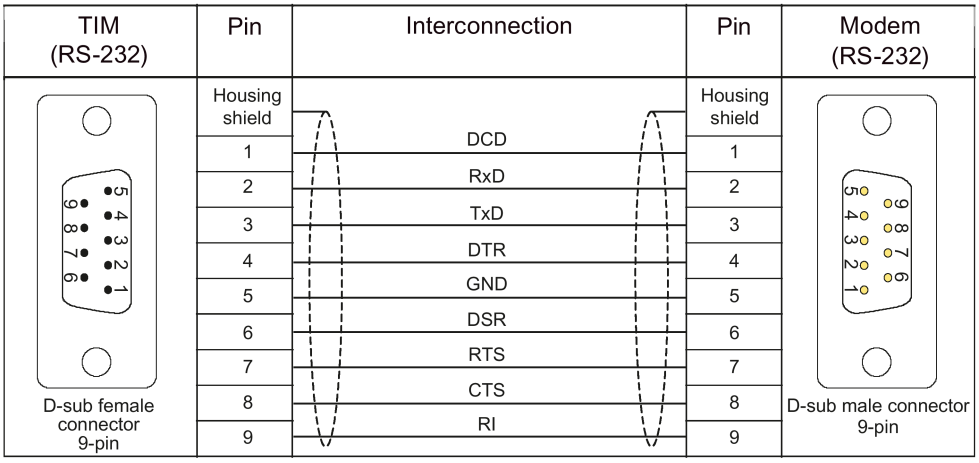


Figure B-5 6NH7701-5AN

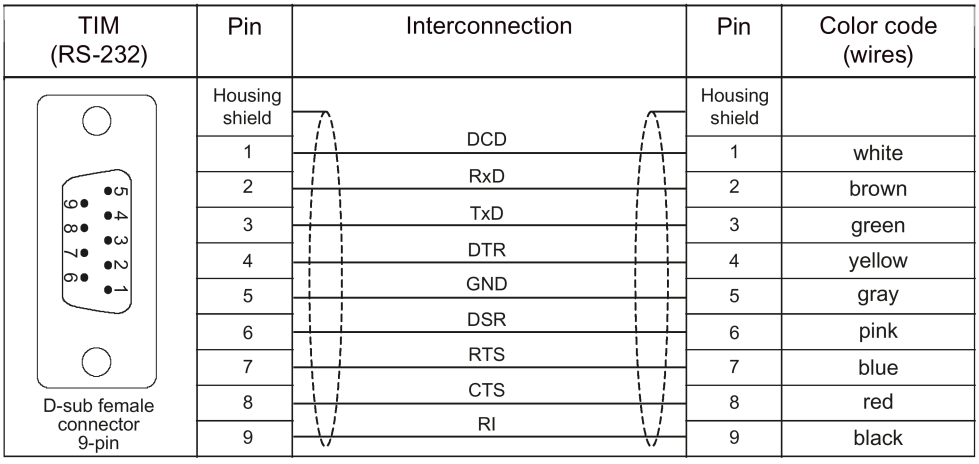


Figure B-6 6NH7701-4BN

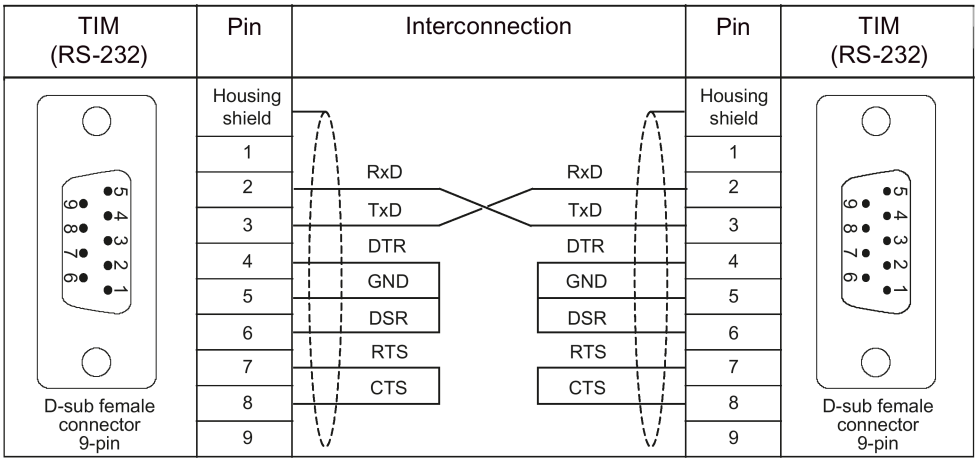


Figure B-7 6NH7701-0AR

B.6.2 Accessories for RS-485 connection

Accessories for RS-485 operation of the serial interface

- **Cable**

  Excerpt from the Siemens accessories program PROFIBUS or RS-485 operation

  – PROFIBUS FC standard cable GP, bus cable 2-wire, shielded, special design for fast installation, sold by the meter

    02YSY (ST) CY, 1x2x0.64 / 2.55-150 VI KF 40 FR

    Article number: 6XV1830-0EH10

- **Terminating resistor**

  In a network in RS-485 operation, the terminating resistor of the bus cable is turned on or off by the STEP 7 configuration of the communications module.

- **Connector**

  Use D-sub connectors with metal or metallized enclosure to comply with the EMC guidelines.

Connector assignment in RS-485 operation

Observe the connector assignment specified by the modem manufacturer.

When the serial interface is connected to a Siemens modem MDx in RS-485 operation, the following assignment applies:

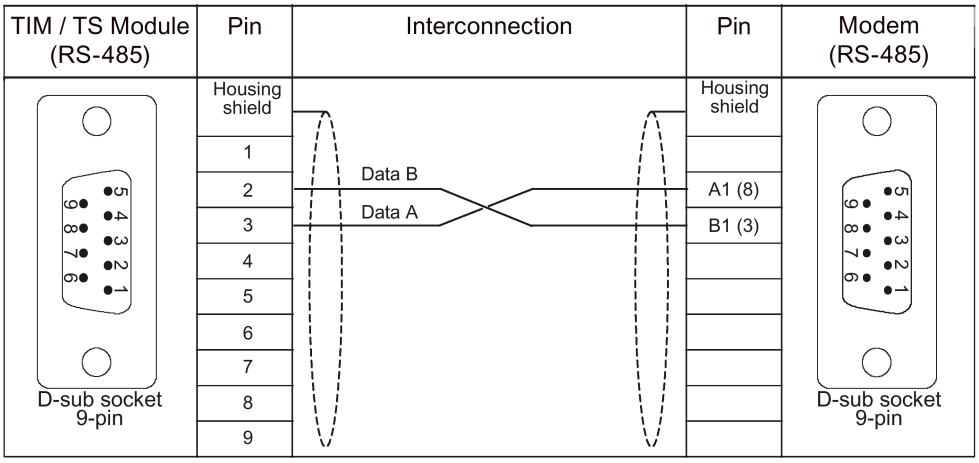


Figure B-8 Assignment of the RS-485 interfaces of the TIM 1531 IRC and an MDx modem

Encryption methods (Ciphers)

C

The following tables list the encryption methods (ciphers) used by the TIM. The tables are valid for TIM in the firmware version specified in the preface.

Meaning of the table columns

- **Category**
  - Cipher: Cipher suite (encryption methods)
  - Group: Group
  - DSA: Signature algorithm
  - SEA: Signature and encryption algorithm
  - KeyX: Key exchange method
- **Name**

  Name of the category according to IANA

  You can find an overview of the TLS parameters and Cipher Suites on the following page: Link: (https://www.iana.org/assignments/tls-parameters/tls-parameters.xhtml#tls-parameters-4)
- **Value**

  Value (hexadecimal) of the suite according to IANA
- **TLS**

  TLS version with which the respective category is used.
- **Security**
  - ✓

    Ciphers considered secure
  - Legacy

    Ciphers no longer considered secure
- **Protocol**

  The numbers indicate the communication protocols that use the respective category.
  - 1
    Telecontrol communication (DNP3 / IEC 60870-5-104)
  - 2
    HTTPS
  - 3
    SMTP client
  - 4
    S7 communication
  - 5
    SNMPv3 server

TLS versions used by the TIM

TLS version	Security
TLS Version 1.2	✓
TLS Version 1.3	✓

Ciphers used by the TIM

Category	Name	Value	TLS	Security	Protocol
Cipher	TLS_AES_128_GCM_SHA256	0x13,0x01	TLS 1.3	✓	2, 3, 4
Cipher	TLS_AES_256_GCM_SHA384	0x13,0x02	TLS 1.3	✓	1, 2, 3, 4
Cipher	TLS_CHACHA20_POLY1305_SHA256	0x13,0x03	TLS 1.3	✓	1, 2, 3, 4
Cipher	TLS_AES_128_CCM_SHA256	0x13,0x04	TLS 1.3	✓	2
Cipher	TLS_DHE_RSA_WITH_AES_128_CCM	0xC0,0x9E	≤ TLS 1.2	✓	2, 3
Cipher	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256	0x00,0x9E	≤ TLS 1.2	✓	2, 3
Cipher	TLS_DHE_RSA_WITH_AES_256_CCM	0xC0,0x9F	≤ TLS 1.2	✓	2, 3
Cipher	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384	0x00,0x9F	≤ TLS 1.2	✓	2, 3
Cipher	TLS_DHE_RSA_WITH_CHACHA20_POLY1305_SHA256	0xCC,0xAA	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_ECDSA_WITH_AES_128_CCM	0xC0,0xAC	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	0xC0,0x2B	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_ECDSA_WITH_AES_256_CCM	0xC0,0xAD	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	0xC0,0x2C	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256	0xCC,0xA9	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	0xC0,0x2F	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	0xC0,0x30	≤ TLS 1.2	✓	2, 3
Cipher	TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256	0xCC,0xA8	≤ TLS 1.2	✓	2, 3
Group	X25519	0x001D		✓	2, 3, 4
Group	X448	0x001E		✓	1, 2, 3
Group	secp256r1 (prime256v1)	0x0017		✓	1, 2, 3, 4
Group	secp384r1	0x0018		✓	1, 2, 3
Group	secp521r1	0x0019		✓	1, 2, 3
SEA	ed25519	0x0807		✓	2, 3, 4
SEA	ed448	0x0808		✓	2, 3, 4
SEA	rsa_pss_pss_sha256	0x0804		✓	2, 3, 4
SEA	rsa_pss_pss_sha384	0x0805		✓	2, 3, 4
SEA	rsa_pss_pss_sha512	0x0806		✓	2, 3, 4
SEA	rsa_pss_rsae_sha256	0x0809		✓	2, 3, 4
SEA	rsa_pss_rsae_sha384	0x080A		✓	2, 3, 4
SEA	rsa_pss_rsae_sha512	0x080B		✓	2, 3, 4
DSA	sha256+ecdsa	0x0403		✓	2, 3, 4
DSA	sha384+ecdsa	0x0503		✓	1, 2, 3, 4
DSA	sha512+ecdsa	0x0603		✓	2, 3, 4
KeyX	ECDH >= 250 Bit			✓	1
DSA	HMAC-MD5-96			Legacy	5
DSA	HMAC-SHA-96			Legacy	5
SEA	aes128-cbc			Legacy	5
SEA	des-cbc			Legacy	5

Documentation references

D

Where to find Siemens documentation

- Article numbers

  You will find the article numbers for the Siemens products of relevance here in the following catalogs:

  – SIMATIC NET - Industrial Communication / Industrial Identification, catalog IK PI

  – SIMATIC - Products for Totally Integrated Automation and Micro Automation, catalog ST 70

  You can request the catalogs and additional information from your Siemens representative. You will also find the product information in the Siemens Industry Mall at the following address:

  Link: (https://mall.industry.siemens.com)

- Manuals on the Internet

  You will find SIMATIC NET manuals on the Internet pages of Siemens Industry Online Support:

  Link: (https://support.industry.siemens.com/cs/ww/en/ps/15247/man)

  Go to the required product in the product tree and make the following settings:

  Entry type “Manuals”

- Manuals on the data medium

  You will find manuals of SIMATIC NET products on the data medium that ships with many of the SIMATIC NET products.

/1/

SIMATIC NET
TIM 1531 IRC
Operating instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/24710/man)

/2/

SIMATIC
S7-1500/ET 200MP Manual Collection
Reference work
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/86140384)

/3/

SIMATIC
S7-1500/ET 200MP
system manual
Siemens AG
SyH automation system S7-1500
(https://support.industry.siemens.com/cs/ww/en/view/59191792)

/4/

SIMATIC NET
Industrial Ethernet
System manual
Siemens AG

- Volume 1: Industrial Ethernet

  Link: (https://support.industry.siemens.com/cs/ww/en/view/27069465)

- Volume 2: Passive network components

  Link: (https://support.industry.siemens.com/cs/ww/en/view/84922825)

/5/

SIMATIC NET
SCALANCE M812, M816
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15984)

/6/

SIMATIC NET
Mobilfunkrouter SCALANCE M870
(M873 / M874 / M875 / M876)
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15987/man)

/7/

SIMATIC NET
MODEM MD720
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21820/man)

/8/

SIMATIC NET
MODEM MD2
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/17163799)

/9/

SIMATIC NET
MODEM MD3
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/17164329)

/10/

SIMATIC NET
MODEM MD4
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/view/17165032)

/11/

SIMATIC NET
Industrial Ethernet Security
SCALANCE S
Commissioning and Installation Manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15327/man)

/12/

SIMATIC NET
Diagnostics and configuration with SNMP
Diagnostics manual
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/15392/man)

/13/

SIMATIC NET
CP 1243-8 IRC
Operating Instructions
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21162/man)

/14/

SIMATIC NET
SINAUT ST7
System Manual
- Volume 1: System and hardware
- Volume 2: Configuration in STEP 7 V5
- Volume 3: Configuration in STEP 7 Professional
Siemens AG
Link: (https://support.industry.siemens.com/cs/ww/en/ps/21771/man)

/15/

SIMATIC NET - TeleControl
Siemens AG
Configuration manuals of the protocols:
- SINAUT ST7
- DNP3
- IEC 60870-5
Link: (https://support.industry.siemens.com/cs/ww/en/ps/24710/man)

Index

A

Abbreviations, 6
Article number, 3
Authentication, 18

C

Connection status - diagnostics, 87
Connections - Number, 27
Cross-references, 6

D

Data buffering, 29
Device replacement, 97
Diagnostics messages, 73, 86
Direct communication, 15
Disposal, 8
Downloading - configuration data, 54

E

E-mail, 16
Encryption, 18
ES - engineering station, 22

F

Firewall, 20
Firmware
    Version, 3
Frame memory, 29

G

General request, 55
GET, 17, 17
Glossary, 8
Grounding, 50

H

Hardware product version, 3

I

Inter-station communication, 15, 24
IP configuration, 22
IPsec, 21

M

MAC address, 3
Master station types, 13
MIB, 93
MSC, 19
MSCsec, 19

O

Online diagnostics, 85
Online functions, 22, 86

P

Partner status - diagnostics, 87
Product name, 6

R

READ, 17
Recycling, 8
Replacement situation, 97
RS-485
    Cable, 119
    Wiring, 52

S

Safety notices, 43
Saving frames, 21
SD card, 29
Security
    Protocols, 18
Security functions, 61
Send buffer, 29
Service & Support, 8
SIMATIC NET glossary, 8

SINAUT ST7cc, 13
SINAUT system, 14
SMS, 16
SNMP, 22, 93
SNMPv3, 19
ST7sc, 13
STEP 7 - version, 30

T

Terminating resistor, 52
Time stamp, 22
Time-of-day synchronization, 22
Training, 8

V

VPN, 21

W

WinCC TC, 13
WRITE, 17