SIEMENS

SIMATIC

**ET 200SP
Interface Module IM 155-6 PN R1
(6ES7155-6AU00-0HM0)**

Equipment Manual

Legal information

Warning notice system

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

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

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

> ⚠ **CAUTION**
>
> indicates that minor personal injury can result if proper precautions are not taken.

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

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

Qualified Personnel

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

Proper use of Siemens products

Note the following:

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

Trademarks

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

Disclaimer of Liability

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

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Introduction

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Purpose of the documentation

This equipment manual supplements the ET 200SP (https://support.industry.siemens.com/cs/ww/en/view/58649293) system manual. Functions that generally relate to the system are described in this manual.

The information provided in this manual and in the system/function manuals supports you in commissioning the system.

Conventions

Please also observe notes labeled as follows:

NOTE

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

Recycling and disposal

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

ID link for the digital nameplate

The ID link is a globally unique identifier according to IEC 61406-1, which you will find in the future as a QR code on your product.

The figure shows an example of an ID link for the IM 155-6 PN R1 interface module.

You can recognize the ID link by the frame with a black corner at the bottom right. The ID link takes you to the digital nameplate of your product.

Scan the QR code on the product or on the packaging label with a smartphone camera, barcode scanner, or reader app. Call the ID link (https://i.siemens.com/1P6ES7155-6AU00-0HM0+S123ABC).

In the digital nameplate, you will find product data, manuals, declarations of conformity, certificates, and other helpful information about your product.

1.1　ET 200SP Documentation Guide

1.1.1　ET 200SP Documentation Guide

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

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

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

Basic information

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

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

Examples:

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

Device information

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

Examples:

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

General information

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

Examples:

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

Product Information

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

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

Manual Collection ET 200SP

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

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

1.1.2 SIMATIC Technical Documentation

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

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

Overview of the SIMATIC Technical Documentation

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

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

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

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

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

Retention of the documentation

Retain the documentation for later use.

For documentation provided in digital form:

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

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

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

2. Retain this version of the documentation.

Updating the documentation

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

1. Download the current version as described above via the Industry Online Support or the ID link.

2. Also retain this version of the documentation.

mySupport

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

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

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

Application examples

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

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

1.1.3 Tool support

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

TIA Selection Tool

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

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

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

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

SINETPLAN

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

The advantages at a glance

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

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

See also

PRONETA Professional (https://support.industry.siemens.com/cs/ww/en/view/109781283)

Industrial cybersecurity

<div style="text-align: right; font-size: 2em;">2</div>

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

For general information and measures regarding industrial cybersecurity, refer to the ET 200SP (https://support.industry.siemens.com/cs/ww/en/view/58649293) system manual.

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

2.1 Cybersecurity information

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

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

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

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

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

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

2.2 Cybersecurity-relevant information

Observe all cybersecurity-relevant information.

Topics with cybersecurity-relevant information	Reference
Operational application environment and security assumptions	
Requirements for the operational application environment of the system and security assumptions	This section is found in the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

Topics with cybersecurity-relevant information	Reference
Security properties of the product	
Access protection	Note the information on the topic of access protection in the "Protection" section of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).
Data integrity	The topic of data integrity is described in the "Industrial cybersecurity" section of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).
Signed firmware update	The topic of signed firmware updates is described in the "Industrial cybersecurity" section of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).
Secure Boot	The topic of secure boot is described in the "Industrial cybersecurity" section of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).
PROFINET Security Class 1 • The device supports PROFINET Security Class 1. • With the introduction of PROFINET Security Class 1, additional security settings have been integrated into the PROFINET communication.	Detailed information about PROFINET Security Class 1 and the additional security settings can be found in the PROFINET with STEP 7 Function Manual (https://support.industry.siemens.com/cs/us/en/view/49948856)
Supported Ethernet services	You can find information on supported services in the Technical specifications section. You can find detailed information on supported Ethernet services in the Communication Function Manual (https://support.industry.siemens.com/cs/us/en/view/59192925).
Interfaces, ports, protocols and services	
Information on the following is security-relevant: • Communication layer and communication role • Default states • Enabling/disabling of ports and services	You can find detailed information on these topics in the Communication Function Manual (https://support.industry.siemens.com/cs/us/en/view/59192925).
Secure operation	
Recommendations for safe operation	Cross-system information on the safe operation of interface modules can be found in the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).
Corrective measures for known risks	Corrective measures for known risks are announced on the Siemens ProductCERT and Siemens CERT (https://siemens.com/productcert) web page. For more information on SIEMENS ProductCERT, refer to the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

Topics with cybersecurity-relevant information	Reference
Security checks	Application-specific security measures such as cyclic checks of the configuration via checksums are described in the "Industrial cybersecurity" section of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).
Secure decommissioning Products that contain security-relevant data must be securely decommissioned before disposal or resale.	Information on secure decommissioning can be found in the "Safe operation of the system" section of the System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

Product overview 3

3.1 Properties

Article number

2x 6ES7155-6AU00-0HM0 (interface module IM 155-6 PN R1)

1x 6ES7193-6BR00-0HM0 (BaseUnit BU type M0 and server module)

6ES7193-6MR00-0AA0 (SIMATIC system rail, length 483 mm)

6ES7193-6MR00-0BA0 (SIMATIC system rail, length 530 mm)

6ES7193-6MR00-0CA0 (SIMATIC system rail, length 830 mm)

6ES7193-6MR00-0DA0 (SIMATIC system rail, length 2000 mm)
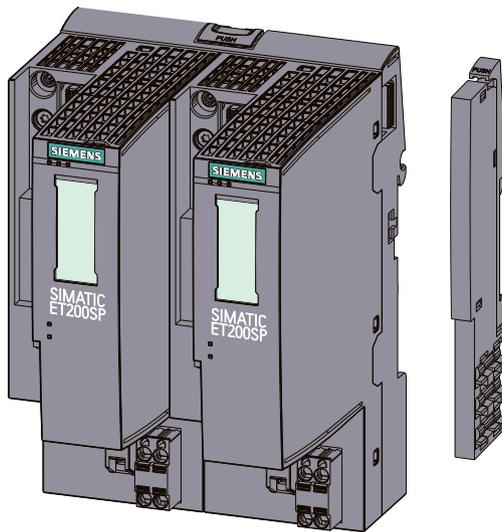
Figure 3-1 View of the ET 200SP R1 and the server module

Properties

The special feature of the ET 200SP R1 system is the high availability due to redundant PROFINET connections.

The two IM 155-6 PN R1 with the corresponding BusAdapters, together with the BaseUnit and the SIMATIC system rail, form the interface of the ET 200SP R1.

The module has the following technical properties:

- Connects the ET 200SP distributed I/O system with PROFINET IO
- Supply voltage 1L+ 24 V DC (SELV/PELV). Two connection plugs are included in the scope of delivery of the BaseUnit.
  The supply voltage is fed in via the BaseUnit.
- PROFINET IO connection via selectable BusAdapters

NOTE

The IM 155-6 PN R1 cannot be pulled/plugged when the corresponding supply voltage plug is plugged in.

NOTE

BusAdapter of the same type

Note that only BusAdapters of the same type are supported on both interface modules.

Accessories

The following accessories can be ordered separately:

- BusAdapter
  - BA 2×RJ45 for RJ45 bus connector
  - BA 2×FC for direct connection of the bus cable
  - BA 2xSCRJ for POF/PCF fiber-optic cable
  - BA 2xLC for glass fiber-optic cable
  - BA 2xM12 for bus cable with standard M12 plug
  - BA 2xLC-LD (Long Distance) for single-mode fiber-optic cables with a maximum length of 20 km
  - BA SCRJ/RJ45 as media converter for POF/PCF fiber-optic cable ⇔ standard RJ45 connector
  - BA SCRJ/FC as media converter for POF/PCF fiber-optic cable ⇔ direct connection of the bus cable
  - BA LC/RJ45 as media converter for glass fiber-optic cable ⇔ standard RJ45 connector
  - BA LC/FC as media converter for glass fiber-optic cable ⇔ direct connection of the bus cable
  - BA LC-LD/RJ45 as media converter for glass fiber-optic cable with an LC plug connector ⇔ standard RJ45 connector
  - BA LC-LD/M12 as media converter for glass fiber-optic cable with an LC plug connector ⇔ standard M12 plug or M12 push-pull connector

Information on the BusAdapters is available in the BusAdapter (https://support.industry.siemens.com/cs/ww/en/view/109751716) manual.

- BaseUnits

    – BaseUnit BU type M0 for two IM 155-6 PN R1 incl. server module and two 24 V DC connectors

Information on the BaseUnits is available in the BaseUnits (https://support.industry.siemens.com/cs/ww/en/view/59753521) equipment manual.

- SIMATIC system rail
- Labeling strips
- Reference identification label

You can find more information on the accessories in the ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/58649293) system manual.

Configuration limits for IO devices

Maximum number of connections to IO controllers

A connection to a redundant S7-1500H system is permitted for the ET 200SP R1.

Maximum configuration

- 64 ET 200SP I/O modules
- 1 m backplane bus (without interface module)

Maximum amount of I/O data

Gross data length (for input data and output data):

- 1440 bytes

The number of maximum net data lengths for input and output data depends on the number and type of I/O modules used.

Calculation of the max. net data length:

The max. net data length is calculated according to the following formula:

Max. net data length = "Max. gross length" – "Total number of I/O submodules" – "Number of mixed I/O modules (input and output data)" – "9 bytes for interface module and server module"

The result of the calculation of the maximum net data length applies equally to input and output data.

Server module

The server module is included in the scope of delivery of the BaseUnit in a bundle and is available separately as an accessory.

The server module has the following properties:

• Terminates the backplane bus of the ET 200SP distributed I/O system.

• Features a support for 3 spare fuses (5 × 20 mm).

• Provides station functions, e.g. "Group diagnostics: No supply voltage L+", status bytes.

• I&M identification data

• Representation of the statuses of supply voltage L+ and the feedback voltage per slot.

NOTE

You need to configure and assign parameters to the server module in the configuration software.

To do this, place the server module on the last slot of the configuration and set the parameter "Group diagnostics: No supply voltage L+". For example, when there are 64 I/O modules, the server module is inserted on slot 66.

NOTE

Immediately after a redundancy switchover, the status of the regenerative voltage can be displayed as not present (= 0) for a maximum of 30 ms if:

• You are using the server module with the "Status of the feedback voltage" enabled, and

• There is no supply voltage L+ to least one digital output module and

• Feedback voltage is present

You can find more information in the server module (https://support.industry.siemens.com/cs/ww/en/view/63257531) manual.

First I/O BaseUnit of an ET 200SP in the configuration

NOTE

First I/O BaseUnit of an ET 200SP in the configuration

To route the 24 V DC supply voltage via a fuse, a light BaseUnit must be plugged into the slot of the first 24 V DC I/O module.

When an AC I/O module or AI Energy Meter ST is plugged, the first BaseUnit in an ET 200SP station may be a dark one. Note the information on limiting the overvoltage and power rating in the AC I/O module manuals.

Pay attention to the type of the BaseUnits during configuration.

3.2 Functions

Introduction

The interface module supports the following PROFINET IO functions:

- Supported Ethernet services: ICMP, ARP, SNMP, LLDP
- Port diagnostics
- Disabling of ports
- Minimum update time 1 ms
- Device replacement without programming device (PG) and without topological configuration
- Media redundancy protocol (MRP)
- Distribution of module channels to a maximum of 4 submodules
- Real-time communication
- Use of fail-safe modules
- System modifications during ongoing operation on S7-1500R/H (CiR)
- System redundancy R1
- Value status of I/O modules
- Reading out service data
- Reference temperature distribution
- H-Sync forwarding
- Setting the time
- Time distribution
- Diagnostic interrupts
- Hardware interrupts
- Removal/insertion of multiple I/O modules during operation (Multi Hot Swap)
- Maintenance events
- Reset to factory settings via PROFINET IO
- Firmware update via PROFINET IO
- Identification data I&M 0 to I&M 3

You can find more information on the system functions in the ET 200SP Distributed I/O System system manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

NOTE
Redundant firmware update
You can only perform a redundant firmware update via MFCT.

Requirements

The table below shows the software requirements for a configuration with the IM 155-6 PN R1 interface module:

Table 3-1 Version dependencies of the module functions

Function	Functional status of the module as of	Firmware version of the module as of	Configuring with GSD file (https://support.industry.siemens.com/cs/ww/en/view/57138621)	Configuring with TIA Portal V18 and higher
Supported Ethernet services: ICMP, ARP, SNMP, LLDP	1	V6.0.0	X	X
Port diagnostics	1	V6.0.0	X	X
Disabling of ports	1	V6.0.0	X	X
Minimum update time 1 ms	1	V6.0.0	X	X
Device replacement without programming device (PG) and without topological configuration	1	V6.0.0	X	X
Media redundancy protocol (MRP)	1	V6.0.0	X	X
Distribution of module channels to a maximum of 4 submodules	1	V6.0.0	X	X
Real-time communication	1	V6.0.0	X	X
Use of fail-safe modules	1	V6.0.0	---	X
System modifications during ongoing operation on S7-1500R/H (CiR)	1	V6.1.0	---	V21 or higher
System redundancy R1	1	V6.0.0	X	X
Value status of I/O modules	1	V6.0.0	X	X
Reading out service data	1	V6.0.0	X	X
Reference temperature distribution	1	V6.0.0	X	X
H-Sync forwarding	1	V6.0.0	X	X
Setting the time	1	V6.0.0	X	X
Time distribution	1	V6.0.0	X	X
Diagnostic interrupts	1	V6.0.0	X	X
Hardware interrupts	1	V6.0.0	X	X
Removal/insertion of multiple I/O modules during operation (Multi Hot Swap)	1	V6.0.0	X	X
Maintenance events	1	V6.0.0	X	X
Reset to factory settings via PROFINET IO	1	V6.0.0	X	X
Firmware update via PROFINET IO	1	V6.0.0	X	X
Identification data I&M 0 to I&M 3	1	V6.0.0	X	X

X = possible

3.2.1 Supported Ethernet services: ICMP, ARP, SNMP, LLDP

Supported Ethernet services: ICMP, ARP, SNMP, LLDP

The module supports the following standardized Ethernet services:

• **ICMP - Internet Control Message Protocol (RFC 792)**

ICMP is a protocol used to transmit informational and error messages over the Internet protocol.

• **ARP - Address Resolution Protocol (RFC 826)**

ARP is a protocol used to determine the hardware address (MAC) of an associated Internet Protocol (IP) address.

• **SNMP - Simple Network Monitoring Protocol (RFC 1157, RFC 3410)**

SNMP is a protocol for transmitting management information across networks.

• **LLDP – Link Layer Discovery Protocol (IEEE 802.1AB)**

LLDP is a protocol for identifying neighboring devices.

3.2.2 Port diagnostics

Port diagnostics

Depending on the BusAdapter used, the device supports special diagnostic alarms that signal the quality of data transfer on the medium used.

3.2.3 Disabling of ports

Disabling of ports

The device supports the deactivation of the port by parameter assignment, so that all communication on this port is prevented.

3.2.4 Minimum update time 1 ms

Minimum update time 1 ms

The shortest update cycle of IO data for this device is 1 ms. To achieve this value, the controller used must also support this time.

3.2.5 Device replacement without programming device (PG) and without topological configuration

Device replacement without topological configuration

In addition to both interface modules, the device name is also stored on the BusAdapter plugged into the interface module. A stored device name in each of the two BusAdapters is a prerequisite for a device exchange without topological configuration.

Replacing the interface module produces a range of scenarios for using the device name.

Table 3-2 Scenarios for using the device name

	Interface module empty	Interface module with device name
BusAdapter without device name	No device name available	The device name from the interface module is used and copied to the BusAdapter.
BusAdapter with device name	The device name from the BusAdapter is used and copied to the interface module.	The device name from the BusAdapter is used and copied to the interface module if this has a different device name.

Note the following constraints:

• When a BusAdapter is replaced, a device name stored in the BusAdapter is applied to the interface module after a POWER ON.

• Removal/insertion of the BusAdapter under voltage is not permitted.

Device replacement with topology configuration

IO devices with this function can be replaced in a simple manner:

• The device name does not need to be assigned with the programming device (PG).

The replaced IO device is assigned the device name by the IO controller, not by the programming device (PG). The IO controller uses the configured topology and the neighborhood relationships determined by the IO devices for this purpose. All involved devices must support the LLDP protocol (Link Layer Discovery Protocol). The configured topology must match the actual topology.

If the IO devices were already used in another configuration, reset them to factory settings before reusing them. You can find more information in the ET 200SP distributed I/O system (https://support.industry.siemens.com/cs/ww/en/view/58649293) system manual.

You can find more information in the STEP 7 online help and as of STEP 7 (TIA Portal) V12 in the PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856) function manual.

3.2.6 Media redundancy protocol (MRP)

Media redundancy protocol (MRP)

MRP is a function for ensuring communication and plant availability. A ring topology ensures that an alternative communication path is made available if a transmission route fails.

You can find additional information in the STEP 7 online help and as of STEP 7 (TIA Portal) V12 in the PROFINET with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/49948856) function manual.

3.2.7 Distribution of module channels to a maximum of 4 submodules

Distribution of module channels to a maximum of 4 submodules

The IM 155-6 PN R1 interface module supports the distribution of channels of selected I/O modules over up to 4 submodules. This allows parts of an I/O module to be separately configured and parameterized.

A maximum of 256 submodules is supported, whereby 4 submodules are used for each interface module and one submodule for the server module.

The following functions are only executed if you have configured submodule 1 during configuration:

- Firmware update
- Write I&M data
- Calibration

3.2.8 Real-time communication

Real-time communication

A transmission method for PROFINET IO based on cyclic data exchange with a provider-consumer model.

3.2.9 Use of fail-safe modules

3.2.9.1 Redundancy switchover times for the fail-safe modules

Definition

In redundancy mode of the ET 200SP interface module, you can expect a changeover time to the active communication channel of up to 500 ms. During this time, the input and output values may be frozen during a redundancy switchover.

> ⚠ **WARNING**
>
> **Loss of the safety function**
>
> Take into account the changeover time of 500 ms for the PROFIsafe timeout time. If you choose a timeout time that is too small, the fail-safe IO modules are depassivated and the safety function may be lost.

3.2.10 System redundancy R1

System redundancy R1

An R1 redundancy mode represents a cyclic data exchange with PROFINET controllers in operating mode R1.

In a redundant R1 system, an interface module of the redundant IO device is connected to one of the redundant CPUs via system redundancy. Both the redundant CPUs and the redundant interface modules are synchronized with each other. The failure of only one connection ensures bumpless continuation of the I/O handling. See section Compatibility of modules (Page 42). Only the failure of both connections results in a station failure.

R1 mode is possible in both line and ring topology (MRP) and any other topologies.

You can find more information on individual topologies in the ET 200SP Distributed I/O System (https://support.industry.siemens.com/cs/ww/en/view/58649293) system manual.

3.2.11 System modifications during ongoing operation on S7-1500R/H (CiR)

Certain configuration changes in the RUN-Redundant system state can be carried out without interruption with system modifications during ongoing, redundant operation (Configuration in RUN, CiR).

The following configuration changes are possible:

- Add IO device
- Reconfigure I/O module

You can find more information on CiR in the S7-1500 RH system manual (https://support.industry.siemens.com/cs/us/en/view/109754833).

3.2.12 Value status of I/O modules

Value status

The IM 155-6 PN R1 interface module supports I/O modules with value status. The value status provides information about the validity of the individual process values.

Additional information on the value status can be found in the manuals for the I/O modules.

3.2.13 Reading out service data

Reading out service data

The function makes it possible to read out diagnostic and service information from the interface module.

In the case of a pending maintenance alarm, you can read out the service data and make it available to SIEMENS support for queries and product improvement.

The service data is read out using the TCP protocol. A connection on port 102 is opened for this.

Methods of reading service data

- Multi Fieldbus Configuration Tool (MFCT), V1.4.1 or higher

The download of the tool and additional information as well as documentation on the individual functions of the MFCT can be found on the Internet (https://support.industry.siemens.com/cs/de/de/view/109773881/en).

3.2.14 Reference temperature distribution

Reference temperature distribution

Specific I/O modules require a reference temperature to compensate for temperature dependence. This device supports the function of distributing this temperature on the backplane bus. Up to 4 reference temperatures can be distributed.

3.2.15 H-Sync forwarding

H-Sync forwarding

H-Sync forwarding enables a PROFINET device with MRP to forward synchronization data (synchronization frames) of a redundant S7-1500R system only within the PROFINET ring.

In addition, H-Sync Forwarding forwards the synchronization data even during reconfiguration of the PROFINET ring. H-Sync Forwarding avoids a cycle time increase if the PROFINET ring is interrupted.

3.2.16 Setting the time

The interface module supports time setting, for example, with AI Energy Meter 480VAC/CT HF (6ES7134-6PA00-0CU0).

In an application example (https://support.industry.siemens.com/cs/ww/en/view/109754890) we show you how to set the time of day.

Note that you call the block "Sync_Time_ET200SP" in the user program for each hardware identifier of the two IM 155-6 interface modules of a redundant ET 200SP R1 station. If there is a loss of redundancy on the ET 200SP R1 involved, one of the two calls of the block "Sync_Time_ET200SP" can be acknowledged with an error. If the call of one of the two blocks is successful, the time has been set in the ET 200SP R1 device.

3.2.17 Time distribution

Time distribution

For example, if there is an AI Energy Meter 480VAC/CT HF (6ES7134-6PA00-0CU0), the time is automatically distributed within the ET 200SP station. You can find more information in the section Setting the time (Page 25).

3.2.18 Diagnostic interrupts

Diagnostic interrupts

A diagnostic interrupt is a display of an error state.

If a module with diagnostic capability in which the diagnostic interrupt is released detects a change in its diagnostic state, it sends a diagnostics interrupt request to the CPU.
The CPU then interrupts the processing of the user program and processes the diagnostic interrupt OB (OB 82).

For additional information, refer to the sections Interrupts (Page 32) and Alarms (Page 34).

3.2.19 Hardware interrupts

Hardware interrupts

According to the configuration, the I/O modules or the interface module trigger a hardware interrupt for certain events/states. When a hardware interrupt occurs, the CPU interrupts the execution of the user program and runs the assigned hardware interrupt OB. The event that triggered the interrupt is entered in the start information of the assigned hardware interrupt OB by the CPU.

3.2.20 Removal/insertion of multiple I/O modules during operation (Multi Hot Swap)

Removal/insertion of multiple I/O modules during operation (Multi Hot Swap)

You can remove and insert any number of I/O modules during operation. The interface module and the inserted I/O modules remain in operation.

Reference

You can find more information on the removal/insertion of modules in the system manual Distributed I/O system ET 200SP
(https://support.industry.siemens.com/cs/ww/en/view/58649293).

3.2.21 Maintenance events

Maintenance events

A maintenance event indicates an identified maintenance requirement that has no direct influence on the function of the module. The maintenance event indicates that a check or replacement of plant components is required.

When a module with maintenance capability detects a change in its diagnostic state, it sends a maintenance request to the CPU. The CPU then interrupts the processing of the user program and processes the diagnostic interrupt OB (OB 82).

For additional information, refer to the sections Interrupts (Page 32) and Alarms (Page 34).

3.2.22 Reset to factory settings

There are two modes for resetting to factory settings:

- Resetting to factory settings via PROFINET IO or the RESET button deletes the device name, IP address, service data and I&M data 1-4 both in the selected interface module and in the corresponding BusAdapter and server module.

- Resetting via PROFINET IO using Factory Mode 8 deletes the IP address, service data and I&M data 1-4 in the device and all associated modules that support resetting to factory settings.

3.2.23 Firmware update via PROFINET IO

Firmware update via PROFINET IO

You can find information on how to perform a firmware update in the ET 200SP Distributed I/O System system manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

3.2.24 Identification data I&M 0 to I&M 3

Identification data I&M 0 to I&M 3

Identification and maintenance data (I&M data) is information saved on the module. The data is:

- Read-only (I-data) or
- Readable/writable (M-data)

Identification data (I&M0): Manufacturer information about the module that can only be read. Some identification data is also printed on the housing of the module, for example article number and serial number.
Maintenance data (I&M1, 2, 3): Plant-dependent information, e.g. installation location. Maintenance data is created during configuration and downloaded to the module.
All modules of the ET 200SP distributed I/O system support identification data (I&M0 to I&M3).

The I&M identification data supports you in the following activities:

- Checking the system configuration
- Locating hardware changes in a plant
- Correcting faults in a plant

Modules can be clearly identified online using the I&M identification data.

With TIA Portal, you can read out the identification data I&M (see online help of the TIA Portal).

You can find additional information on the identification data I&M 0 to I&M 3 in the ET 200SP distributed I/O system System Manual (https://support.industry.siemens.com/cs/ww/en/view/58649293).

Interrupts, error messages, diagnostics and system alarms

4

4.1 Status and error displays

LED displays

The figure below shows the LED indicators on the interface modules and on the BusAdapters:
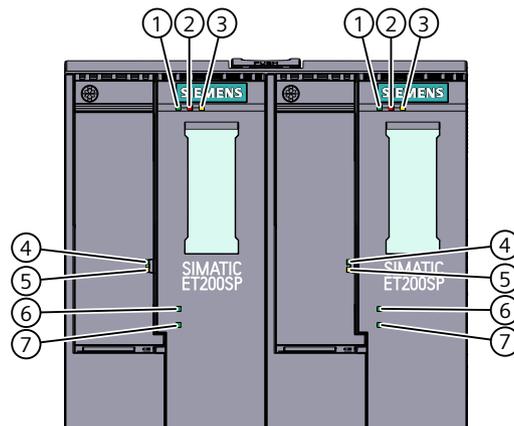
① RN (green)
② ER (red)
③ MT (yellow)
④ LK1 (green)
⑤ LK2 (green)
⑥ ACT (green)
⑦ PWR (green)

Figure 4-1 LED displays on the interface module and BusAdapter 2xRJ45

Meaning of the LEDs

The following tables contain the meaning of the status and error displays.

RN/ER/MT LEDs on the interface module

Table 4-1 Status and error displays of RN/ER/MT LEDs

LEDs			Meaning	Remedy
RN (RUN)	**ER (ERROR)**	**MT (MAINT)**		
□ Off	□ Off	□ Off	Missing or insufficient supply voltage on interface module.	Check the supply voltage or turn it on at the interface module.*
■ On	■ On	■ On	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s.	-
■ On	■ On	■ On	RN/ER/MT LEDs are permanently on: Hardware or firmware defective. Error information will be determined and stored retentively on the Flash memory.	Do not disconnect the interface module from the supply voltage while the LEDs are permanently lit up. This process takes between 20 s and 6 min.
▤ Flashes	Not relevant	Not relevant	Interface module is deactivated.	Activate the interface module with the configuration software or via the user program.
			Interface module is not configured.	Configure the interface module with the configuration software.
			ET 200SP is starting up.	-
			ET 200SP is being assigned parameters.	
■ On	Not relevant	Not relevant	ET 200SP is currently exchanging data with an IO controller.	-
Not relevant	▤ Flashes	Not relevant	Group error and group error channels	Evaluate the diagnostics and eliminate the error.
			The preset configuration does not match the actual configuration of the ET 200SP.	Check the design of the ET 200SP R1 to see whether a module is missing or defective, or whether a non-configured module is inserted.
			Invalid configuration states	You can find information on the hardware configuration of the ET 200SP R1 in the ET 200SP Distributed I/O System system manual; section Application planning, Hardware configuration.
			Parameter assignment error in the I/O module	Evaluate the display of the module status in HW Config and eliminate the error in the respective I/O module.
Not relevant	Not relevant	▤ On	A maintenance required is present, that is, at least one maintenance event has occurred.	You can find more information in the section Maintenance alarms (Page 36).
▤ Flashes	▤ Flashes	▤ Flashes	The "Node flash test" is run (the LEDs LK1 and LK2 of the PROFINET interface also flash).	Restart the device by disconnecting and reconnecting the supply voltage and read out the service data as described in the manual. Replace the interface module.
			Hardware or firmware defective (the LEDs LK1 and LK2 of the PROFINET interface do not flash).	-

* PWR LED on (on the interface module): Check the backplane bus for short-circuit.

ACT LED on the interface module

Status display of the ACT LED

ACT LED	Meaning
□ Off	There is no active data exchange with the I/O modules via this interface module.
☀ On	Active data exchange with the I/O modules is taking place via this interface module. The partner interface module is ready for operation and can take over the data exchange in the event of a switchover.
Flashes	Active data exchange with the I/O modules is taking place via this interface module. The partner interface module is not operational and **cannot** take over the data exchange during a switchover.

PWR LED on the interface module

Status display of the PWR LED

PWR LED	Meaning	Remedy
□ Off	Missing or insufficient supply voltage at the interface module.	Check the supply voltage.
☀ On	Supply voltage L+ is available.	-

LK1/LK2 LEDs on the BusAdapter

Status display of the LK LED

LK1/LK2 LEDs	Meaning	Remedy
□ Off	There is no Ethernet connection between the PROFINET IO interface of your PROFINET device and a communication partner (e.g. IO controller).	Check whether the bus cable to the switch/IO controller is interrupted or whether the port is disabled.
On	There is an Ethernet connection between the PROFINET IO interface of your PROFINET device and a communication partner (e.g. IO controller).	-
☀ Flashes	The "Node flash test" is run (the RN/ER/MT LEDs also flash).	-

LED display of configuration errors

Configuration errors of the ET 200SP distributed IO system are indicated on the interface module via the red ERROR LED and the yellow MAINT LED.

The following configuration errors are indicated by the LEDs:

- Server module missing during startup of station
- Interruptions or short circuit on the backplane bus

Principle of operation

You determine the information on the cause of the error with the LED error display. After notification by the flash signal, the error type is displayed followed by the error location/error code.

The LED error display:

* Is activated during POWER ON and during operation.

* Takes precedence over all other states indicated by the ERROR LED (ER) and MAINT LED (MT).

* Remains on until the cause of the error has been eliminated.

Table 4-2 Display of error type and error location

Sequence		Description
1	The ERROR and MAINT LEDs flash 3x at 0.5 Hz	Signaling of error type
2	MAINT LED flashes at 1 Hz	Display of the error type (decimal)
3	The ERROR and MAINT LEDs flash 3x at 2 Hz	Signaling of error location/error code
4	The ERROR LED flashes at 1 Hz	Display of tens digit (decimal) of the error location/error code
5	The MAINT LED flashes at 1 Hz	Display of ones digit (decimal) of the error location/error code
6	Repetition of 1 to 5 until the cause of the error has been eliminated.	

Error display

Table 4-3 Error display

Error type (MAINT)	Error location (ERROR/ MAINT)	Cause of error	Remedy
1	65	• No server module • Interruptions at the backplane bus • Short circuit of communication on the backplane bus	Check the configuration of the ET 200SP.

NOTE

A short circuit in the backplane bus supply or the bus connection supply is indicated by the following LEDs:

* PWR LED: On

* RN, ER and MT LED: Off

More information on the BusAdapters and their status and error displays is available in the BusAdapter (https://support.industry.siemens.com/cs/ww/en/view/109751716) manual.

Show not supported BusAdapter

The LEDs RN (flashes), ER (flashes) and MT (off) on the interface module indicate that no supported BusAdapter has been inserted.

See also

Diagnostics alarms (Page 34)

Reading out service data (Page 24)

4.2 Interrupts

Introduction

The I/O device generates interrupts as a reaction to specific error events. Interrupts are evaluated based on the I/O controller used.

Evaluating interrupts with I/O controllers

The ET 200SP distributed I/O system supports the following interrupts:

- Diagnostics interrupts
- Hardware interrupts
- Pull/plug interrupts
- Maintenance events

In the event of an interrupt, interrupt OBs are automatically called in the CPU of the IO controller.

Information on the cause and class of the error is already available, based on the OB number and start information.

Detailed information on the error event can be obtained in the error OB using the instruction "RALRM" (read additional interrupt information).

System diagnostics

In STEP 7 (TIA Portal), the innovated system diagnostics is available for the devices of the S7-1500 automation system (IO controller S7-1500 CPU) and ET 200SP (IO device). Independent of the cyclic user program, alarms are made available on the display of the S7-1500 CPU, the CPU web server and the HMI device.

You will find more information on system diagnostics in the Diagnostics (https://support.industry.siemens.com/cs/ww/en/view/59192926) function manual.

4.2.1 Triggering of a diagnostics interrupt

Triggering of a diagnostics interrupt

For an incoming or outgoing event (e.g. wire break on a channel of an I/O module), the module triggers a diagnostics interrupt if this is configured accordingly.

The CPU interrupts the processing of the user program and processes the diagnostics interrupt OB (OB 82). The event that triggered the interrupt is entered in the start information of the diagnostics interrupt OB.

4.2.2 Triggering a hardware interrupt

Triggering a hardware interrupt

In the event of a hardware interrupt, the CPU interrupts processing of the user program and processes the process interrupt OB, e.g. OB 40. The event that triggered the interrupt is entered in the start information of the hardware interrupt OB.

NOTE

Diagnostics "Hardware interrupt lost" (from I/O module)

Do not use hardware interrupts for functional purposes (e.g. cyclic generation of hardware interrupts).

If the hardware interrupt load is too high, hardware interrupts can get lost depending on the number of I/O modules and the communication load.

4.2.3 Triggering of a pull/plug interrupt

Triggering of a pull/plug interrupt

In the event of a pull/plug interrupt, the CPU interrupts processing of the user program and processes the pull/plug OB (OB 83). The event that triggered the interrupt is entered in the start information of the pull/plug OB.

NOTE

Parameter assignment error after removal/insertion

If you write data records from the user program to the modules of the distributed I/O, make sure that these modules actually exist and are available. You can do this by evaluating OB83. After inserting a module, OB83 is not called until the module has started up and its parameters are assigned. This ensures that data record operations can be executed without errors.

4.2.4 Triggering of a maintenance event

Triggering of a maintenance event

The PROFINET IO interfaces of the interface module support the diagnostic concept and maintenance concept in PROFINET IO according to the IEC 61158 Type 10 standard. The goal is to detect and remove potential problems as early as possible.

For the interface module, maintenance events signal to the user when a plant component must be checked or replaced.

The CPU interrupts the processing of the user program and processes the diagnostic interrupt OB (OB 82). The event that triggered the maintenance event is entered in the start information of the diagnostic interrupt OB.

4.3 Alarms

Introduction

The ET 200SP distributed I/O system generates the following alarms:

- Diagnostic alarms
- Maintenance alarms

4.3.1 Diagnostics alarms

Actions after a diagnostic alarm

There can be more than one diagnostics alarm at the same time. Each diagnostic alarm initiates the following actions:

- The ERROR LED of the interface module flashes red.
- Diagnostic data is reported as diagnostic interrupts to the CPU of the IO controller and can be read via data records.
- Incoming diagnostic alarms are saved to the diagnostic buffer of the IO controller.

Table 4-4 Diagnostic alarms, their meaning and possible remedies

Diagnostic alarm	Channel error type (CET)	Extended Channel Error Type (ECET)	Associated value AddValue	Meaning / Cause	Remedy
Configuration error: Station stop - missing or wrong server module	0x0602	0x0693	-	No server module was plugged in during startup of an ET 200SP station.	Check that the server module is installed correctly in the rack.
Configuration error: Permitted size of backplane exceeded	0x0602	0x0698	-	The total width of the installed modules exceeds the permitted configuration length of 1 000 mm.	Check that the configuration of the backplane bus does not exceed the permitted size.
Configuration error: Incorrect backplane bus configuration in slot <slot>	0x0602	0x0699	Slot	The maximum power requirement of all installed modules exceeds 2 100 mA in total. The associated value <slot> indicates the faulty slot.	Check backplane mounting.
Configuration error: Invalid BusAdapter on the interface module	0x0602	0x069C	-	The installed BusAdapter does not correspond to the configuration.	Check project planning and mounting of the right BusAdapter.
Configuration error: Module parameter 'potential group' incorrect or wrong BaseUnit/TerminalBlock on real configuration slot <slot>	0x0602	0x069F	Slot	The configured BaseUnit or the terminal block does not match the real configuration.	Check for suitable base unit or terminal block.
Load voltage error: Missing voltage in load group at slot according channel number	0x0610	0x6B0	-	No supply voltage to the load group.	Check the load supply voltage of the modules.
Redundancy error: Maintenance demanded <internal error code>	0x0630	0x06D0	ErrorCode	There is a problem which may lead to redundancy loss.	Perform the operating instructions described in the manual. The interface modules and the BaseUnit should be replaced at the next opportunity.*)
Redundancy error: Failure in BusAdapter of partner module	0x0630	0x06D2	-	The BusAdapter of the redundancy partner module is not installed or is not supported.	Replace BusAdapter of partner module.

*) Read the service dataaccording tothe description in the manual andsend them to the SIEMENS CustomerSupport for root cause analysis.

PROFINET IO

Another source of diagnostic events is the PROFINET basic technology in use. It generates diagnostics messages containing coding that is already defined in the PROFINET IO Standard - Application Layer Service Definition V2.2.

The actual scope of diagnostics used is dependent on the configuration and parameter assignment.

You can download the standard if needed on the Internet (https://www.profibus.com) from the home page of the PROFIBUS user organization.

4.3.2 Maintenance alarms

Maintenance alarms

A maintenance event is generated each time a maintenance requirement is identified. The maintenance LED on the interface module lights up in yellow.

NOTE

Maintenance messages have no direct effect on the module function.

Table 4-5 Maintenance messages, their meaning and possible remedies

Maintenance message	Channel error type (CET)	Extended Channel Error Type (ECET)	Associated value AddValue	Meaning / Cause	Remedy
Configuration error: Missing or wrong server module	0x0602	0x069E	-	When operating an ET 200SP station, the server module is pulled.	Check that the server module is installed correctly in the rack.
Redundancy error: Maintenance demanded <internal error code>	0x0630	0x06D0	ErrorCode	There is a problem which may lead to redundancy loss.	Perform the operating instructions described in the manual. The interface modules and the BaseUnit should be replaced at the next opportunity.*)
Redundancy error: Power supply malfunctioning	0x0630	0x06D1	-	There is a problem with the power supply which may lead to redundancy loss.	Perform a maintenance cycle as described in the manual. **)
Redundancy error: Redundancy partner with different hardware or software version	0x0630	0x06D3	-	The hardware/firmware versions of the redundancy partners are not identical.	Replace the module with one with the same MLFB of the redundancy partner, or perform a firmware update with the identical version of the redundancy partner.
Hardware error: Failure on access of flash memory in base unit or in carrier module	0x0640	0x06E0	Slot	An error in the memory block on the BaseUnit was detected during operation.	Check if the base unit or the carrier module is mounted correctly into the rack or replace base unit or the carrier module.

*) Read the service data according to the description in the manual and send them to the SIEMENS Customer Support for root cause analysis.

*- As described in theET 200SP Distributed I/O System system manual

*)

Maintenance message	Channel error type (CET)	Extended Channel Error Type (ECET)	Associated value AddValue	Meaning / Cause	Remedy
Hardware error: Failure on access of flash memory in BusAdapter	0x0640	0x06E1	Slot	An error of the memory block of the BusAdapter was detected during operation.	Check if the BusAdapter is mounted correctly into the module or replace the BusAdapter.
Hardware error: Module resource limit has been reached	0x0640	0x06E2	Error code	The internal memory block was overloaded. Example: Increased memory requirements caused by extreme overload over PROFINET (denial of service).	Read the service data according to the description in the manual and send them to the SIEMENS Customer Support for root cause analysis.
Hardware error: Increased disturbances detected	0x0640	0x06E4	Error code	For more detailed information, see the following section Compatibility (Page 42).	Check the operational environment of your rack with regard to external impacts (e.g. high voltage pulses, EMC, radiation). To reset the diagnosis, read the service data according to the description in the manual and send them to the SIEMENS Customer Support for root cause analysis.

*) Read the service data according to the description in the manual and send them to the SIEMENS Customer Support for root cause analysis.

*- As described in theET 200SP Distributed I/O System system manual

*)

4.3.2.1 Automatic restart of the interface module in case of error

Automatic restart of the interface module in case of error

In the following situations, the interface module is restarted automatically:

- Detected code distortions, for example due to radiation exposure (cosmic rays or a radioactively contaminated environment)
- Firmware error

It can take 20 s to 6 minutes between detecting such an error and restarting. For this time, there is a loss of redundancy.

If the error leads to a maintenance alarm "Hardware error: Increased disturbances detected", read out the service data from the device and make it available to SIEMENS support for queries and product improvement. Only reading out service data leads to the reset of the Maintenance LED display.

You can find more information on reading out the service data in section Reading out service data (Page 24).

4.3.2.2   Invalid configuration states of the ET 200SP on PROFINET IO

Invalid configuration states

The following invalid configuration states prevent data exchange:

- Number of modules exceeds maximum configuration. You can find additional information on the maximum configuration in the section Properties (Page 14).

- Faulty backplane bus (e.g. defective BaseUnit). An interruption of the ET 200SP backplane bus does not trigger an interrupt.

- Server module missing during startup of station

- Invalid or incorrectly configured BusAdapter
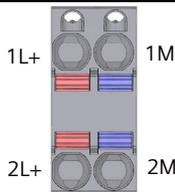
Wiring

5

5.1 Pin assignment

Definition

Each interface module has its own 24 V connection.

24 V DC supply voltage

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

Table 5-1 Pin assignment 24 V DC supply voltage

View		Signal name [1]	Description
Connector	IM con-nection		
		1L+	24 V DC
		2L+	24 V DC (for looping through)[2]
		1M	Ground
		2M	Ground (for looping through)[2]

[1] 1L+ and 2L+ as well as 1M and 2M are bridged internally

[2] Maximum 10 A permitted

Reference

You can find more information on connecting the interface module and on the accessories in the ET 200SP distributed I/O system (https://support.industry.siemens.com/cs/ww/en/view/58649293) system manual.
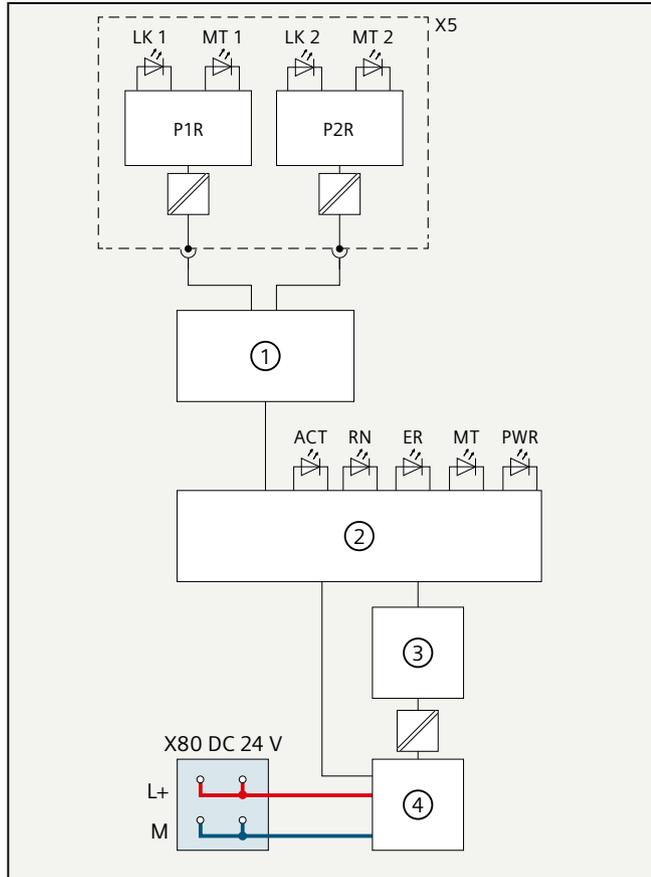
You can find more information on the pin assignment of the BusAdapter under PROFINET IO BusAdapter (https://support.industry.siemens.com/cs/ww/en/view/109773801).

5.2 Schematic circuit diagram

Schematic circuit diagram

The following figure shows the block diagram of the IM 155-6 PN R1 interface module.

①	Switch	L+	24 V DC supply voltage
②	ET 200SP backplane bus interface and electronics	M	Ground
③	Backplane bus	LK 1,2	Link TX/RX LED (green)
④	Internal voltage distribution	MT 1,2	MAINTENANCE FiberOptic LED (optional, yellow)
X80	24 V DC supply voltage infeed	ACT	ACTIVE LED (green)
X5	BusAdapter	RN	RUN LED (green)
P1R	PROFINET interface X1 port 1	ER	ERROR LED (red)
P2R	PROFINET interface X1 port 2	MT	MAINTENANCE LED (yellow)
		PWR	Power LED (green)

Figure 5-1 Schematic circuit diagram of the IM 155-6 PN R1 interface module

Parameter

<div align="right">

6

</div>

Description

You configure the ET 200SP R1 on a redundant S7-1500H system.

6.1 Status of the supply voltage L+ of the I/O modules

You can find information on the status of the supply voltage L+ of the I/O modules in the Server module (https://support.industry.siemens.com/cs/ww/en/view/63257531) equipment manual.

6.2 Substitute value behavior

The substitute value behavior in the ET 200SP distributed I/O system is executed by the IO controller for each slot.

The respective output behaves according to its configured substitute value behavior:

- Current-free/voltage-free
- Output substitute value
- Keep last value

The substitute value behavior is triggered in the following cases:

- STOP of H-system (both controllers are in STOP state at the same time)
- H-system failure (connection interruption on both controllers at the same time)
- Stop of station, e.g. due to missing server module during startup of the ET 200SP R1 station
- Deactivating the IO device

NOTE

Reducing a configuration

If you reduce the configuration of the ET 200SP distributed I/O system and download the configuration to the CPU, the modules which are no longer configured but still present retain their original substitute value behavior. This applies until the supply voltage is switched off at the interface module or the modules are removed.

The "current-free/voltage-free" behavior takes effect in the following cases:

- Incorrectly configured module
- Module with incorrect parameter assignment

Compatibility

7

7.1 Compatibility of modules

Station configuration with more than 32 I/O modules

Certain I/O modules with functional status 001 and 002 do not support a station configuration with more than 32 I/O modules.

The following table shows all modules that do not support a station configuration with more than 32 I/O modules.

Table 7-1 Incompatible modules with functional status

Modules	Article number	Up to and including functional status
Analog modules		
AI 4xI 2-/4-wire ST	6ES7134-6GD00-0BA1	002
AI 4xU/I 2-wire ST	6ES7134-6HD00-0BA1	002
AI 4xRTD/TC 2-/3-/4-wire HF	6ES7134-6JD00-0CA1	002
AI 4xU/I ST	6ES7135-6HD00-0BA1	002
Digital modules		
DI 16x24VDC ST	6ES7131-6BH00-0BA0	002
DI 8x24VDC ST	6ES7131-6BF00-0BA0	002
DQ 16x24VDC/0.5A ST	6ES7132-6BH00-0BA0	002
DQ 4x24VDC/2A ST	6ES7132-6BD20-0BA0	002
DQ 8x24VDC/0.5A ST	6ES7132-6BF00-0BA0	002

Bumpless changeover of modules

You can find additional information on the bumpless changeover of modules in the Product Information on the Internet (https://support.industry.siemens.com/cs/ww/en/view/73021864).

Operation of modules in isochronous mode

Since the ET 200SP R1 system does not support isochronous mode, there is a corresponding functional limitation with modules (e.g. TM Timer DIDQ 10x24) that require isochronous mode for full functionality.

Data record repetition on redundancy switchovers

> During a redundancy switchover, it may happen that a data record addressed to the module does not reach the recipient or the data record response cannot be delivered. In these cases, there is an automatic repetition of data records.
>
> For some modules, this behavior may result in error messages or state errors in related instructions. Therefore, you must evaluate the error messages for these instructions and react to them in an application-specific manner.
>
> The following table shows affected modules and instructions.

Table 7-2 Modules and instructions that require an application-specific error response

Modules	Instruction	Article number
ET 200SP, CM PTP		6ES7137-6AA00-0BA0
ET 200SP, CM PTP	• PtP communication • USS communication • MODBUS (RTU) • ET200S serial interface • SIMATIC NET CP	6ES7137-6AA01-0BA0

Technical specifications

<div align="right">

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Technical specifications of IM 155-6 PN R1

The following table shows the technical specifications as of 11/2022. You can find a data sheet including daily updated technical specifications on the Internet (https://support.industry.siemens.com/cs/de/en/pv/6ES7155-6AU00-0HM0/td?dl=en).

Article number	6ES7155-6AU00-0HM0
General information	
Product type designation	IM 155-6 PN R1
HW functional status	From FS03
Firmware version	V6.1
• FW update possible	Yes
Product function	
• I&M data	Yes; I&M0 to I&M4
• Module swapping during operation (hot swapping)	Yes; Multi-hot swapping
• Isochronous mode	No
• IRT	No
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V19
• STEP 7 configurable/integrated from version	use GSD file
• PROFINET from GSD version/GSD revision	GSDML V2.45
Configuration control	
via dataset	No
CiR - Configuration in RUN	
Reparameterization possible in RUN	Yes
reconfiguration possible in RUN	Yes
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Short-circuit protection	Yes
Mains buffering	
• Mains/voltage failure stored energy time	10 ms
Input current	
Current consumption, max.	700 mA
Inrush current, max.	5 A
I^2t	0.36 A²·s

Article number	6ES7155-6AU00-0HM0
Power loss	
Power loss, typ.	2.4 W
Address area	
Address space per module	
• Address space per module, max.	288 byte; For input and output data respectively
Address space per station	
• Address space per station, max.	1 440 byte
Hardware configuration	
Rack	
• Quantity of operable ET 200SP modules, max.	64
• Quantity of operable ET 200AL modules, max.	0
Submodules	
• Number of submodules per station, max.	256
Interfaces	
Number of PROFINET interfaces	1; 2 ports (switch)
1. Interface	
Interface types	
• RJ 45 (Ethernet)	Yes; with BusAdapter
• Number of ports	2; with BusAdapter
• integrated switch	Yes
• BusAdapter (PROFINET)	Yes; BA 2x RJ45, BA 2x M12, BA 2x FC, BA 2x SCRJ, BA SCRJ/RJ45, BA SCRJ/FC, BA 2x LC, BA LC/RJ45, BA LC/FC, BA 2x LC-LD, BA LC-LD/RJ45, BA LC-LD/M12
Protocols	
• PROFINET IO Device	Yes
• Open IE communication	Yes
• Media redundancy	Yes; PROFINET MRP client
PROFINET IO Device	
Services	
– IRT	No
– PROFIenergy	No
– Prioritized startup	No
– Shared device	No

Article number	6ES7155-6AU00-0HM0
Interface types	
RJ 45 (Ethernet)	
• Transmission procedure	PROFINET with 100 Mbit/s full duplex (100BASE-TX)
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes
Protocols	
Supports protocol for PROFINET IO	Yes
PROFIsafe	Yes
PROFIBUS	No
EtherNet/IP	No
Modbus TCP	No
Redundancy mode	
• PROFINET system redundancy (S2)	No
• PROFINET system redundancy (R1)	Yes
• H-Sync forwarding	Yes
Media redundancy	
– MRP	Yes
– MRPD	No
Open IE communication	
• TCP/IP	Yes
• SNMP	Yes
• LLDP	Yes
Interrupts/diagnostics/status information	
Status indicator	Yes
Alarms	Yes
Diagnostics function	Yes
Diagnostics indication LED	
• RUN LED	Yes; green LED
• ERROR LED	Yes; red LED
• MAINT LED	Yes; Yellow LED
• ACT LED	Yes; green LED
• Monitoring of the supply voltage (PWR-LED)	Yes; green PWR LED
• Connection display LINK TX/RX	Yes; 2x green link LEDs on BusAdapter
Potential separation	
between backplane bus and electronics	No
between PROFINET and all other circuits	Yes; 1500 V AC (type test)
between supply and all other circuits	Yes

Article number	6ES7155-6AU00-0HM0
Permissible potential difference	
between different circuits	Safety extra low voltage SELV
Isolation	
Isolation tested with	707 V DC (type test)
Security	
PROFINET Security Class	1
signed firmware update	Yes
Secure Boot	No
safely removing data	No
data integrity	Yes
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-30 °C; No condensation
• horizontal installation, max.	60 °C
• vertical installation, min.	-30 °C; No condensation
• vertical installation, max.	50 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	2 000 m
Connection method	
ET-Connection	
• via BU/BA Send	No
Dimensions	
Width	50 mm
Height	138 mm
Depth	89 mm
Weights	
Weight, approx.	192 g; without BusAdapter

Dimension drawing

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This appendix contains the dimension drawing of the ET 200SP R1 including its BaseUnit, mounted on a SIMATIC system rail. You must take into account the dimensions for installation in cabinets, control rooms, etc.
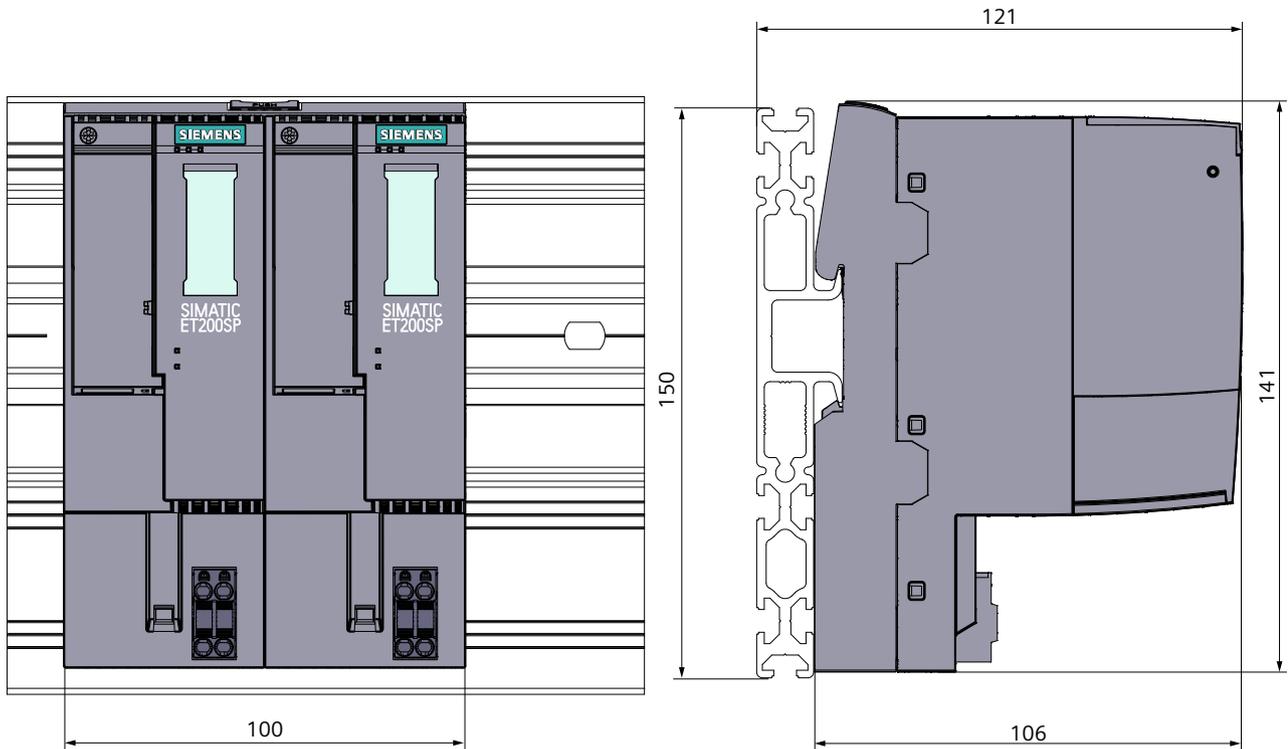

Figure A-1 Dimension drawing for ET 200SP R1 (front and side view)