SIEMENS

SIMATIC

S7
EIP-200S Ethernet/IP Adapter Distributed I/O System

System Manual

06/2018

A5E44345053-AB

Legal information

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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.

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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.

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

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The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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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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Document order number: ZNX-EIP-200S
℗ 06/2018 Subject to change

Preface

Trademarks

This manual references technologies whose names are trademarked by ODVA, the Open DeviceNet Vendors Association. The ODVA technologies referenced in this manual include:

- EtherNet/IP™
- CIP™ (Common Industrial Protocol)
- QuickConnect™

For more information on ODVA and its trademarked technologies, visit the ODVA website (http://www.odva.org).

Purpose of the manual

The information in this manual is intended to enable you to operate the EIP-200S Ethernet/IP Adapter on Ethernet/IP.

Required basic knowledge

To understand this manual, it is necessary to have a general knowledge of automation engineering.

Scope of the manual

This manual describes the following product:

EIP-200S Ethernet/IP Adapter

Certifications, Marks, and Standards

The EIP-200S Ethernet/IP Adapter complies with Ethernet/IP Specification CIP Networks Library Volume 2: Ethernet/IP Adaption of CIP, Edition 1.22.

Refer to General technical specifications (Page 91) for more information.

Service and Support

In addition to our documentation, Siemens offers technical expertise on the Internet and on the customer support web site (http://support.industry.siemens.com).

Contact your Siemens distributor or sales office for assistance in answering any technical questions, for training, or for ordering S7 products. Because your sales representatives are technically trained and have the most specific knowledge about your operations, process and industry, as well as about the individual Siemens products that you are using, they can provide the fastest and most efficient answers to any problems you might encounter.

Documentation and information

The following list shows a summary of the documentation packages or manuals related to the ET 200S system, which can be found on the Siemens Service & Support Website (http://support.automation.siemens.com)

- EIP-200S Ethernet/IP Adapter (this manual)
- ET 200S Distributed I/O System Operating Instructions
- ET 200S Distributed I/O System Manuals:
  - Interface Modules
  - PM-E Power Modules
  - Reserve Modules
  - Digital Electronic Modules
  - Analog Electronic Modules
- Terminal Modules for Power and Electronic Modules
- Motor Starters and Frequency Converters

See also

Automation / partner (http://www.siemens.com/automation/partner)

Automation support (http://support.automation.siemens.com)

Security information

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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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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 (https://www.siemens.com/industrialsecurity).

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Product overview

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1.1 What are distributed I/O systems?

Distributed I/O systems - area of application

When a system is set up, the inputs and outputs from and to the process are often located centrally in the programmable logic controller.

If there are inputs and outputs at considerable distances from the programmable logic controller, there may be long runs of cabling which are not immediately comprehensible, and electromagnetic interference may impair reliability.

Distributed I/O systems are the ideal solution in such cases:

- The controller CPU is located centrally.
- The I/O systems (inputs and outputs) operate locally on a distributed basis.
- The high-performance EIP-200S Ethernet/IP Adapter network ensures that the controller CPU and I/O systems communicate smoothly.

1.2 What is the ET 200S distributed I/O system?

The ET 200S distributed I/O system is a modular, extremely flexible I/O system with IP20 degree of protection.

Area of application

You can connect virtually any number of I/O modules in virtually any combination right next to the interface module. This means you can adjust the configuration to suit local requirements.

Depending on the interface module, each ET 200S system can consist of up to 63 modules - for example, power modules, I/O modules, and motor starters.

The fact that motor starters can be integrated (switching and protecting any three-phase load up to 7.5 kW) ensures that the ET 200S can be quickly adapted to suit virtually any process-related use of your machine.

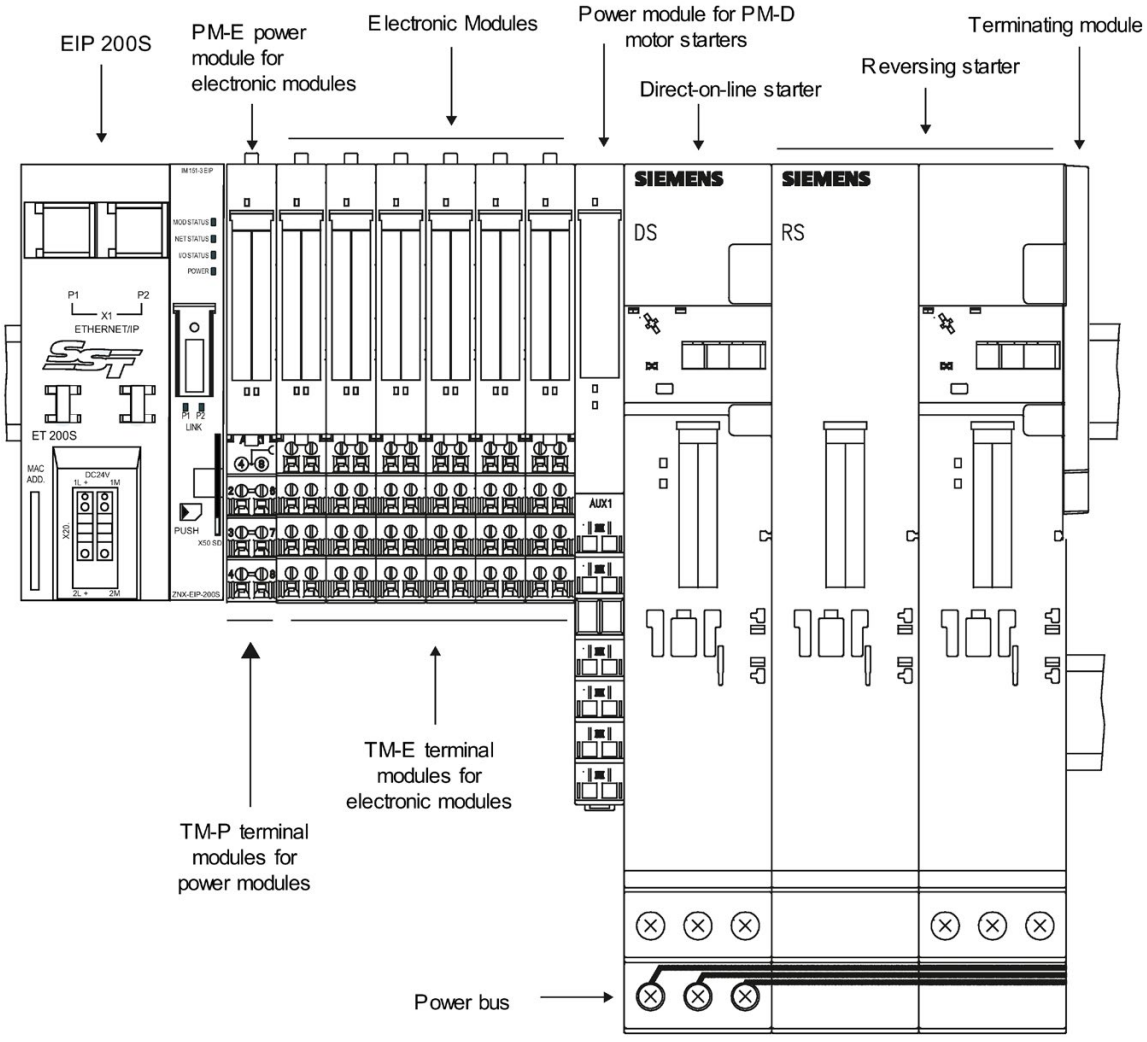
Terminal modules and electronic modules

The ET 200S distributed I/O system consists primarily of various passive terminal modules to which you connect the electronic modules and motor starters.

The EIP-200S Ethernet/IP Adapter enables the ET 200S distributed I/O system to be connected to the Ethernet/IP network.

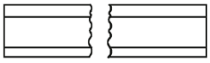
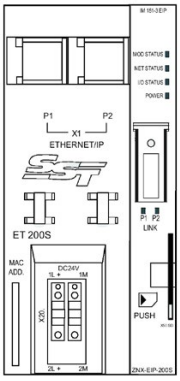
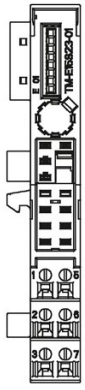
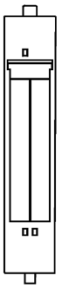
View

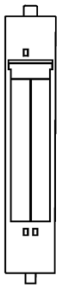
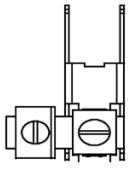
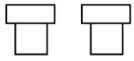
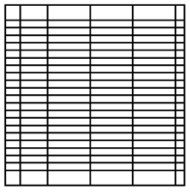
The illustration below shows an example of an ET 200S distributed I/O system configuration:



ET 200S components

The table below provides an overview of the most important components of the ET 200S system:

Component	Function	Drawing
Rail	Carries the ET 200S. You mount the ET 200S on the rail.	
Interface module: EIP-200S Ethernet/IP Adapter	Connects the ET 200S with the EIP-200S Ethernet/IP Adapter and prepares the data for the electronic modules and motor starters.	
Terminal module	Carries the wiring and receives the power and electronic modules. Terminal modules are available in the following variants: • For power modules • For electronic modules • With screw-type terminal • With spring terminal • With Fast Connect (quick connection method, no stripping required)	
Power module	Monitors the voltage for all the electronic modules in the potential group. The following power modules are available: • For a 24 VDC supply with diagnostics • For a 24 to 48 VDC supply with diagnostics • For a 24 to 48 VDC, 24 to 230 VAC supply with diagnostics and fuse	

Component	Function	Drawing
Electronic module	Is connected to the terminal module and determines the function: • Digital input modules with 24 VDC, 120/230 VAC and NAMUR • Digital output modules with 24 VDC and 120/230 VAC • Relay modules • Analog input modules with voltage, current, and resistance measurement; thermal resistance; and thermocouples • Analog output modules for voltage and current	
Terminating module	Terminates the ET 200S and can be used to carry 6 reserve fuses (5 mm x 20 mm).	
Shield contact	For connecting cable shields.	
Slot number labels	For identifying the slots on the terminal module.	
Color identification labels	Permit customer and country-specific identification of the terminals on the terminal module.	
Labeling sheet (DI A4, perforated, foil)	For machine labeling or printing - 80 strips per labeling sheet	

1.3 The EIP-200S Ethernet/IP Adapter

EIP-200S Ethernet/IP Adapter interface module package

The EIP-200S Ethernet/IP Adapter module package includes as one unit the following listed components:

- Interface module and terminating module (EIP-200S Ethernet/IP Adapter)
- Companion Disk with EIP ET200 Configuration Tool and EIP ET200 Configuration Tool User Manual
- Power connector
- SD memory card (6ES7954-8LC03-0AA0)

Order number

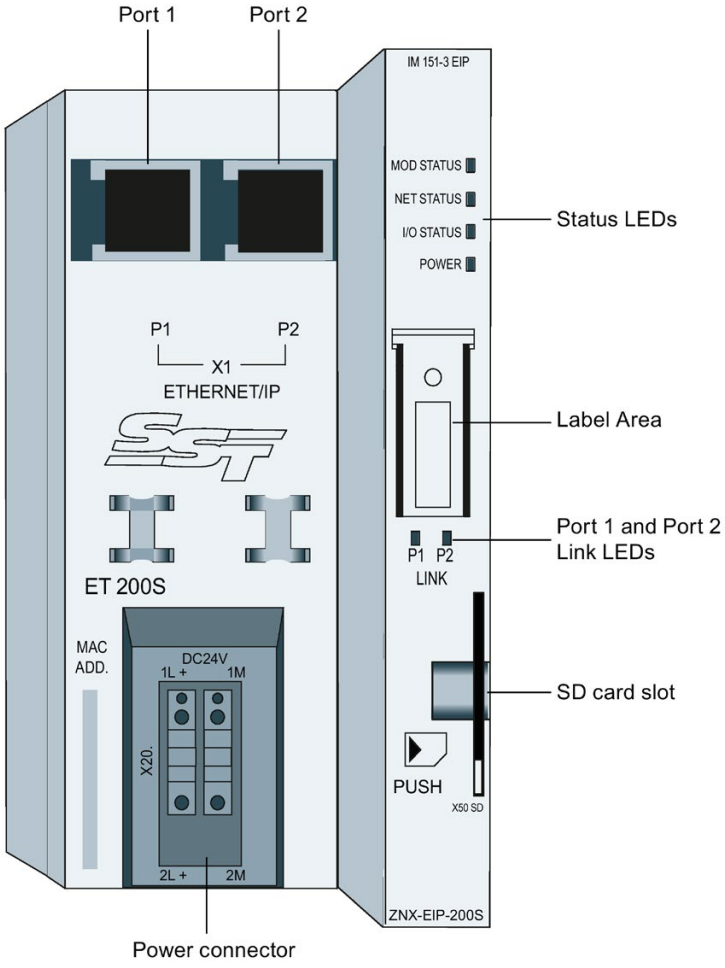
ZNX-EIP-200S

EIP-200S Ethernet/IP Adapter module features

The EIP-200S Ethernet/IP Adapter is a communications adapter for interfacing to the Siemens SIMATIC ET 200S distributed I/O system. It provides connectivity between an Ethernet/IP network and ET 200S power and I/O modules, and has the following features:

- It prepares the data for the electronic modules and motor starters that are fitted.
- It supplies the backplane bus.
- The maximum address space is 255 bytes for inputs and 255 bytes for outputs.
- The reference potential M of the rated supply voltage of the interface module to the rail (protective conductor) is connected by means of an RC combination, thus permitting an ungrounded configuration.
- A maximum of 63 modules can be operated with the interface module.
- The maximum width of the station is 1 m. The width can be between 1 m and 2 m, but the adapter Bus Length parameter must be set to >1 m, and the response time would increase. See the topic entitled "Parameters" for more information.
- The maximum parameter length for the entire station is 237 bytes.
- Grouping of modules within one byte (packing)
- Device Level Ring (DLR) operation

The following illustration shows the hardware features of the EIP-200S Ethernet/IP Adapter module:



24 VDC terminals

The 24 VDC Quick Release terminal connector on the front of the EIP-200S Ethernet/IP Adapter module provides logic power for the adapter module itself.

I/O features

The EIP-200S Ethernet/IP Adapter provides the following I/O features:

- Provides support for most ET 200S modules
- Supports up to 63 modules per EIP-200S Ethernet/IP Adapter module
- Supports electronic module parameterization
- Supports electronic module diagnostics

1.4 Features and benefits of the EIP-200S Ethernet/IP Adapter

The following table lists the features and benefits of the EIP-200S Ethernet/IP Adapter:

Features	Benefits
Structure	
Finely-graduated modular design: • 1/2/4/8 channel electronic modules • Power modules • Integrated motor starters	• Function-oriented, cost-optimized station design • Considerable reduction in outlay for configuration and documentation • Space savings due to arbitrary arrangement of the modules
Extensive range of electronic modules	Broad area of application
Communication capacity, system-integrated motor starter: direct and reversing starter to 7.5 kW	PLC inputs and outputs, terminal blocks, circuit breakers and contactors in a plug-in module save space and the effort involved in wiring
Permanent wiring due to the separation of mechanical and electronic components	• Prewiring possible • Module replacement during operation of the EIP-200S ("hot swapping")
Individual connection of power modules to common potential	• Individual formation of potential groups (identifiable by color coding of the TM-P terminal modules for power modules) • Simple load interruption
DLR media redundancy	Ring structures with Device Level Ring (DLR) support
Robust structure for rough industrial conditions (5 g vibration resistance)	High operating reliability when mounted directly on the machine, high availability
Connection system	
Integrated voltage buses	Reduced effort required for wiring
Power bus up to 50 A for motor starters	Minimization of wiring in 400 V range
Screw-type terminals, spring terminals, and Fast Connect	A change in terminal connection method is not necessary
• 2- and 3-wire connection, or • 2-, 3-, and 4-wire connection	Optimal selection on grounds of space and cost
Fast Connect	• Quick connection method with no stripping required • Saves time with wiring
Terminal box in terminal module replaceable	No need to remove the terminal module in the event of terminal damage
Automatic coding of the I/O modules	Quick and reliable module replacement
Large label plate	Adequate space for clear identification
With motor starters up to safety category 4 in accordance with EN 954-1	Saves money on costly safety equipment

1.5 What is Device Level Ring (DLR)?

DLR network

A DLR network is a single-fault-tolerant ring network that is intended for the interconnection of automation devices without the need for more switches. This topology is also implemented at the device level. The ring topology offers the following advantages:

- Media redundancy
- Fast-network fault detection and reconfiguration
- Resiliency of a single-fault-tolerant network
- Easy implementation without more hardware requirements

The DLR network includes at least one node configured to be a ring supervisor, and any number of normal ring nodes utilizing embedded switch technology. The ZNX:EIP200S is a Beacon based ring node and processes the Beacon frames sent by the ring supervisor. When a fault occurs on the DLR network, the ring nodes reconfigure themselves and relearn the network topology. Additionally, ring nodes can report fault locations to the active ring supervisor. For more information about Beacon/Announce based ring nodes, see ODVA publication, EtherNet/IP Adaptation of CIP, Vol2_1.22, chapter 9-5 Device Level Ring Protocol.

NOTICE

Important network configuration considerations:

- Depending on your network architecture, DLR topology limitations can exist. Make sure to validate your DLR topology within the larger network before production use.
- Do not connect non-DLR devices directly to the ring network. Non-DLR devices must be connected to the network through secondary devices (for example, an Ethernet tap)
- In a DLR network, you must configure at least one of the supervisor-capable devices as the ring supervisor before physically closing the ring. A backup supervisor is recommended in case of a supervisor fault.
- Run all nodes on the DLR network at 100 Mbps and in Full-duplex mode. These configuration values provide the best performance. Otherwise, run all nodes in Auto-Negotiate. Do not use Auto-Negotiate on one node and then force the baud rate on the next node linked to it.
- Devices running at 10 Mbps should be connected through a network tap using the device port. If you connect a 10 Mbps device directly to the network, instead of through a tap, the linear or DLR network traffic slows to 10 Mbps. Additionally, if the 10 Mbps device is connected to the network without a network tap, network recovery times are significantly impacted.

EIP-200S Ethernet/IP Adapter

2

Hardware configuration

See the separate manual "EIP ET200 Configuration Tool User Manual" for information on the EIP ET200 Configuration Tool for the EIP-200S Ethernet/IP Adapter. The manual can be found on the Companion Disk that shipped with the product, or downloaded from the Siemens Service & Support Website (http://support.automation.siemens.com).

LED status indicators

The EIP-200S Ethernet/IP Adapter module has three bi-color LEDs that provide diagnostic information about the current state of the device and provide an indication of any faults. The LEDs conform to the behaviors defined in the ODVA Ethernet/IP Adaptation of CIP Adapter Specification for the Module Status and Network Status LEDs, and in this manual for I/O Status LEDs.

LED status indicator: Module Status LED

The bi-color Module Status LED indicates the current state of the EIP-200S Ethernet/IP Adapter, as described in the following table:

State	Description
Off	No power applied to device.
Flashing green	Device has not been configured. Invalid parameter data.
Green	Device has initialized successfully and no errors were detected.
Flashing red	Recoverable fault. Device needs commissioning due to configuration error: • Invalid parameter data • Invalid slot configuration data.
Red	Unrecoverable fault detected: hardware failure.

LED status indicator: Network Status LED

The bi-color Network Status LED indicates the current state of the EIP-200S Ethernet/IP Adapter communications link, as described in the following table:

State	Description
Off	• Device is powered off, or is powered on but does not have an IP address • May be waiting for IP address if in DHCP/BOOTP mode
Flashing green	No connection - an IP address is configured, but no CIP connections are established
Green	Connected
Flashing red	One or more CIP connections have timed out
Red	Duplicate IP address detected

LED status indicator: I/O Status LED

The bi-color I/O Status LED provides diagnostic information about the current state of the I/O under the control of the EIP-200S Ethernet/IP Adapter module, as described in the following table:

State	Description
Off	• All outputs and inputs are inactive • Configuration errors prevent enabling of inputs/outputs • No connection • Device not powered
Green	Device online with connections established (normal operation, RUN mode)
Flashing green	Firmware update in progress
Flashing red	One or more outputs or inputs are faulted when I/O is active

Installing the EIP-200S Ethernet/IP Adapter

The EIP-200S Ethernet/IP Adapter transfers data between ET 200S I/O modules and the Ethernet/IP network. The "Installation" chapter provides information on installing the components that make up an ET 200S distributed I/O system.

Refer to the section entitled "Installing the EIP-200S Ethernet/IP Adapter" for information on installing and removing the EIP-200S Ethernet/IP Adapter.

2.1 Operation

Operating modes

The EIP-200S Ethernet/IP Adapter is a modular device capable of operating out of the box without any special configuration software. However, to take full advantage of advanced diagnostics and features, a configuration tool is required. The Companion Disk shipped with this product contains both the Configuration Tool and the EIP ET200 Configuration Tool User Manual.

The EIP-200S Ethernet/IP Adapter operates in one of two modes: automatic configuration and user configured. The default mode, as shipped from the factory, is automatic configuration mode.

Automatic configuration mode

When operating in automatic configuration mode, the EIP-200S Ethernet/IP Adapter configures its I/O sizes, I/O module parameterization data, and configuration data according to the combination of ET 200S modules present at power-up or reset. In automatic configuration mode:

- Electronic module parameter data cannot be specified - the modules use the default parameters. The user must make certain that the default parameters for the modules satisfy the application requirements.
- I/O configuration cannot be verified - the EIP-200S Ethernet/IP Adapter is responsible for verifying the configuration by examining I/O sizes.

Note that the EIP-200S Ethernet/IP Adapter module is unable to differentiate modules of similar configuration types (for example, a 2 A discrete output module as compared to a 0.5 A discrete output module):

- The I/O data format is defined by the combination of modules installed.
- I/O module grouping is enabled.
- The I/O status byte is enabled.

Note

NAMUR and motor starters require user configured mode.

User Configured Mode

When operating in user configured mode, the EIP-200S Ethernet/IP Adapter I/O sizes, I/O module parameterization data, and I/O configuration data is stored in nonvolatile memory and accessed via the Slot Object. In user configured mode:

- Electronic module parameter data can be modified, allowing access to more advanced configuration options and diagnostics.
- I/O configuration is verified. Mismatching I/O configurations result in an error.

Note that the EIP-200S Ethernet/IP Adapter is unable to differentiate modules of similar configuration types (for example, a 2 A discrete output module as compared to a 0.5 A discrete output module):

- Slot Object instance attributes can be set, providing no I/O connections are open.
- The I/O data format is defined by the user by using the combination of modules configured.
- I/O module grouping is available but must be specified by the configuration selections.

Note

The EIP ET200 Configuration Tool is suggested for configuration of a EIP-200S Ethernet/IP Adapter in user configured mode.

This tool is available on the Companion Disk that shipped with the product, or via download from the Siemens Service & Support Website (http://support.automation.siemens.com).

I/O status byte

The IO_StatusEnable attribute of the Adapter Object allows you to enable or disable the generation of an additional I/O status byte to detect faults in the EIP-200S Ethernet/IP Adapter. If the IO_StatusEnable attribute is TRUE (1), an additional status byte is placed at the beginning of the input data packet, prior to any electronic module data. In the event of a fault, the status byte is set to 1, and the I/O status LED flashed red while I/O is active.

If the IO_StatusEnable attribute is FALSE (0), the input data packet contains only electronic module data as configured.

Configuration

Changes to user configuration data take effect immediately without resetting the device.

Changes to user configuration data are stored in nonvolatile memory and on the SD card immediately (before the explicit message response is sent).

Module grouping

For more efficient use of address space and data transfer, the EIP-200S Ethernet/IP Adapter supports the grouping of electronic module data. In AutoConfig mode, the electronic module data is always grouped. See the topic entitled "Configuring the ET 200S" for details about grouping of module data.

Reset behavior

When the Adapter is reset, the outputs will be deactivated during the short period that the reset is in progress. The unit can be reset in the following ways:

- Cycling of primary device 24 VDC power
- Using the reset capabilities in the Configuration Tool
- Sending an explicit Ethernet/IP Reset service message to instance 1 of the Identity Object with service data of 0 or 1. If service data 1 is sent, on reset the module returns to factory default state and any user configuration is lost.

Note

When network power is removed (or if an I/O connection times out or is lost), outputs will go to their configured "substitute" value according to how this parameter is set for each I/O module. The "default" substitute value, which will be in effect in automatic configuration mode, will be to turn off or zero outputs. Consult the individual manual for the specific I/O module if this is a concern. To set a non-default substitute value, user configuration MUST be used.

2.2 Parameters for the EIP-200S Ethernet/IP Adapter

Parameter assignment

Parameters for the EIP-200S Ethernet/IP Adapter are set by using the ZNX-EIP-200S Configuration Tool software. After loading new parameters into the interface module, the parameters take effect immediately.

The following table describes the parameters of the interface module:

EIP-200S Ethernet/IP Adapter IM	Value range	Default	Applicability
Interference frequency suppression	50 Hz / 60 Hz	60 Hz	ET 200S
Reference junction slot	None / 2 to 63	None	ET 200S
Reference junction	RTD on channel 0 / RTD on channel 1	RTD on channel 0	ET 200S
Bus length	≤ 1 m / > 1 m	≤ 1m	ET 200S

Interference frequency suppression

The frequency of your alternating voltage system can affect measured values negatively, particularly in the case of both measurements in small voltage ranges and thermocouples. Specify here the dominant line frequency in your system (50 Hz or 60 Hz).

The interference frequency suppression parameter is valid for all analog electronic modules. The integration time and conversion time of the individual modules are also set by means of this parameter.

Bus length

The bus length parameter specifies the maximum width of the station backplane bus:

- ≤ 1 m: the default setting for the maximum bus length is 1 m.
- > 1 m: the bus length of the ET 200S system is > 1 m and can be up to 2 m. However, this setting will increase the response time of the ET 200S.

2.3 Faults / diagnostics

Configuration faults

Faults in the electronic module configuration/parameterization data are handled slightly differently depending on when they are detected. In any case, the following occurs:

- Adapter Object AdapterStatus attribute indicates the appropriate code.
- Identity Object Status attribute indicates a minor recoverable fault.

Fault detected at power-up or as a result of a hot swap when no I/O connections are open:

- Attempts to open I/O connections result in a Device State Conflict error.

Fault detected as a result of a hot-swap when one or more I/O connections are open:

- If the IO_StatusEnable attribute is TRUE, a fault is indicated in the I/O Status byte at the beginning of the input data packet.
- Output data from scanner is ignored.
- Any attempt to allocate I/O connections will be rejected by the device.

Configuration fault recovery is achieved by:

- Installing/removing I/O module(s) to make the actual configuration match the user-defined configuration; and/or
- Changing the configuration data to match the actual configuration.

The I/O configuration is reapplied immediately after a configuration download from the ZNX-EIP-200S Configuration Tool, and at module startup.

Electronic module faults

When an I/O connection is active, faults in electronic modules are reported as follows:

- If the IO_StatusEnable attribute is TRUE, a fault is indicated in the I/O Status byte at the beginning of the input data packet.
- The appropriate Slot Object instance SlotStatus attribute and Channel<n>Status attribute(s) indicate the nature of the fault.
- The I/O status LED state is flashing red when I/O is active.

Module hot swap

The EIP-200S Ethernet/IP Adapter supports electronic module hot swap, which allows you to replace modules while the device is active on the network without removing power.

A configuration mismatch due to an improper module substitution is considered a fault. A subsequent hot swap that results in a match between the original configuration and the new module configuration clears the fault and the EIP-200S Ethernet/IP Adapter resumes normal operation.

Note the following issues regarding hot swap:

- No more than one module can be swapped at a time.
- All modules have to be present at power up or reset.
- Outputs go to a default state when a module is unplugged. The default state is normally 0 unless specified differently in the module parameters.

Communication faults

If you are unable to communicate with the EIP-200S Ethernet/IP Adapter, ensure that you have completed the following :

- Check that the appropriate link LED, P1 or P2, is green. If it is off, check the cabling to the network switch. The link LED must be on before proceeding to the next step.
- If the Network Status LED is off, the IP address is not set. If the Adapter is using DHCP (factory default), check that the DHCP server is set up correctly and running. The Network Status LED must be flashing green before proceeding to the next step.
- Perform a List Identity from the ZNX-EIP-200S Configuration Tool.
- Ensure that the IP address is unique on the network.
- Ensure that the IP address of the communication partner (controller or Configuration Tool) is on the same IP subnet.

2.4 Troubleshooting

The following sections describe some typical problems and how to address them.

Unable to communicate with the device

This is covered in the previous section under "Communication faults".

All of the LEDs are off

It is necessary to provide module power via the power terminals on the front of the EIP-200S Ethernet/IP Adapter. The EIP-200S Ethernet/IP Adapter will not attempt to initialize until power has been applied to the 24 VDC terminals.

Module Status LED is solid red

If a major unrecoverable fault occurs, the device will cease all communication on the network and the Module Status LED will be solid red. This condition could occur due to a hardware failure that prevents proper operation of the device. Replace the interface module, or contact your Siemens representative.

Module Status LED is flashing red

If the Module Status LED is flashing red, this is most likely due to a configuration error. In automatic configuration mode, this may be due to a module hot swap in which an incorrect module was used in place of the previous module or a new module has not been inserted. In user configured mode, this may indicate that an invalid Adapter parameter combination has been specified or the configuration specified by the Adapter module does not match the actual configuration currently connected to the EIP-200S Ethernet/IP Adapter.

Module Status LED is flashing green

The Module Status LED might be flashing green for one of the following reasons:

- The module configuration is correct, but an invalid parameter combination has been specified for either the Adapter or one or more modules.
- Mod Status flashing green and Net Status Off - waiting for IP address from DHCP or BOOTP.

Network Status LED is solid red

The device fails the duplicate MAC ID check sequence during power-up due to a conflicting node ID.

To recover, perform one of the following steps:

- If the EIP-200S Ethernet/IP Adapter is using DHCP, change the IP address at the DHCP server and power cycle the EIP-200S.
- If using a configured IP address, modify one of the IP addresses with the ZNX-EIP-200S Configuration Tool. You may have to disconnect one of the conflicting devices from the network first.

Network Status LED flashing red

If the Network Status LED is flashing red, one or more I/O connections are in the time-out state. This can be caused by the controller stopping I/O without closing the connection or by a break in Ethernet communications.

I/O Status LED flashing red

If the I/O Status LED is flashing red, one or more of the inputs/outputs are faulted when I/O is active. This only occurs if an I/O connection is open (Network Status LED is solid green). This may be caused by a diagnostic alarm due to a short circuit on an output module, a missing module due to hot swapping, or a missing terminating module.

2.5 Replacing a faulty EIP-200S Adapter

When a new configuration or new network parameters are downloaded to the EIP-200S Ethernet/IP Adapter, the data is stored in the SD memory card if it is installed. When an Adapter is replaced, the SD card can be used to transfer the configuration and network parameters to the replacement Adapter.

In case of Adapter failure, follow this process to replace the Adapter:

1. Prepare and mount the replacement Adapter.
2. Transfer the SD card from the old Adapter to the replacement Adapter.
3. Power up the Adapter so it will read the SD card and set the configuration in nonvolatile memory.
4. The replacement Adapter is now ready for use.

2.6 Device profile: supported CIP objects

2.6.1 Identity Object

The following information applies to the Identity Object for the EIP-200S Ethernet/IP Adapter.

Class code 0x01
Class attributes 1, 2, 3
Number of instances 1

Instance 1 attributes for Identity Object

Attribute ID	Access rule	Name	Data type	Data value
1	Get	Vendor	UINT	0008_H
2	Get	Device Type	UINT	$000C_H$
3	Get	Product Code	UINT	239_H
4	Get	Revision Major Revision Minor Revision	Structure of: USINT USINT	 Depending on the firmware
5	Get	Status	WORD	Device_Status[1]
6	Get	Serial Number	UDINT	Unique 32-bit number
7	Get	Product Name String Length ASCII String	Structure of: USINT STRING	 15 EIP-200S Adapter

[1] See Device_Status word definition in Device_Status definitions table

Device_Status definitions for Identity Object

Bit(s)	Called	Definition
0	Owned	0 = not owned 1 = the device has an owner
1	Reserved	Always 0
2	Configured	0 = "out-of-box" configuration 1 = configuration modified (not including communications)
3	Reserved	Always 0
4, 5, 6, 7	Extended Device Status	Defined in the table "Extended device status description" below
8	Minor recoverable fault	Minor configuration fault
9	Minor unrecoverable fault	Minor device fault (unrecoverable)
10	Major recoverable fault	Major configuration fault
11	Major unrecoverable fault	Major device fault (unrecoverable)
12, 13	Reserved	Always 0
14, 15	Reserved	Always 0

Extended device status description

Bit(s)	Called	Definition
0	Owned	TRUE indicates the device (or an object within the device) has an owner.
1		Reserved, shall be 0.
2	Configured	TRUE indicates the application of the device has been configured to do something different than the "out-of-box" default. This shall not include configuration of the communications.
3		Reserved, shall be 0.
4 - 7	Extended Device Status	See "Extended Device Status - Bits 4-7" table below.
8	Minor Recoverable Fault	TRUE indicates the device detected a problem with itself, which is thought to be recoverable. The problem does not cause the device to go into one of the faulted states. See Note regarding Behavior below.
9	Minor Unrecoverable Fault	TRUE indicates the device detected a problem with itself, which is thought to be unrecoverable. The problem does not cause the device to go into one of the faulted states. See Note regarding Behavior below.
10	Major Recoverable Fault	TRUE indicates the device detected a problem with itself, which caused the device to go into the "Major Recoverable Fault" state. See Note regarding Behavior below.
11	Major Unrecoverable Fault	TRUE indicates the device detected a problem with itself, which caused the device to go into the "Major Unrecoverable Fault" state. See Note regarding Behavior below.
12-15		Reserved, shall be 0.

Extended Device Status - Bits 4-7

Bits 4-7	Extended Device Status Description
0 0 0 0	Self-testing or Unknown.
0 0 0 1	Firmware update in progress.
0 0 1 0	At least one faulted I/O connection.
0 0 1 1	No I/O connections established.
0 1 0 0	Nonvolatile configuration bad.
0 1 0 1	Major fault - either bit 10 or bit 11 is true (1).
0 1 1 0	At least one I/O connection in run mode.
0 1 1 1	At least one I/O connection established, all in idle mode.
1 0 0 0 1 0 0 1	Reserved, shall be 0.
1 0 1 0 thru 1 1 1 1	Vendor/product specific.

Note

Behavior after a fault

A device may not be able to communicate in the Major Unrecoverable Fault state. Therefore, it might not be able to report a Major Unrecoverable Fault. It will not process a Reset service. The only exit from a Major Unrecoverable Fault is to cycle power.

Common services for Identity Object

Service code	Implemented for		Service name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x05	Yes	Yes	Reset
0x01	Yes	Yes	Get_Attributes_All

2.6.2 Assembly Object

The following applies to the Assembly Object for the EIP-200S Ethernet/IP Adapter.

Class code	0x04
Class attributes	1, 2, 3
Number of instances	4

Class attributes for Assembly Object

Attribute ID	Access rule	Description	Data type	Default value
1	Get	Revision of this object	UINT	0x0002
2	Get	Maximum instance	UINT	0x0069
3	Get	Number of instances	UINT	0x0004

Instance attributes for Assembly Object:

Instance 101 (65_{hex}): Input Assembly

Attribute ID	Access rule	Description	Data type	Default value
3	Get	Input Data	ARRAY of BYTE	---

Instance 102 (66_{hex}): Output Assembly

Attribute ID	Access rule	Description	Data type	Default value
3	Set	Output Data	ARRAY of BYTE	---

Instance 103 (67_{hex}): Config Assembly

Attribute ID	Access rule	Description	Data type	Default value
3	Get	Configuration data	ARRAY of BYTE	---

Instance 198 ($C6_{hex}$): Input Only

This instance is used to establish a connection when no outputs are to be addressed or when inputs, which are already being used in an exclusive owner connection, are to be interrogated. The data length of this instance is always zero.

Instance 199 ($C7_{hex}$)

This instance is used to establish a connection based on an existing exclusive owner connection. The new connection also has the same transmission parameters as the exclusive owner connection. When the exclusive owner connection is cleared, this connection, too, is automatically cleared. The data length of this instance is always zero.

Common services for Assembly Object

Service code	Service available		Service name	Description
	Class	Instance		
0x0E	Yes	Yes	Get_Attribute_Single	Supplies contents of the appropriate attribute
0x10	No	Yes	Set_Attribute_Single	Modifies an attribute value

2.6.3 Connection Manager Object

The following information applies to the EIP-200S Ethernet/IP Adapter Connection Manager Object.

Class code	0x06
Class attributes	1, 2, 3
Number of instances	1

Instance 1 attributes for Connection Manager Object

Attribute ID	Need in implem	Access rule	NV	Name	Data type	Description
1	Optional	Set [1]	V	Open Requests	UINT	Number of Forward Open service requests received.
2	Optional	Set [1]	V	Open Format Rejects	UINT	Number of Forward Open service requests which were rejected due to bad format.
3	Optional	Set [1]	V	Open Resource Rejects	UINT	Number of Forward Open service requests which were rejected due to lack of resources.
4	Optional	Set [1]	V	Open Other Rejects	UINT	Number of Forward Open service requests which were rejected for reasons other than bad format or lack of resources.
5	Optional	Set [1]	V	Close Requests	UINT	Number of Forward Close service requests received.
6	Optional	Set [1]	V	Close Format Requests	UINT	Number of Forward Close service requests which were rejected due to bad format.
7	Optional	Set [1]	V	Close Other Requests	UINT	Number of Forward Close service requests which were rejected for reasons other than bad format.
8	Optional	Set [1]	V	Close Timeout	UINT	Total number of connection timeouts that have occurred in connections controlled by this Connection Manager.

[1] A device may reject a set request to this attribute, using General Status Code 0x09 (Invalid Attribute Value), if the attribute value sent is not zero.

Common services for Connection Manager Object

Service code	Implemented for		Service name
	Class	Instance	
0x01	Yes	Yes	Get_Attributes_All
0x0E	Yes	Yes	Set_Attribute_Single

2.6.4 TCP/IP Interface Object

The TCP/IP Interface Object provides the mechanism to configure the EIP200S Ethernet/IP Adapter's TCP/IP network interface. Examples of configurable items include the device's IP address, network mask, gateway address, and host name.

Class attributes 1, 2, 3
Class services 0x1, 0xE, 0x10
Instance attributes 1, 2, 3, 4, 5, 6, 12, 13
Instance services 0x1, 0xE, 0x10

Class attributes for TCP/IP Interface Object

Attribute ID	Access rule	Description	Data type	Default value
1	Get	Revision	UINT	0x0001
2	Get	Maximum number of instances	UINT	0x0001
3	Get	Number of instances	UINT	0x0001

Instance attributes for TCP/IP Interface Object

Attribute ID	Access rule	Description	Data type	Default value	Semantics of values
1	Get	Interface status (Status)	DWORD	0x00000002	See table below: "Table for Interface status, attribute 1"
2	Get	Interface capability flags (Configuration Capability)	DWORD	0x00000015	Bit 0: BOOTP Client (false) Bit 1: DNS Client (true) Bit 2: DHCP Client (true) Bit 3: DHCP-DNS Update (false = device is not capable of sending its host name in the DHCP request) Bit 4: Configuration Settable (true = Interface control flags are settable, see attribute 3) Bit 5-31: reserved
3	Set	Interface control flags (Configuration Control)	DWORD	0x00000000	Bit 0-3: Startup Configuration (0 – as stored in flash, 1 = via BOOTP, 2 = via DHCP, 3-15 = reserved) Bit 4: DNS Enable (false)
4	Get	Path to physical link object	STRUCT of:		Identifies the object associated with underlying physical communication object.
		Size of path	UINT	0x0002	Number of 16 bit words in path.
		Logical segments identifying the physical link	Padded EPATH	Class: = 0xF6 Instance = 1	Path address of the internal port of the embedded switch.

Attribute ID	Access rule	Description	Data type	Default value	Semantics of values
5	Set	TCP/IP network interface configuration	STRUCT of:		Contains parameters required to operate as a TCP/IP node. In order to prevent incomplete or incompatible configuration, the parameters cannot be set individually. The user should first Get this attribute, change the desired parameters, then Set the attribute.
		IP address	UDINT	Device's IP address	Value of 0 indicates no IP address has been configured. Otherwise a valid Class A, B, or C address shall be set and shall not be set to the loopback address (127.0.0.1).
		Network mask	UDINT	Device's network mask	Value of 0 indicates no network mask address has been configured.
		Gateway address	UDINT	Default gateway address	Value of 0 indicates no IP address has been configured. Otherwise a valid Class A, B, or C address shall be set and shall not be set to the loopback address (127.0.0.1).
		Primary name server	UDINT	0x00000000	Value of 0 indicates no name server address has been configured. Otherwise a valid A, B, or C address shall be set.
		Secondary name server	UDINT	0x00000000	Value of 0 indicates no secondary name server address has been configured. Otherwise a valid A, B, or C address shall be set.
		Domain name	STRING	0x0000 (length = 0, empty STRING)	ASCII characters. Maximum length is 48 characters. Shall be padded to an even number of characters (pad not included in length). A length of 0 indicates no domain name is configured.

Attribute ID	Access rule	Description	Data type	Default value	Semantics of values
6	Set	Host name	STRING	0x00E (length = 14) plus hex equivalent of "br+MAC" (2+12 digits)	ASCII characters. Maximum length is 48 characters. Padded to an even number of characters (pad not included in length). A length of 0 indicates no host name is configured.
12	Set	Ethernet/IP QuickConnect	BOOL	0	0 = disabled 1 = enabled
13	Set	Encapsulation Inactivity Timeout	UINT		0 = disabled 1-3600 = timeout in seconds Default = 120

Table for "Interface status", Attribute 1

Bit(s):	Called:	Definition	
0 - 3	Interface Configuration Status	Indicates the status of the Interface Configuration attribute.	0 = The Interface Configuration attribute has not been configured 1 = The Interface Configuration attribute contains valid configuration obtained from BOOTP, DHCP, or non-volatile storage. 2 = The Interface Configuration attribute contains valid configuration, obtained from hardware settings (for example, pushwheel, thumbwheel, etc.) 3 - 15 = Reserved for future use
4	Mcast Pending	Indicates a pending configuration change in the TTL Value and/or McastConfig attributes. This bit is set when either the TTL Value or McastConfig attribute is set, and cleared the next time the device starts.	
5 - 31	Reserved	Reserved for future use and set to zero.	

Common services for TCP/IP Interface Object

Service code	Service available		Service name	Description
	Class	Instance		
0x01	Yes	Yes	Get_Attribute_All	Supplies contents of all attributes
0x0E	Yes	Yes	Get_Attribute_Single	Supplies contents of the appropriate attribute
0x10	No	Yes	Set_Attribute_Single	Modifies an attribute value

2.6.5 Ethernet Link Object

The Ethernet Link Object maintains link-specific counters and status information for an IEEE 802.3 communications interface. The EIP-200S Ethernet/IP Adapter has an embedded 2-port switch and has two instances of the Ethernet Link Object (one for each port).

Class attributes	1, 2, 3
Class services	0x1, 0xE, 0x10
Instance attributes	1, 2, 3, 4, 5, 6, 7, 8, 10, 11
Instance services	0x1, 0xE, 0x10
Number of instances	2

Class attributes for Ethernet Link Object

Attribute ID	Access rule	Name	Description	Data type	Semantics of values
1	Get	Revision	Revision of this object	UINT	1 = the minimum value. ≥ 2 = if instance attribute 6 is implemented. 3 = the maximum value.
2	Get	Max Instance	Maximum instance number of an object currently created in this class level of the device	UINT	The largest instance number of a created object at this class hierarchy level.
3	Get	Number of Instances	Number of object instances currently created at this class level of the device	UINT	The number of object instances at this class hierarchy level.

Instance 1 attributes for Ethernet Link Object

Attribute ID	Access rule	Name	Description	Data type	Semantics of values
1	Get	Interface Speed	Interface speed currently in use	UDINT	Speed in Mbps (10, 100, etc.).
2	Get	Interface Flags	Interface status flags	DWORD	Bit map of interface flags. See Table "Interface Flags attribute" below.
3	Get	Physical Address	MAC layer address	ARRAY of 6 USINTs	MAC layer address in the format "XX-XX-XX-XX-XX-XX."
4	Get	Interface Counters	Relevant to the receipt of packets	STRUCT of:	See section "Interface Counters" below.
5	Get	Media Counters	Media-specific counters	STRUCT of:	See section "Media Counters" below.

Attribute ID	Access rule	Name	Description	Data type	Semantics of values
6	Set	Interface Control	Configuration for physical interface	STRUCT of:	See section "Interface Control" below.
		Control Bits	Interface Control Bits	WORD	----
		Forced Interface Speed	Speed at which the interface shall be forced to operate	UINT	Speed in Mbps (10, 100, etc.).
7	Get	Interface Type	Type of interface: twisted pair, fiber, internal, etc.	USINT	
8	Get	Interface State	Current state of the interface: operational, disabled, etc.	USINT	
10	Get	Interface Label	Human readable idenfication	SHORT_ STRING	
11	Get	Interface Capability	Indication of capabilities of the interface	STRUCT of:	
		Capability Bits	Interface capabilities, other than speed/duplex	DWORD	Bit map
		Speed/Duplex Options	Indicates speed/duplex pairs supported in the Interface Control attribute	STRUCT of:	
			Speed/Duplex Array Count	USINT	Number of Elements
			Speed/Duplex Array	ARRAY of STRUCT of:	
			Interface Speed	USINT	Semantics are the same as the Forced Interface Speed in the Interface Control attribute: speed in Mbps.
			Interface Duplex Mode	USINT	0 = half duplex 1 = full duplex 2-255 = Reserved

Interface Flags attribute

Bit(s):	Called:	Definition
0	Link Status	Indicates whether the IEEE 802.3 communications interface is connected to an active network: 0 = inactive link 1 = active link The determination of link status is implementation specific
1	Half/Full Duplex	Indicates the duplex mode currently in use: 0 = interface is running half duplex 1 = interface is running full duplex Note that if the Link Status flag is 0, the value of the half/full duplex flag is indeterminate.
2 - 4	Negotiation Status	Indicates the status of link autonegotiation: 0 = autonegotiation in progress 1 = autonegotiation and speed detection failed. Using default values for speed and duplex 2 = autonegotiation failed but detected speed. Duplex was faulted. 3 = successfully negotiated speed and duplex 4 = autonegotiation not attempted. Forced speed and duplex.
5	Manual Setting Requires Reset	0 = interface can activate changes to link parameters (autonegotiate, duplex mode, interface speed) automatically. 1 = device requires a Reset service be issued to its Identity Object in order for the changes to take effect.
6	Local Hardware Fault	0 = interface detects no local hardware fault 1 = local hardware fault detected
7 - 31	Reserved	Set to 0

Interface Counters (STRUCT of)

Name	Data Type	Description of Attribute
In Octets	UDINT	Octets received on the interface
In Ucast Packets	UDINT	Unicast packets received on the interface
In NUcast Packets	UDINT	Non-unicast packets received on the interface
In Discards	UDINT	Inbound packets received on the interface but discarded
In Errors	UDINT	Inbound packets that contain errors (does not include In Discards)
In Unknown Protos	UDINT	Inbound packets with unknown protocol
Out Octets	UDINT	Octets sent on the interface
Out Ucast Packets	UDINT	Unicast packets sent on the interface
Out NUcast Packets	UDINT	Non-unicast packets sent on the interface
Out Discards	UDINT	Outbound packets discarded
Out Errors	UDINT	Outbound packets that contain errors

Media Counters (STRUCT of)

Name	Data Type	Description of Attribute
Alignment Errors	UDINT	Frames received that are not an integral number of octets in length
FCS Errors	UDINT	Frames received that do not pass the FCS check
Single Collisions	UDINT	Successfully transmitted frames which experienced exactly one collision
Multiple Collisions	UDINT	Successfully transmitted frames which experienced more than one collision
SQE Test Errors	UDINT	Number of times SQE test error message is generated
Deferred Transmission	UDINT	Frames for which first transmission attempt is delayed because the medium is busy
Late Collisions	UDINT	Number of times a collision is detected later than 512 bittimes into the transmission of a packet
Excessive Collisions	UDINT	Frames for which transmission fails due to excessive collisions.
MAC Transmit Errors	UDINT	Frames for which transmission fails due to an internal MAC sublayer transmit error.
Carrier Sense Errors	UDINT	Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
Frame Too Long	UDINT	Frames received that exceed the maximum permitted frame size
MAC Receive Errors	UDINT	Frames for which reception on an interface fails due to an internal MAC sublayer receive error

Interface Control attribute

The Interface Control attribute is a structure consisting of Forced Interface Speed and Control Bits.

If the autonegotiate bit is 0, the Forced Interface Speed bits indicate the speed at which the interface operates. Speed is specified in megabits per second; for example, for 10 Mbps Ethernet, the Interface Speed is 10. Interfaces not supporting the requested speed return 0x09 (Invalid Attribute Value). If autonegotiation is enabled, attempting to set the Forced Interface Speed results in a response of 0x0C (Object State Conflict).

Control Bits operate as follows:

Bit(s)	Called:	Definition
0	Autonegotiate	0 = 802.3 link autonegotiation is disabled. 1 = autonegotiation is enabled. If autonegotiation is disabled, the device uses the settings indicated by the Forced Duplex Mode and Forced Interface Speed bits.
1	Forced Duplex Mode	If the Autonegotiate bit is 0, the Forced Duplex Mode bit indicates whether the interface operates in full or half duplex mode. 0 = half duplex. 1 = full duplex. Interfaces not supporting the requested duplex return 0x09 (Invalid Attribute Value). If autonegotiation is enabled, attempting to set the Forced Duplex Mode bits results in a response of 0x0C (Object State Conflict).

Interface Capability

The Interface Capability attribute indicates the set of capabilities for the interface. The attribute is a structure with two main elements: Capability Bits and Speed/Duplex Options.

Bit(s)	Called:	Definition
0	Manual Setting Requires Reset	Indicates whether or not the device requires a reset to apply changes made to the Interface Control attribute (#6). 0 = Indicates the device automatically applies changes made to the Interface Control attribute (#6) and does not require a reset for changes to take effect. This is the value this bit has when the Interface Control attribute (#6) is not implemented. 1 = Indicates the device does not automatically apply changes made to the Interface Control attribute (#6) and, requires a reset in order for changes to take effect. Note: this bit is also replicated in the Interface Flags attribute (#2) to retain backwards compatibility with previous object revisions.
1	Auto Negotiate	0 = Indicates the interface does not support link auto-negotiation. 1 = Indicates the interface supports link auto-negotiation.
2	Auto-MDIX	0 = Indicates the interfaces does not support auto MDIX operation. 1 = Indicates the interface supports auto MDIX operation.
3	Manual Speed/Duplex	0 = Indicates the interface does not support manual setting of speed/duplex. The Interface control attribute (#6) is not supported. 1 = Indicates the interface supports manual setting of speed/duplex via the Interface Control attribute (#6).
4-31	Reserved	Set to 0

The Interface Capability attribute indicates the set of capabilities for the interface. The attribute is a structure with two main elements: Capability Bits and Speed/Duplex Options.

Common services for Ethernet Link Object

Service code	Need in implementation		Service name	Description
	Class	Instance		
0x01	Optional	Optional	Get_Attribute_All	Supplies contents of all attributes.
0x0E	Conditional	Required	Get_Attribute_Single	Supplies contents of the appropriate attribute.
0x10	N/A	Conditional	Set_Attribute_Single	Modifies a single attribute.

2.6.6 Device Level Ring (DLR) Object

Device Level Ring (DLR) Object

The Device Level Ring (DLR) Object provides the configuration and status information interface for the DLR protocol. The DLR protocol is a layer 2 protocol that enables the use of an Ethernet ring topology.

Class Code	0x47
Class attributes	1, 2, 3
Class services	0x1, 0xE
Instance attributes	1, 2, 10, 12
Instance services	0x1, 0xE
Number of Instances	1

Class attributes

Attribute ID	Access rule	Name	Description	Data type	Default value
1	Get	Revision	Revision of this object[1]	UINT	0x0001
2 to 7	These class attributes are optional and are described in Volume 1, Chapter 4 of the CIP Common specifications.				

[1] Conditional: Required if the Revision value is greater than 1.

Instance attributes

Attribute ID	Access rule	Name	Data type	Description of Attribute	Semantics of values
1	Get required	Network Topology	USINT	Current network topology mode	0 - indicates "Linear" 1 - indicates "Ring"
2	Get required	Network Status	USINT	Current status of network	0 - indicates “Normal” 1 - indicates “Ring Fault” 2[1] - indicates “Unexpected Loop Detected” 3 - indicates “Partial Network Fault” 4 - indicates “Rapid Fault/Restore Cycle”
10	Get required	Active Supervisor Address	STRUCT of:	IP and/or MAC address of the active ring supervisor	
			UDINT	Supervisor IP Address	A value of 0 indicates no IP Address has been configured for the device
			ARRAY of 6 USINTs	Supervisor MAC Address	Ethernet MAC address
12	Get required	Capability Flags	DWORD	Describes the DLR capabilities of the device	

2.6.7 Quality of Service (QoS)

Quality of Service (QoS) is a general term that is applied to mechanisms used to treat traffic streams with different relative priorities or other delivery characteristics. Standard QoS mechanisms include IEEE 802.1D/Q (Ethernet frame priority) and Differentiated Services (DiffServ) in the TCP/IP protocol suite.

The QoS Object provides a means to configure certain QoS-related behaviors in EtherNet/IP devices.

Class Code 0x48
Class attributes 1, 2, 3
Class services 0x1, 0xE
Instance attributes 4, 5, 6, 7, 8
Instance services 0x1, 0xE, 0x10
Number of Instances 1

Class attributes

The QoS object supports the following class attributes:

Attribute ID	Access rule	Description	Data type	Default value
1	Get	Revision	UINT	0x0001
2	Get	Maximum number of instances	UINT	0x0001
3	Get	Number of instances	UINT	0x0001

Instance attributes

Attribute ID	Access rule	Name	Data type	Description of Attribute	Semantics of values
4	Set	DSCP Urgent	USINT	DSCP value for CTP transport class 0/1 priority messages	
5	Set	DSCP Schedule	USINT	DSCP value for CIP transport class 0/1 Scheduled priority messages	
6	Set	DSCP High	USINT	DSCP value for CIP transport class 0/1 High priority messages	
7	Set	DSCP Low	USINT	DSCP value for CIP transport class 0/1 low priority messages	
8	Set	DSCP Explicit	USINT	DSCP value for CIP explicit messages (transport class 2/3 and UCMM) and all other EtherNet/IP encapsulation messages	

Note

A change to the value of the above attributes takes effect the next time the device restarts.

Common Services

The QoS object provides the following common services:

Service code	Need in Implementation		Service Name	Description of Service
	Class Instance			
0x01	Optional	N/A	Get_attributes_All	See Volume 1, Appendix A
0x0E	Conditional[1]	Required	Get_Attribute_Single	See Volume 1, Appendix A
0x10	N/A	Required	Set_Attribute_Single	See Volume 1, appendix A

[1] Required if any class attributes are implemented.

2.7 Device profile: vendor-specific objects

2.7.1 Adapter Object

The Adapter Object provides the external configuration and monitoring interface to the EIP-200S Ethernet/IP Adapter.

Class code 0x64
Class attributes No attributes are supported for the Adapter Object at the class level.
Number of instances 1

Instance 1 attributes of the Adapter Object

Attribute ID	Access rule	Name	Data type	Data value
1	Get	AdapterStatus	USINT	Adapter Status (see AdapterStatus details table).
2	Get	InputSize	USINT	Currently configured input assembly size.
3	Get	OutputSize	USINT	Currently configured output assembly size.
4	Get/Set [2]	AutoConfig	BOOL	Automatic Configuration mode 1: Automatic configuration: the rack self-configures based on the modules installed (factory default). 0: Manual configuration: the rack configuration is stored in nonvolatile memory.
5	Get	ConfigChanged	BOOL	True if manual configuration changes have been made but have not taken effect.
6	Get	Diagnostic String	Array of USINT [65]	An array of USINT containing slot diagnostics. The first byte of the array indicates the number of valid diagnostic bytes within the array (the remaining bytes within the array can be ignored).
7	Get	ConfiguredSlots	USINT	Indicates the number of configured slot objects.
8	Get/Set [2]	HeadParameters	Array of USINT [19]	Configuration information for the adapter module.
9	Get/Set [2]	IO_StatusEnable	BOOL	Enables the generation of an I/O status byte at the beginning of the input data I/O packet. Factory default = enabled.
10	Get/Set [2]	HeadParamByte1	USINT	Parameter bytes for electronic module and adapter module behavior.
11	Get/Set [2]	HeadParamByte2	USINT	
12	Get/Set [2]	HeadParamByte3	USINT	
13	Get/Set [2]	HeadParamByte4	USINT	
14	Get/Set [2]	HeadParamByte5	USINT	
15	Get/Set [2]	HeadParamByte6	USINT	
16	Get/Set [2]	HeadParamByte7	USINT	
17	Get/Set [2]	HeadParamByte8	USINT	
18	Get/Set [2]	HeadParamByte9	USINT	
19	Get/Set [2]	HeadParamByte10	USINT	

Attribute ID	Access rule	Name	Data type	Data value
20	Get/Set [2]	HeadParamByte11	USINT	
21	Get/Set [2]	HeadParamByte12	USINT	
22	Get/Set [2]	HeadParamByte13	USINT	
23	Get/Set [2]	HeadParamByte14	USINT	
24	Get/Set [2]	HeadParamByte15	USINT	
25	Get/Set [2]	HeadParamByte16	USINT	
26	Get/Set [2]	HeadParamByte17	USINT	
27	Get/Set [2]	HeadParamByte18	USINT	
28	Get/Set [2]	HeadParamByte19	USINT	
29	Reserved			
30	Reserved			
31	Reserved			
32	Get	Firmware version String Length ASCII String	Struct of: USINT STRING	Firmware version
33	Get	Serial Number String Length ASCII String	Struct of: USINT STRING	Serial number

[1] Length of data [...] array does not include data.

[2] When an I/O connection is open: setting this attribute returns Device_State_Conflict.

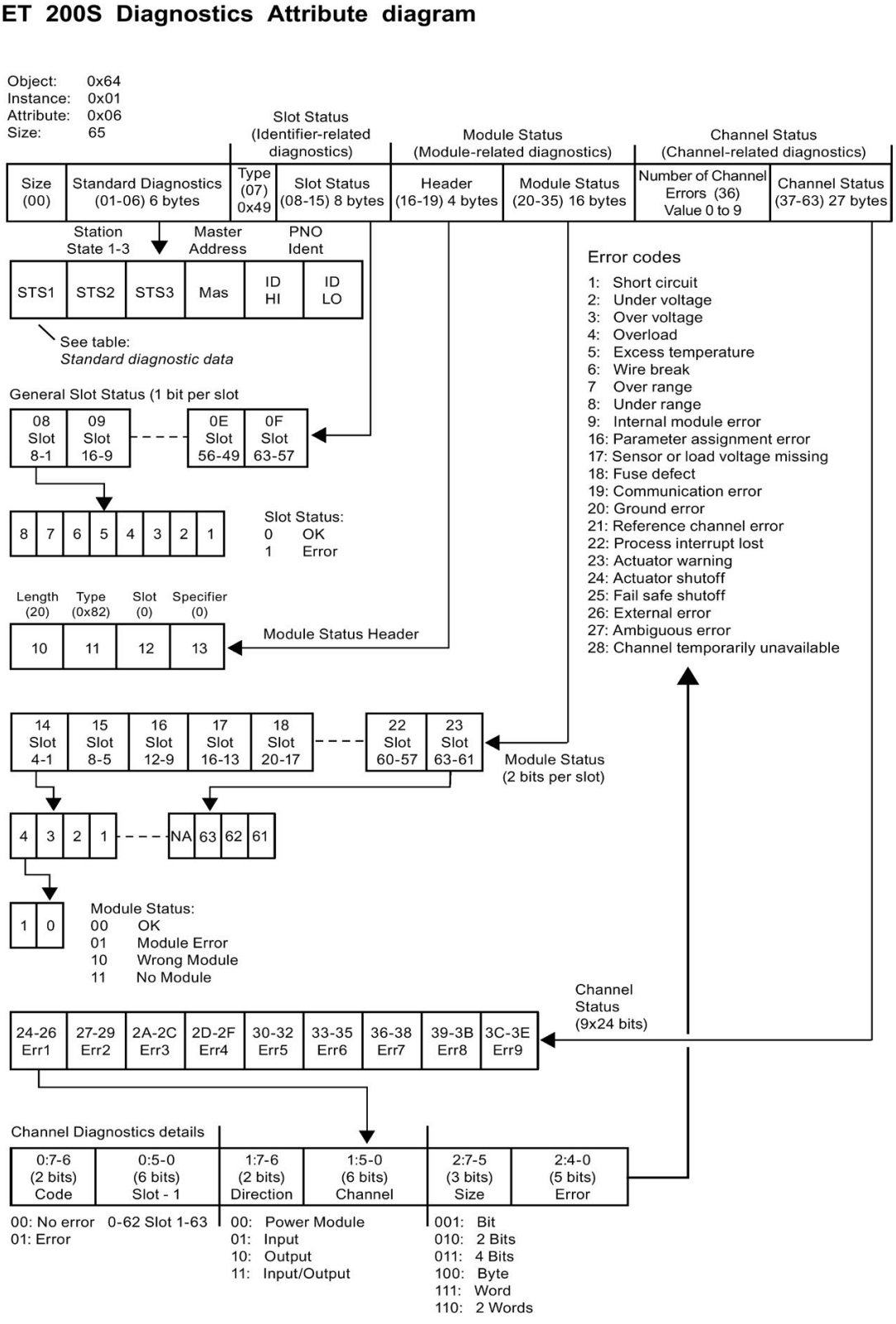
Attribute 1 [AdapterStatus] details

Object 0x64
Instance 0x01
Attribute 0x06
Size 65

The AdapterStatus attribute reports the status of the EIP-200S Ethernet/IP Adapter and electronic modules:

Bit(s)	Name	Description
0		Reserved
1	Parameters rejected	One or more modules rejected the parameters specified by its slot object.
2	Configuration rejected	One or more modules rejected the configuration byte specified by its slot object.
3	Electronic module diagnostics	One or more modules is reporting an error.
4 - 7		Reserved

Attribute 6 [Diagnostic String] details



Adapter Object: Standard diagnostic data

Byte 0	Station state 1
Byte 1	Station state 2
Byte 2	Station state 3
Byte 3	Master address
Byte 4	Ident number (low)
Byte 5	Ident number (high)

The structure of the standard diagnostic data is as follows:

Byte	Bit(s)	Description
0	0, 1	Not used
	2	CfgFault: configuration data mismatch
	3	ExtDiag: extended Diagnostic data available and valid
	4 - 7	Not used
1	0	Not used
	1	Bus error or > 63 modules
	2 - 7	Not used
2	0 - 6	Not used
	7	ExtDiagOverflow: extended diagnostic data overflow
3, 4, 5		Not used

Attribute 9 [IO_StatusEnable] details

The IO_StatusEnable attribute enables/disables the generation of a single I/O status byte at the beginning of the input data I/O packet. This status byte indicates if any faults have occurred which would result in invalid data. The default value for Attribute 9 is enabled (1).

The format of the I/O status byte is shown below:

7	6	5	4	3	2	1	0
---	---	---	---	---	---	---	Fault

Attributes 10-28 [HeadParamByte(n)] details

The HeadParamByte attributes provide single byte (USINT) access to the elements of the HeadParameters attribute (attribute 8) for access via tools not supporting complex data type representation. Modification of the HeadParameters will affect all the corresponding HeadParamByte attributes and visa versa.

Common services for the Adapter Object

Service code	Implemented for		Service name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

2.7.2 Slot Object

The following information applies to the Slot Object for the EIP-200S Ethernet/IP Adapter. The Slot Object provides the external configuration and monitoring interface to the I/O module in one slot. One instance of this object exists for each available slot.

Class code 0x65
Class attributes No attributes are supported for the Slot Object at the class level.
Number of instances 63

Instance attributes of the Slot Object

Attribute ID	Access rule	Name	Data type	Data value
1	Get / Set[1,2]	ModuleReference	UINT	For Configuration Tool use.
2	Get / Set[1,2]	ParameterSize	USINT	Number of parameter bytes required by this slot (max. 32).
3	Get / Set[1,2]	Parameters	Array of USINT	Parameter bytes for this slot: array size is set by Attribute 2.
4	Get / Set[1,2]	ConfigByte	USINT	Configuration byte for this slot.
5	Get	SlotStatus	USINT	Slot status code (see Attribute 5 table).
6	Get	Channel0Status	USINT	Channel Status code (see Attribute 6-13 table).
7	Get	Channel1Status	USINT	
8	Get	Channel2Status	USINT	
9	Get	Channel3Status	USINT	
10	Get	Channel4Status	USINT	
11	Get	Channel5Status	USINT	
12	Get	Channel6Status	USINT	
13	Get	Channel7Status	USINT	

Attribute ID	Access rule	Name	Data type	Data value
14	Get	Channel0Type	USINT	Channel Type code (see Attribute 14-21 table). The Channel Type code is zero if the corresponding Channel Status code is zero.
15	Get	Channel1Type	USINT	
16	Get	Channel2Type	USINT	
17	Get	Channel3Type	USINT	
18	Get	Channel4Type	USINT	
19	Get	Channel5Type	USINT	
20	Get	Channel6Type	USINT	
21	Get	Channel7Type	USINT	
22	Get / Set[1,2]	ParamByte1	USINT	Parameter bytes for this slot: Number actually used is set by Attribute 2.
23	Get / Set[1,2]	ParamByte2	USINT	
24	Get / Set[1,2]	ParamByte3	USINT	
25	Get / Set[1,2]	ParamByte4	USINT	
26	Get / Set[1,2]	ParamByte5	USINT	
27	Get / Set[1,2]	ParamByte6	USINT	
28	Get / Set[1,2]	ParamByte7	USINT	
29	Get / Set[1,2]	ParamByte8	USINT	
30	Get / Set[1,2]	ParamByte9	USINT	
31	Get / Set[1,2]	ParamByte10	USINT	
32	Get / Set[1,2]	ParamByte11	USINT	
33	Get / Set[1,2]	ParamByte12	USINT	
34	Get / Set[1,2]	ParamByte13	USINT	
35	Get / Set[1,2]	ParamByte14	USINT	
36	Get / Set[1,2]	ParamByte15	USINT	
37	Get / Set[1,2]	ParamByte16	USINT	
38	Get / Set[1,2]	ParamByte17	USINT	
39	Get / Set[1,2]	ParamByte18	USINT	
40	Get / Set[1,2]	ParamByte19	USINT	
41	Get / Set[1,2]	ParamByte20	USINT	
42	Get / Set[1,2]	ParamByte21	USINT	
43	Get / Set[1,2]	ParamByte22	USINT	
44	Get / Set[1,2]	ParamByte23	USINT	
45	Get / Set[1,2]	ParamByte24	USINT	
46	Get / Set[1,2]	ParamByte25	USINT	
47	Get / Set[1,2]	ParamByte26	USINT	
48	Get / Set[1,2]	ParamByte27	USINT	
49	Get / Set[1,2]	ParamByte28	USINT	
50	Get / Set[1,2]	ParamByte29	USINT	

Attribute ID	Access rule	Name	Data type	Data value
51	Get / Set[1,2]	ParamByte30	USINT	
52	Get / Set[1,2]	ParamByte31	USINT	
53	Get / Set[1,2]	ParamByte32	USINT	

1 When Adapter Object AutoConfig attribute is true: These attributes reflect the nonvolatile configuration parameters and are not used by the Adapter.

2 When an I/O connection is open, setting this attribute returns Device_State_Conflict.

Attribute 5 [SlotStatus] details

The SlotStatus attribute, listed in the table below, reports the operating status of the module installed:

Status code	Text	Description
0	OK	Module is operating normally.
1	Module error	
2	Wrong module	
3	No module	Slot is empty - no module installed.
4 - 255		Reserved

Attribute 6-13 [Channel<n>Status] details

The Channel<n>Status attributes, listed in the following table, report the operating status of each channel in the module:

Status code	Text
1	Short circuit
2	Under voltage
3	Over voltage
4	Overload
5	Excess temperature
6	Wire break
7	Over range
8	Under range
9	Internal module error
16	Parameter assignment error
17	Sensor or load voltage missing
18	Fuse defect
19	Communication error
20	Ground error
21	Reference channel error
22	Process interrupt lost
23	Actuator warning
24	Actuator shutoff
25	Fail-safe shutoff
26	External error
27	Ambiguous error
28	Channel temporarily unavailable

Attribute 14-21 [Channel<n>Type] details

The Channel<n>Type attributes, listed in the following table, provide additional detail when the corresponding Channel<n>Status is reporting an error.

Status code	Text	Description
0	N/A	Reported when corresponding Channel<n>Status is reporting "No error"
1	Bit	1-bit channel
2	2 Bit	2-bit channel
3	4 Bit	4-bit channel
4	Byte	8-bit channel
5	Word	16-bit channel
6	2 Word	32-bit channel
7 - 255		Reserved

Attribute 22-53 [ParamByte(n)] details

The ParamByte attributes provide single byte (USINT) access to the first 32 elements of the Parameters attribute (Attribute 3) for access via tools not supporting complex data type representation. Modification of the Parameters attribute will affect all the corresponding ParamByte attributes and visa versa. The EIP-200S Ethernet/IP Adapter limits the slot object's ParameterSize attribute to a maximum value of 32.

Common services for the Slot Object

Service code	Implemented for		Service name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

2.8 Technical specifications

SIMATIC DP, interface module EIP-200S Ethernet/IP Adapter:2 Ethernet ports with RJ45 connectors; up to 2 m width connectable to a maximum of 63 power, electrical, or motor starter modules.

SUPPLY VOLTAGE	
Power supply hold-up time	
Hold-up time, min.	20 ms
INPUT CURRENT	
From supply voltage 1L+, max.	250 mA
POWER LOSSES	
Power loss, typ.	2.5 W
ADDRESS AREA	
Addressing volume	
Outputs	255 bytes
Inputs	255 bytes
INTERFACES	
Supports protocol for Ethernet/IP	
Automatic detection of transmission speed	Yes
Transmission rate, max.	100 Mbps
RJ45 (2 ports)	Yes
PROTOCOLS	
Supports protocol for Ethernet/IP	Yes
INTERRUPTS/DIAGNOSTICS/STATUS INFORMATION	
Diagnoses	
Diagnostic functions	Yes
Diagnostics indication LED	
Module Status, Network Status, and I/O Status LEDs	Yes
Monitoring 24 V voltage supply ON (green)	Yes
Connection to network LINK (green)	Yes
GALVANIC ISOLATION	
Between backplane bus and electronics	No
Between supply voltage and electronics	No
Between Ethernet and electronics	Yes
DIMENSIONS	
Width	60 mm
Height	119.5 mm
Depth	75 mm
WEIGHT	
Weight, approx.	120 g

Installation and wiring

3

3.1 Installation

Simple installation

The ET 200S distributed I/O system is designed for simple installation.

The modules of an ET 200S system are classified as Open Equipment. You must install the ET 200S in cases, cabinets or electrical control rooms where they will only be accessible with a key or a tool. You should limit entry to the housing, cabinet, or electric control room to authorized personnel.

3.2 Installation rules

Installation position

The preferred installation position is horizontal on a vertical wall. Any other installation position is also possible; however, there are limitations with regard to ambient temperature.

Rail

The EIP-200S Ethernet/IP Adapter is installed on a zinc-plated rail, according to the EN 50022 standard (35 x 7.5 mm or 35 x 15 mm).

Note

If the interface module is exposed to increased vibrations and shock, we recommend that you screw the rail to the mounting surface at intervals of 200 mm.

To prevent the interface module from slipping to the side, we recommend that you fit a mechanical stop (for example, with a ground terminal, 8WA2 011-1PH20) at both ends of the device.

If you install the rail on grounded, zinc-plated mounting plates, there is no need to ground the rail separately.

Installation measurements

Installation width: 60 mm (2.36 inches)

Installation height: 119.5 mm (4.7 inches)

3.3 Installing the EIP-200S Ethernet/IP Adapter

Features

- The EIP-200S Ethernet/IP Adapter connects the ET 200S with the network.
- The EIP-200S Ethernet/IP Adapter transfers data between the higher-level controller and the I/O modules.

Prerequisites

The prerequisites for installation are shown below

- The rail must be installed.
- All the terminal modules must be installed to the right of the interface module. The maximum configuration of the ET 200S distributed I/O system is 63 modules (including power modules, I/O modules, motor starters, and terminating module).

Tools required

3 mm screwdriver

Installing the EIP-200S Ethernet/IP Adapter

To install the EIP-200S Ethernet/IP Adapter, follow the steps below:

1. Hang the interface module on the rail.
2. Tip the interface module back until you hear the locking mechanism engage.

Removing the EIP-200S Ethernet/IP Adapter

The interface module is wired, and the terminal modules are on the right:

1. Switch off the supply voltage on the interface module.
2. Disconnect the wiring connector and the bus connector on the interface module.
3. Use a screwdriver to push the locking mechanism on the interface module down until the mechanism stops, and move the interface module to the left.
   – Note: The locking mechanism is under the interface module.
4. With the locking mechanism depressed, tip the interface module forward so that it comes off the rail.

3.4 Inserting and identifying the electronic modules

Features

- The electronic modules are inserted in the terminal modules.
- A labeling strip allows you to identify the electronic modules.
- Electronic modules are:
  - Self-coding
  - Type-coded

The first time you insert an electronic module, a code element engages on the terminal module. This mechanically prevents the wrong electronic module from being inserted.

Prerequisites

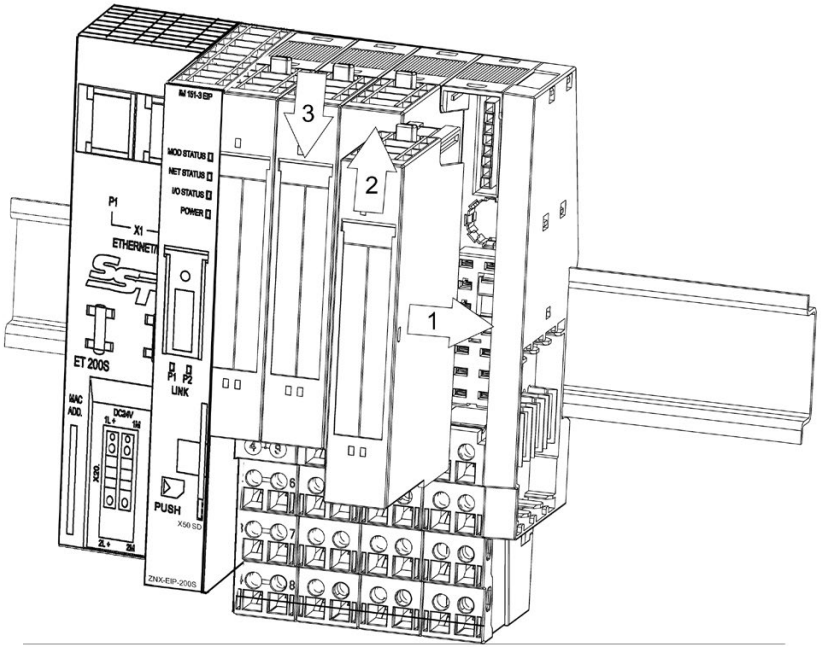
Adhere to the rules below for inserting electronic modules.

Inserting and identifying the electronic modules

To insert and identify the electronic modules, follow the steps below:

1. Insert the electronic module in the terminal module until you hear it snap into place.
2. Pull the labeling strip up out of the electronic module in order to identify it.
3. Then put the labeling strip back into the electronic module.

The following diagram illustrates inserting and identifying electronic modules:

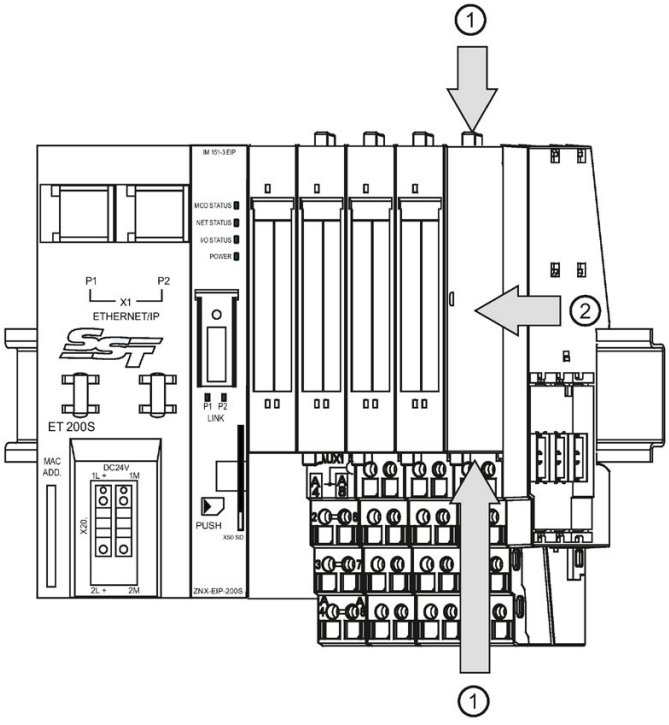


Removing electronic modules

To remove electronic modules, follow the steps below:

1. Simultaneously press the two release buttons on the top and bottom of the electronic module.
2. Pull the electronic module out from the terminal module at the front.

The following diagram illustrates removing electronic modules:

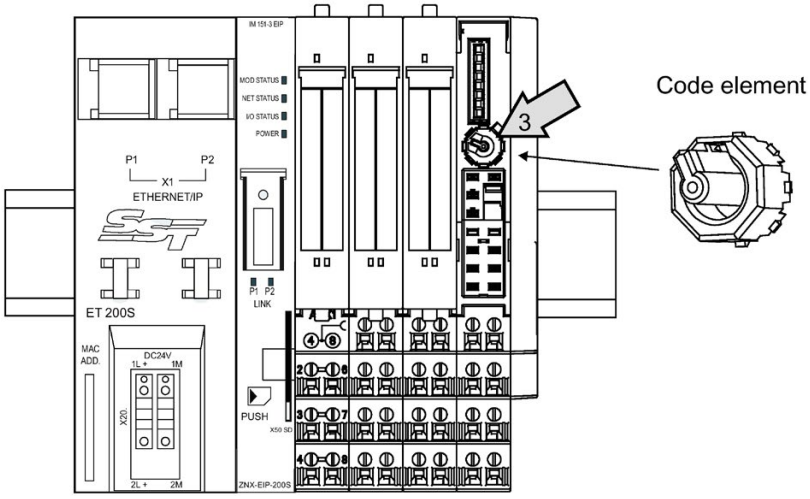


Changing the type of an electronic module

Assuming you have already removed the electronic module, follow the steps below to change the type of electronic module:

1. Use a screwdriver to push the code element out of the terminal module.
2. Put the code element on the used electronic module again.
3. Insert the new electronic module (different type) in the terminal module until you hear it snap into place.
4. Identify the new electronic module.

The following diagram illustrates removing the code element:



WARNING

Risk of making changes to the code element:

If you make changes to the code element, dangerous plant conditions can result and the outputs of the ET 200S can be damaged.

As a consequence, death or severe personal injury may result if proper precautions are not taken.

Because of this possible danger, do not make any changes to the code element to avoid damaging the ET 200S.

Replacing a defective electronic module

Assuming you have already removed the electronic module, follow the steps below to replace a defective electronic module:

1. Remove the code element from the bottom of the new electronic module.
2. Insert the new electronic module (same type) in the terminal module until you hear it snap into place.
3. Identify the new electronic module.

Removing and inserting electronic modules during operation (hot swapping)

ET 200S supports the removal and insertion of modules during operation (during the RUN operating mode). The ET 200S remains in RUN mode when an electronic module is removed. The protective conductor connections of the ET 200S are not interrupted.

Note

If one module is missing (gap) and the ET 200S is switched off and then on again, this action results in a station failure of the ET 200S.

Replacing multiple electronic modules

If you replace more than one module, only one gap can result.

The following table indicates which modules you can remove and insert under which conditions:

Modules	Removing and inserting	Conditions
Interface module	No	---
Power modules	Yes	The load voltage must be switched off.
Digital electronic modules (input)	Yes	---
Digital electronic modules (output)	Yes	The load voltage must be switched off by means of an external switch/fuse.
Analog electronic modules	Yes	---
1SSI	Yes	The load voltage must be switched off by means of an external switch/fuse.
Reserve	Yes	---

3.5 Wiring and setup

Prewiring

The ET 200S distributed I/O system allows you to prewire the terminal modules with screw-type or spring terminals.

3.6 General rules and regulations for operating the EIP-200S Ethernet/IP Adapter

Introduction

When operating the ET 200S distributed I/O system as a component part of a plant or system, certain rules and regulations have to be followed depending on where the device is to be used.

This chapter provides an overview of the most important rules you have to observe when integrating the ET 200S in a plant or system.

Specific applications

Note the safety and accident prevention regulations that apply to specific applications (for example, the Machine Directive).

EMERGENCY STOP devices

Emergency stop devices complying with IEC 204 (which corresponds to DIN VDE 0113) must remain effective in all the operating modes of the plant or system.

Startup of the system after specific events

The following table tells you what you should do when the system starts up after the occurrence of specific events:

If :	Then:
• Startup follows a voltage drop or failure, or • Startup of the ET 200S follows an interruption of bus communication	No dangerous operating states must occur. If necessary, force an emergency stop.
• Startup follows unlocking of the emergency stop device	There must not be an uncontrolled or undefined startup.

Line voltage

The following table tells you what you should do with regard to the line voltage:

With:	Requirements:
Permanently installed plants or systems without all-pole line disconnect switches	There must be a line disconnect switch or a fuse in the building installation system.
Load power supplies, power supply modules	The set rated voltage range must correspond to the local line voltage.
All circuits of the ET 200S distributed I/O system	Any fluctuation/deviation in the line voltage from the rated value must be within the permitted tolerances.

24 VDC supply

The following table tells you what you should do with regard to the 24 VDC supply:

With:	Pay attention to:	
Buildings	Outdoor lightning protection	Take lightning protection precautions (for example, lightning conductors)
24 VDC supply lines, signal lines	Indoor lightning protection	
24 VDC supply	Safe (electrical) isolation of extra-low voltage	

Protection against outside electrical influences

The following table tells you what to do to provide protection against electrical influences or faults:

With:	You must ensure that:
All plants or systems in which the ET 200S is integrated	The plant or system is connected to a protective conductor for diverting electromagnetic interference.
Supply, signal, and bus lines	The wiring arrangement and installation are correct.
Signal and bus lines	Any break of a line or conductor does not result in undefined states of the plant or system.

3.7 Operating the ET 200S on a grounded supply

In this section, you will find information on the overall setup of an ET 200S distributed I/O system on a grounded supply (TN-S system). The specific subjects discussed are:

- Circuit-breaking devices, short-circuit and overload protection according to DIN VDE 0100 and DIN VDE 0113
- Load power supplies and load circuits

Components and protective measures

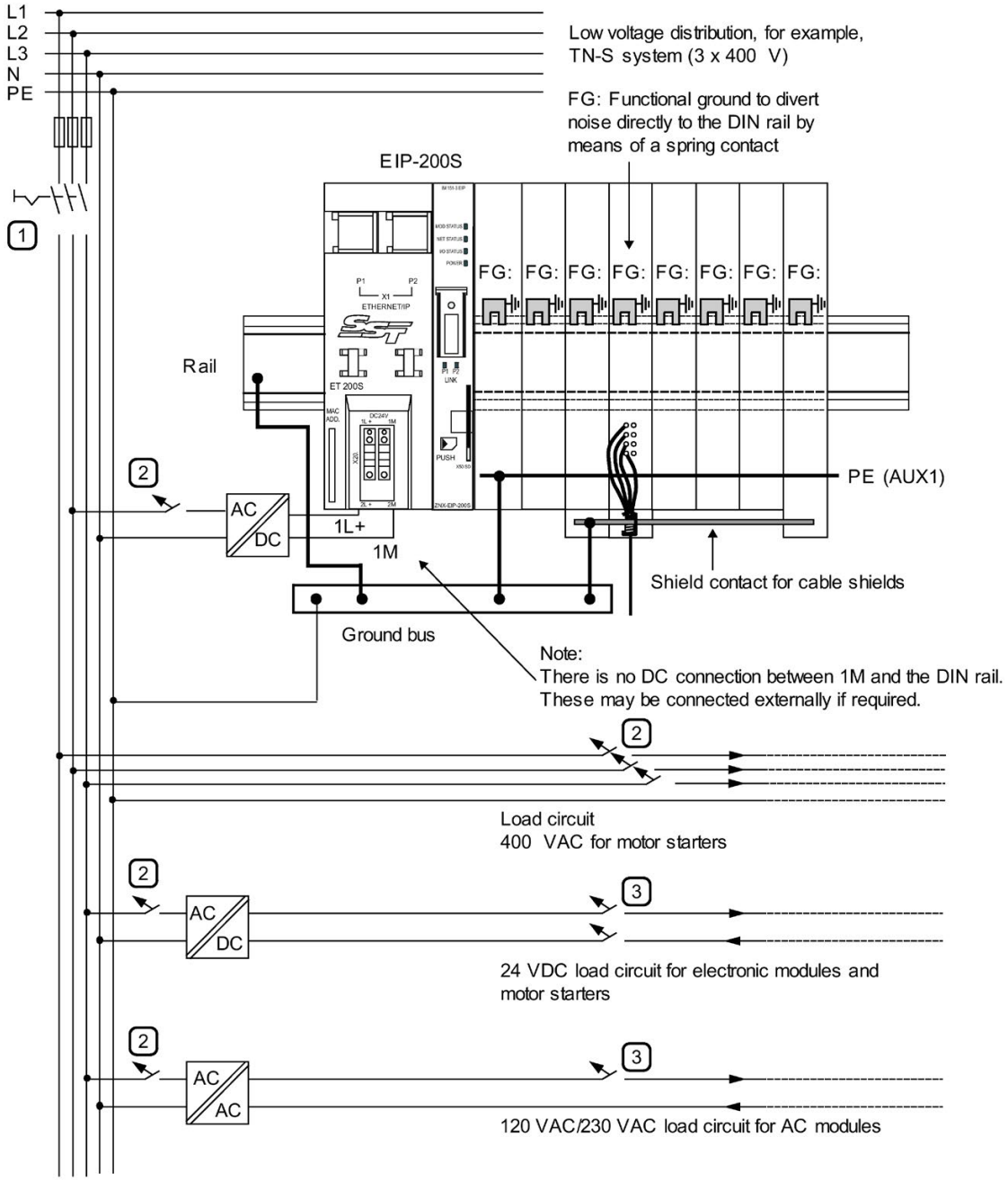
Various components and protective measures are prescribed when setting up an entire plant. The types of component and the degree to which the protective measures are binding depend on the DIN VDE regulation that applies to your plant setup. The following table refers to the configuration illustration below:

Table 3- 1 Comparison of the DIN VDE 0100 and the DIN VDE 0113

Components and protective measures	Refer to configuration illustration	DIN VDE 0100	DIN VDE 0113
Circuit-breaking device for PLC, sensors and actuators	①	Part 460: Main switch	Part 1: Disconnector
Short-circuit and overload protection: grouped for sensors and actuators	② ③	Part 725: Single-pole protection of circuits	Part 1: • With a grounded secondary circuit: single-pole protection • In all other cases: all-pole protection
Load power supply for AC load circuits with more than five electromagnetic devices	② ③	Isolation by transformer recommended	Isolation by transformer recommended

Overall configuration of the ET 200S

The following illustration shows the overall configuration of the ET 200S distributed I/O system (load voltage supply and grounding concept) with supply from a TN-S system.



Grounded supply

In a grounded supply, the neutral conductor of the system is grounded. A mere ground fault between a live conductor and ground or a grounded section of the plant causes the protective devices to trip.

Safe electrical isolation

Safe electrical isolation must be provided for:

- Modules that must be operated at the following voltages: v60 VDC or v25 VAC
- 24 VDC operating current circuits

Setting up the ET 200S with ungrounded reference potential

The reference potential M of the rated supply voltage for the interface module is connected to the rail (protective conductor) by means of an RC combination, therefore making an ungrounded configuration possible.

To divert interference current, the reference potential of the interface module is connected internally to the rail (protective conductor) via an RC combination (R = 10 MΩ / C = 22 nF). High-frequency interference currents are thus discharged, and static charge is prevented.

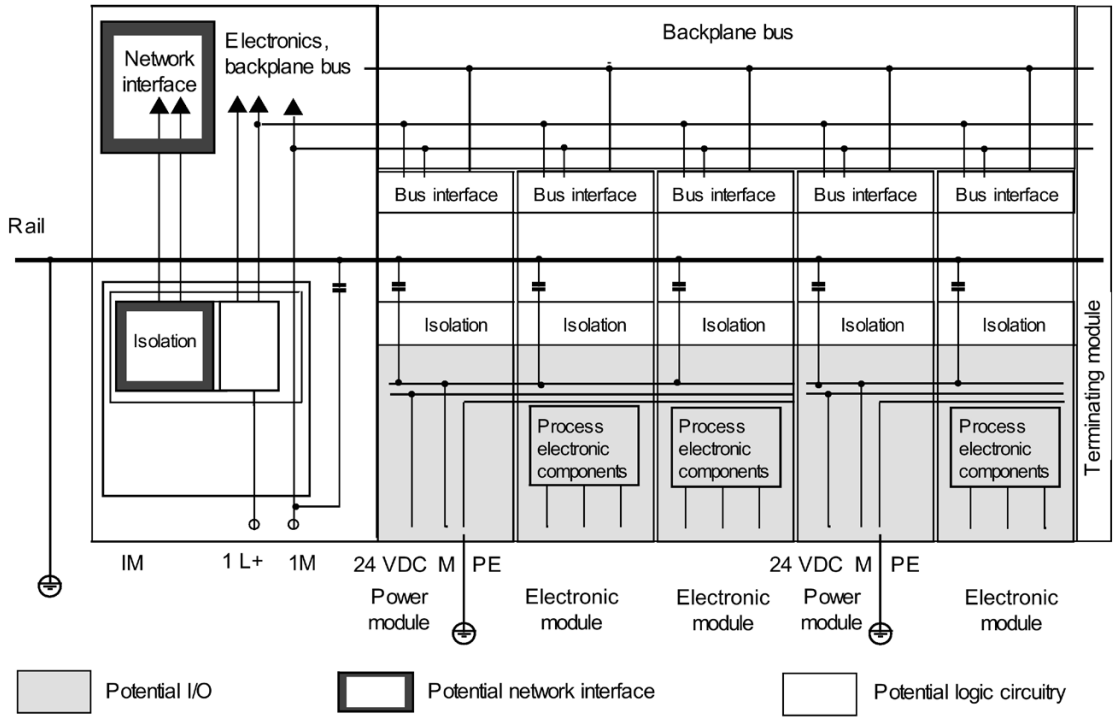
3.8 Electrical design of the ET 200S

Isolation between:

The ET 200S provides isolation between the following components:

- The load circuits/process and all other circuit components of the ET 200S
- The interface in the interface module and all other circuit components

The following illustration shows the potentials of the ET 200S. Only the most important components are shown:



3.9 Wiring the ET 200S

3.9.1 Wiring rules for the ET 200S

Wiring rules for:		Interface voltage (supply voltage)	Terminal modules (spring and screw-type terminals)	Terminal modules (Fast Connect)
Connectable wire cross-sections for rigid lines		No	0.14 to 2.5 mm^2	0.5 to 1.5 mm^2
Connectable wire cross-sections for flexible lines	Without wire end ferrule	0.25 to 2.5 mm^2	0.14 to 2.5 mm^2	0.5 to 1.5 mm^2
	With wire end ferrule	0.25 to 1.5 mm^2	0.14 to 1.5 mm^2	---
Number of wires per connection		1 or a combination of 2 wires up to 1.5 mm^2 (sum) in a common wire end ferrule		1
Maximum external diameter of the wire's insulation		∅ 3.8 mm	∅ 3.1 mm at 1.5 mm^2 ∅ 3.8 mm at 2.5 mm^2	∅ 3.2 mm at 1.5 mm^2
Stripping length of the wires		11 mm		---
Wire end ferrules to DIN 46228	Without insulating collar	Form A, 8 to 12 mm long	Form A, up to 12 mm long	---
	With insulating collar 0.25 to 1.5 mm^2	Form B, up to 12 mm long		---

3.9.2 Wiring a terminal module with screw-type terminals

Features

In terminal modules with screw-type terminals, the individual wires are screwed into the terminal.

No wire end ferrules are required.

Prerequisites

Adhere to the wiring rules.

Tool required

3 mm screwdriver

Wiring a terminal module with a screw-type terminal

To wire a terminal module with a screw-type terminal, follow these steps:

1. Strip 11 mm (0.43 in) of insulation from the wires.
2. Insert the individual wires in the terminal.
3. Screw the ends of the individual wires onto the terminal module (torque: 0.4...0.7 Nm).

3.9.3 Wiring a terminal module with spring terminals

Features

In terminal modules with spring terminals, the individual wires are held securely when you simply insert them in the terminal.

Prerequisites

Adhere to the wiring rules.

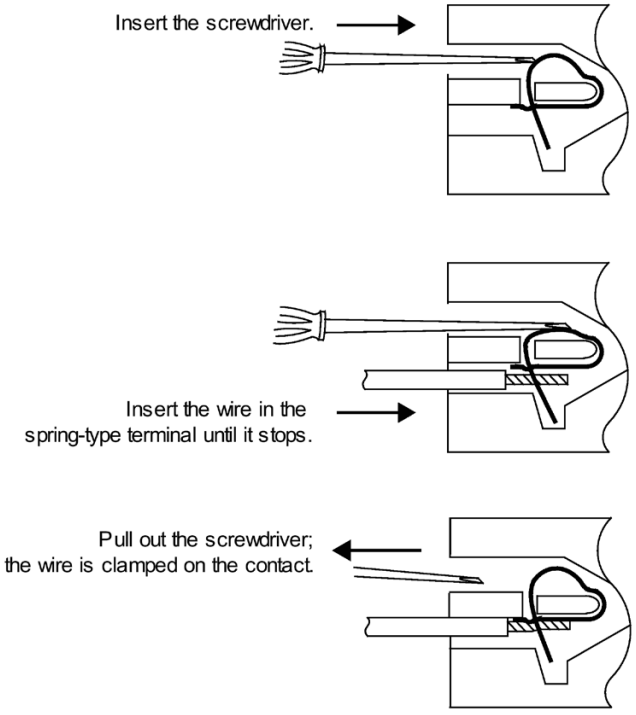
Tool required

3 mm screwdriver

Wiring a terminal module with spring terminals

To wire a terminal module with a spring terminals, follow these steps:

1. Strip 11 mm (0.43 in) of insulation from the wires.
2. Insert the screwdriver in the upper (round) opening of the terminal.
3. Insert the wire until it stops in the lower (square) opening of the terminal.
4. Release the terminal by pushing the screwdriver into the opening.
5. Push the wire into the released spring terminal, and pull the screwdriver out.

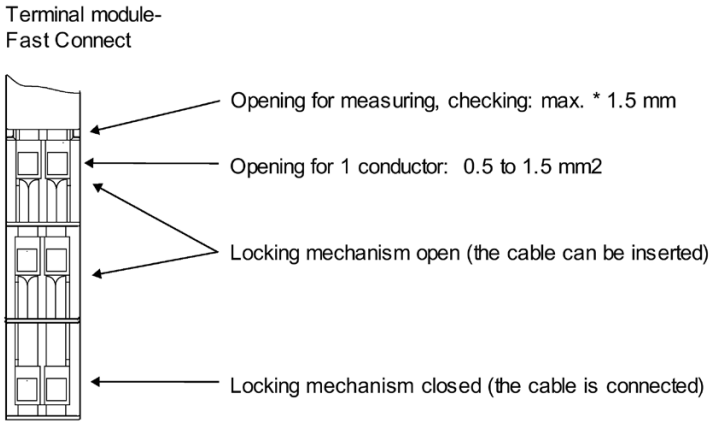


3.9.4 Wiring a terminal module with Fast Connect

Features

- In the case of terminal modules with Fast Connect, the individual wires are attached using a quick connection method that requires no stripping.
- Fast Connect is a connection method that requires no preparation - the conductor does not have to be stripped.
- Each terminal of the terminal module with Fast Connect has a test opening (for measuring the voltage, for example). The test opening is suitable for test probes with a maximum diameter of ∅ 1.5 mm.
- Wire end ferrules are not permitted.

Following is a block diagram of the terminal module with Fast Connect:



Prerequisites

Adhere to the wiring rules.

Tool required

3 mm screwdriver

Connectable cables

You can connect rigid and flexible cables with PVC insulation with a conductor cross-section of 0.5 mm^2 to 1.5 mm^2 (maximum external diameter 3.2 mm). If the cross-section of the conductors is the same, they can be wired 50 times.

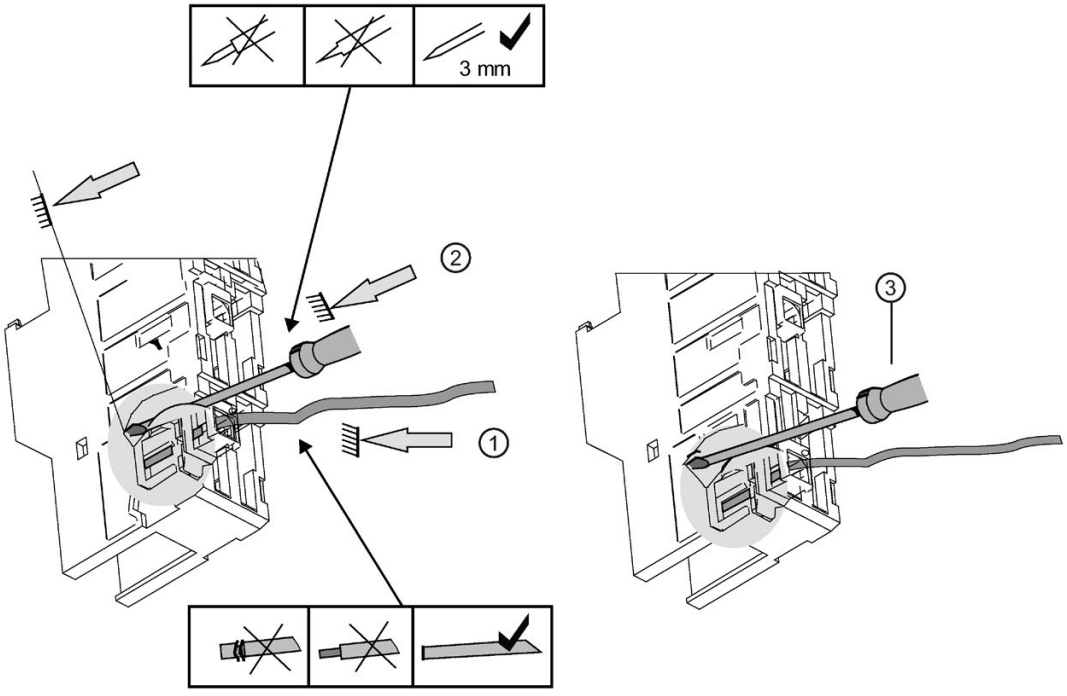
Cables and connections complying with UL: Wiring range for insulating piercing connection: 22 - 16 AWG solid/stranded PVC insulated conductors, UL style 1015 only.

Wiring terminal modules with Fast Connect

1. Insert the unstripped cable in the round opening until it stops (the insulation and conductor must form a flat surface).
2. Insert the screwdriver into the opening above the locking mechanism until it stops.
3. Press the screwdriver downward until the locking mechanism reaches the end.

Result: The cable is connected.

The illustration that follows shows how to wire terminal modules with Fast Connect:



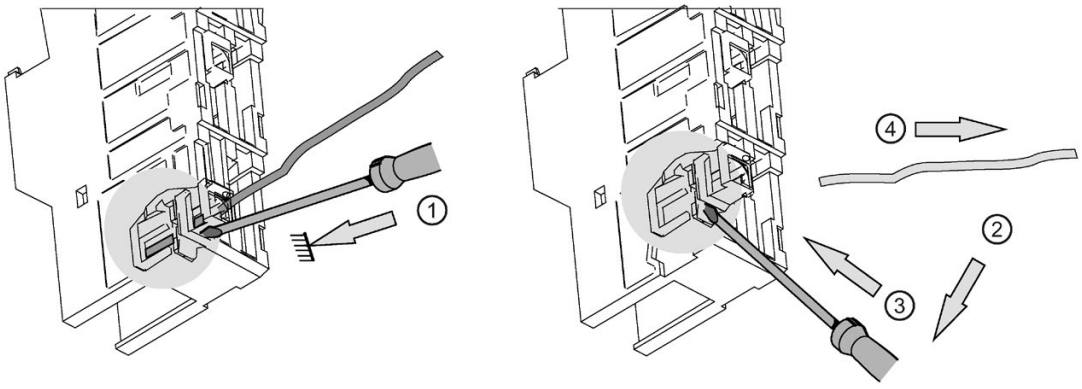
Note

If you want to reconnect a cable that has already been connected, you must cut the end of the wire to remove the pierced insulation so that good contact will be made when the wire is reinserted.

Releasing the wiring of the terminal module with Fast Connect

1. Insert the screwdriver into the opening below the locking mechanism until it stops.
2. Use the screwdriver to lever and push the locking mechanism upward.
3. The wiring is released.
4. Remove the cable.

The illustration that follows shows how to release the wiring of the terminal module with Fast Connect:



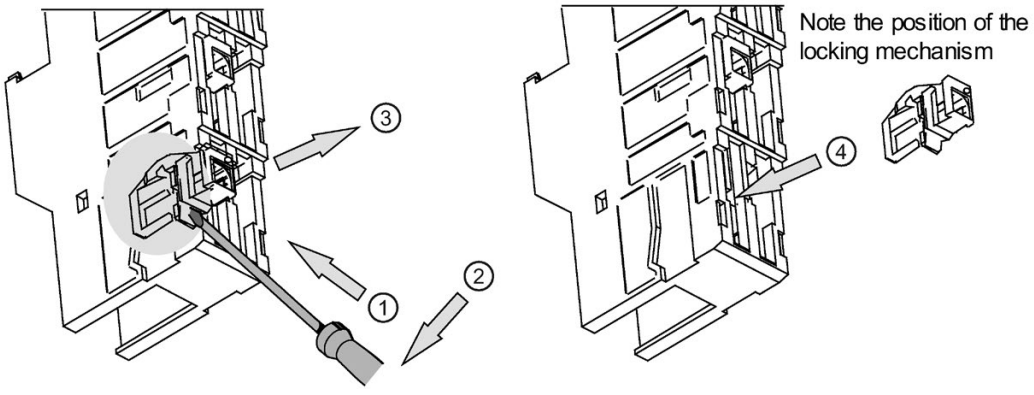
Removing any remains of the conductor (only if necessary)

To remove any remains of the conductor (insulation), you can uninstall the locking mechanism from the terminal module (see Step 3). To do this, the locking mechanism must be open (upper position). You can only insert the locking mechanism in the upper position (see Step 4).

Follow these steps to remove conductor material:

1. Insert the screwdriver in the opening below the locking mechanism (the tip of the screwdriver is on the lip of the locking mechanism).
2. Press the screwdriver downwards to lever the locking mechanism out of the terminal module.
3. Remove the locking mechanism from the terminal module. Remove any remains of the conductor from the locking mechanism.
4. Use your fingers to press the locking mechanism back into the opening. Important: Make sure the locking mechanism is inserted in the correct position, otherwise you can damage the clamping unit.

The illustration that follows shows removal of the locking mechanism from the terminal module:



3.9.5 Wiring terminal modules for power and electronic modules

Features

The ET 200S distributed I/O system comprises terminal modules for power modules and electronic modules:

- At the terminal modules for the power modules, you connect the supply/load voltage for the respective potential group.
- Terminal modules for electronic modules connect the ET 200S with the process.
- At the terminal modules for electronic modules, you can connect cable shields by means of a shield contact.

Prerequisites

- You must wire the terminal modules with the supply/load voltage switched off at the power module and the load voltage switched off at the electronic module.
- Adhere to the wiring rules.

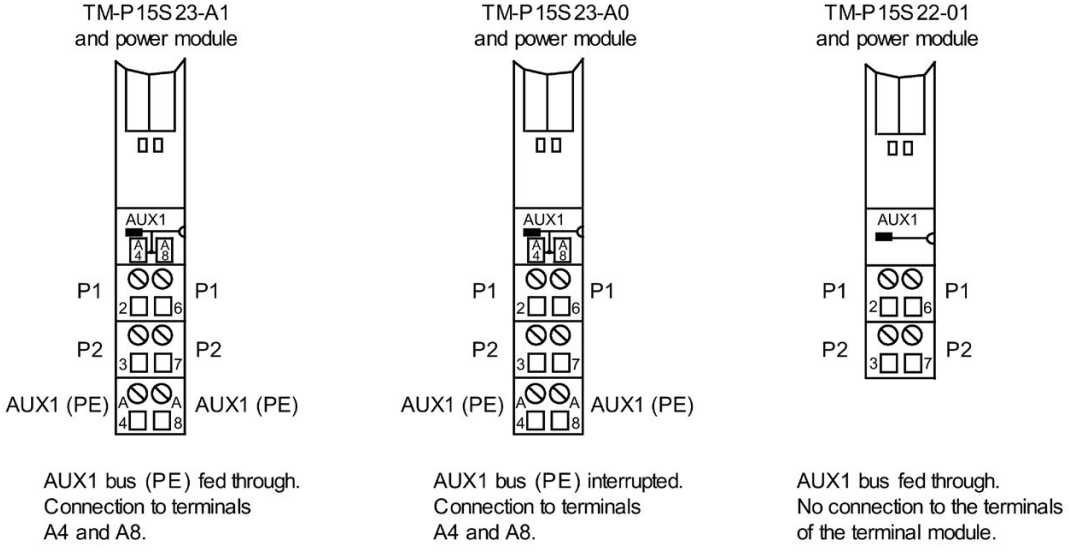
Tool required

3 mm screwdriver

Wiring terminal modules for power modules

The terminal assignment of the terminal module depends on which power module is inserted.

The following diagram illustrates wiring terminal modules for power modules:

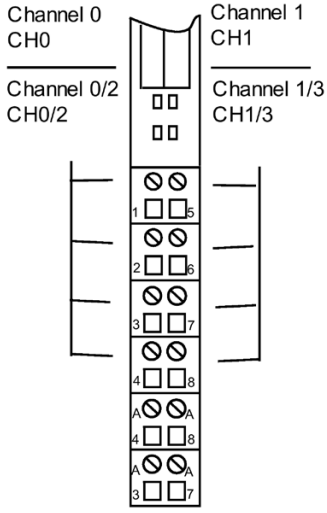


Wiring terminal modules for digital, analog, and process-related modules

The terminal assignment of the terminal module depends on which electronic module is inserted.

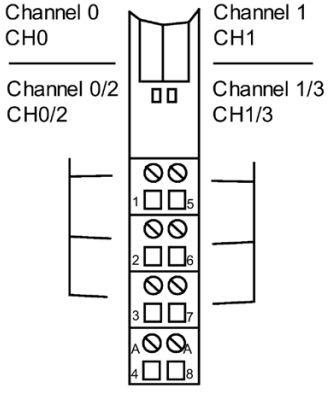
The following diagram illustrates wiring terminal modules for electronic modules:

TM-E15S26-A1 and electronic module/process-related module



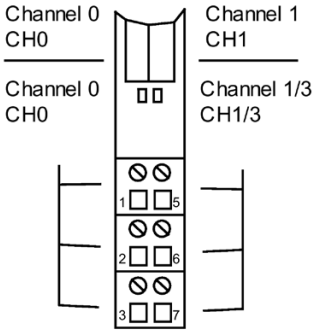
AUX1 bus (PE) fed through.
Connection to terminals
A4, A8 and A3, A7.

TM-E15S24-A1 and electronic module



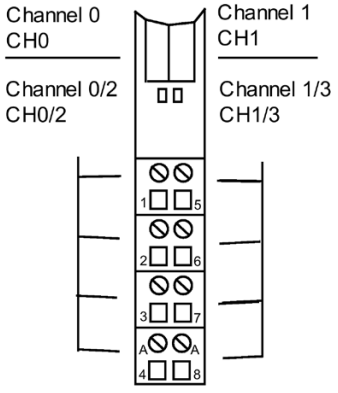
AUX1 bus (PE) fed through.
Connection to terminals
A4 and A8.

TM-E15S23-01 and electronic module



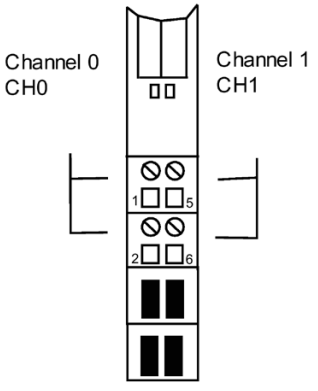
AUX1 bus fed through.
No connection to the terminals.

TM-E15S23-01 and electronic module/process-related module

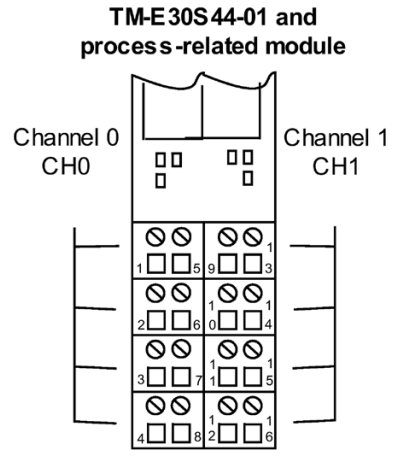


AUX1 bus (PE) fed through.
No connection to terminals 4 and 8.

TM-E15S24-AT and 2AI TC HF



AUX1 bus (PE) fed through.
No connection of the terminal module.



AUX1 bus (PE) fed through.
No connection to terminals
4 and 8 or 12 and 16.

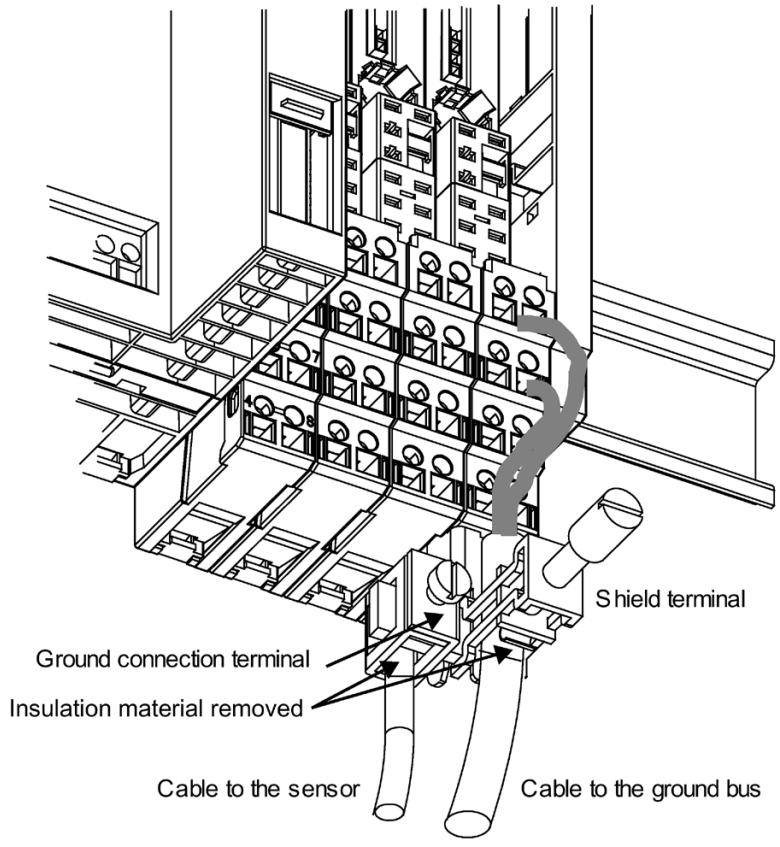
Connecting cable shields

We recommend you use the shield contact to connect cable shields (in the case of analog electronic modules, the 1COUNT 24V/100kHz electronic module and the 1SSI electronic module, for example).

To connect cable shields, perform the following steps:

1. Remove the insulation material from the area around the shield terminal, and clamp the cable shield in the shield terminal (above the conductor rail). The shield terminal is suitable for one cable with a max. ∅ of 8 mm or two cables with a max. ∅ of 4 mm each.
2. Tighten the shield terminal (approximately 0.5 Nm).
3. Repeat steps 1 and 2 if you want to connect additional cable shields.
4. Strip the insulation from the ground wire (from 6 mm to 25 mm^2), and insert it in the ground connection terminal (under the conductor rail). Tighten the ground connection terminal
(2 Nm to 2.5 Nm).
5. Attach the other end to the ground bus.

The following diagram illustrates connecting cable shields:



Note

To stabilize the shield contact, you must mount and screw in at least one shield terminal over the shield contact element.

3.9.6 Wiring the EIP-200S Ethernet/IP Adapter

Features

You can connect the supply voltage to the EIP-200S Ethernet/IP Adapter.

Prerequisites

Prerequisites for wiring the EIP-200S Ethernet/IP Adapter are shown below:

- Wire the interface module power connector with the supply voltage switched off.
- Adhere to the wiring rules.

Tool required

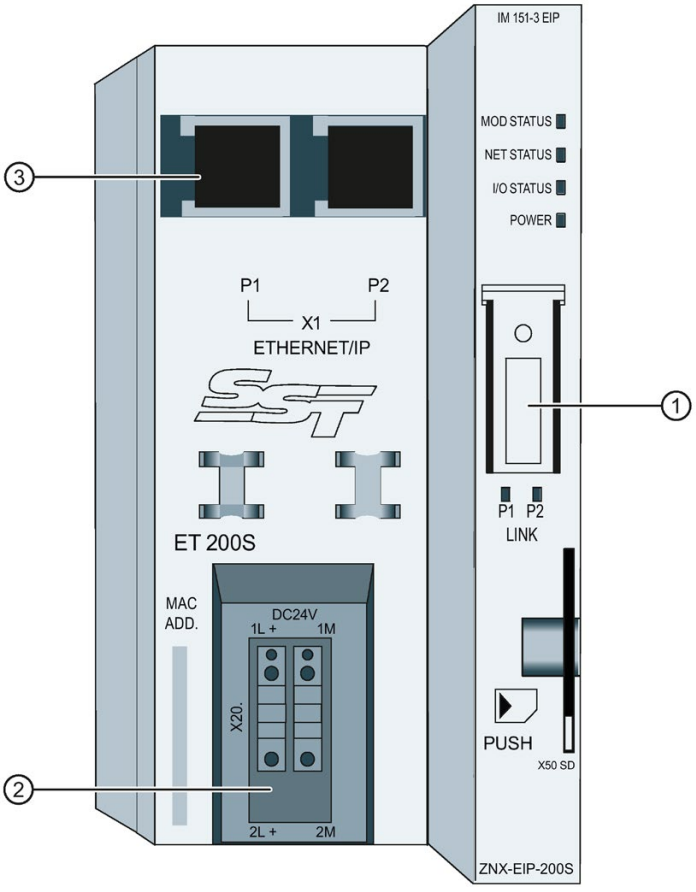
3 mm screwdriver

Wiring the EIP-200S Ethernet/IP Adapter interface module

To connect the supply voltage, follow these steps:

1. Strip the insulation from the wires for the supply voltage of the interface module.
2. Depress the orange wire release slot with a screwdriver and, while holding it down, insert the stripped wire. Release the wire release slot.

There is a pluggable power connector on the Adapter. The wires are connected to it.



① Labeling strip
② Supply voltage
③ Ports

Commissioning and diagnostics

4

4.1 Configuring the ET 200S

Introduction

This section describes how to configure and assign parameters to the ET 200S:

- Configuration: The systematic arrangement of the different ET 200S modules (setup)
- Parameter assignment: Setting the ET 200S parameters using the configuration software

Configuration

The ET 200S has address space of up to 255 bytes for inputs and 255 bytes for outputs. To better exploit the available address space of the scanner and reduce data transfer between the ET 200S and the scanner, you can group several electronic modules/load feeders in a single byte in the input or output area of the process image. This is achieved by the systematic arrangement and designation of the ET 200S electronic modules/motor starters.

In Appendix C, you will find a table giving the address space required for the individual modules.

You can group the following module types in a single byte:

- Digital input modules
- Digital output modules
- Motor starters (direct-on-line starters and reversing starters)

Procedure for groupable modules

In the hardware catalog of your configuration software, you can recognize groupable modules by the fact that they are available in duplicate. The modules differ from each other only by a " * " in the designation. To group modules, follow the steps below:

1. Configure the ET 200S setup, adhering to the following rules:
   - The modules that you can group in a single byte must be of the same module type (see section above).
   - There can be a total of no more than 8 channels (1 byte).
2. Select from the hardware catalog of your configuration software the module designation without " * ".
   - Result: You open a byte and store the first module there.
3. Select from the hardware catalog of your configuration software the module designation with " * ".
   - Result: In the open byte, you store additional modules until all the bits are occupied.
4. If a byte is filled, you must configure a module again (that is, open a new byte without " * ").

Note

The configuration software does not check whether the modules have been grouped correctly. If you configure more than 8 channels in one byte, the modules that exceed the byte limit are reported as being incorrectly configured in the diagnosis:

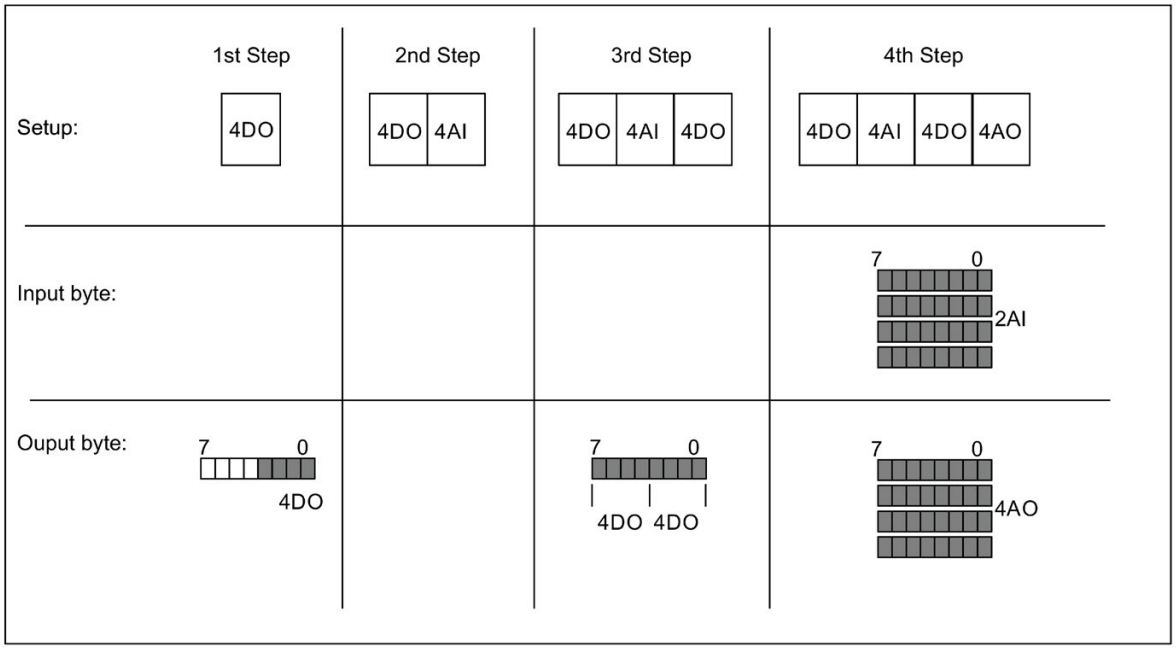
Module status → 10_B: Incorrect module; invalid user data

These modules are not addressed.

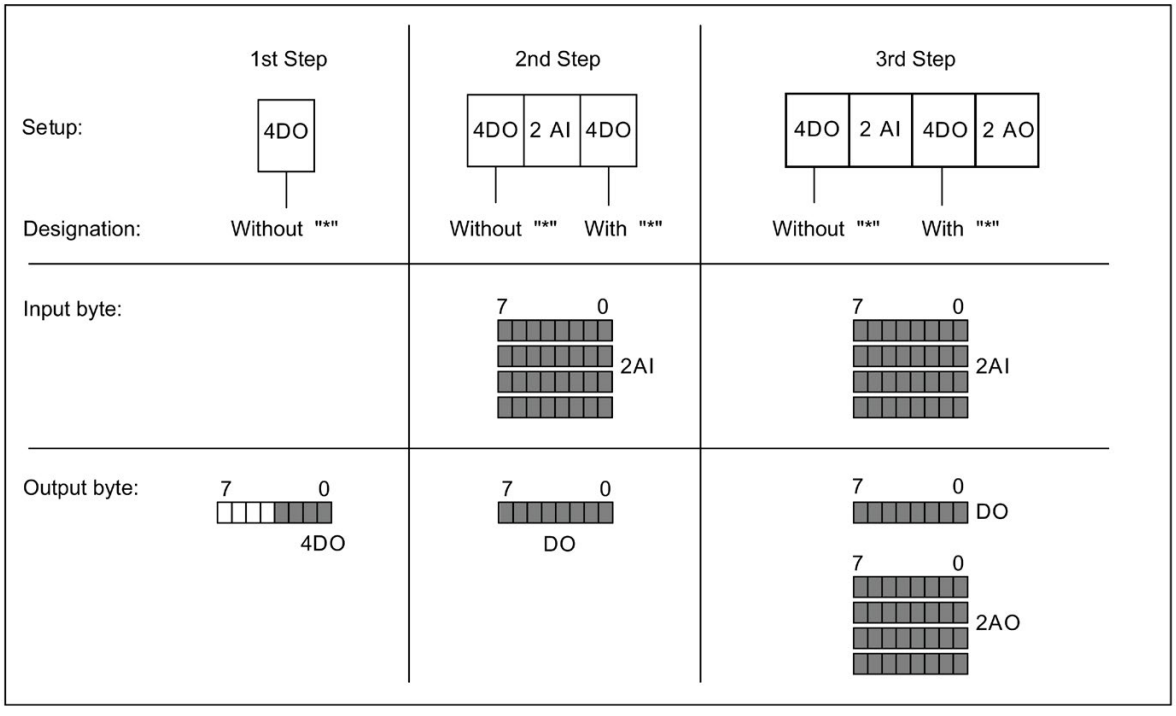
Note

The EIP-200S Ethernet/IP Adapter assembles data on byte boundaries. Some scanners may only provide access to this data on word boundaries. You should organize your ET 200S modules to conform to the scanner's restrictions. For example, configure the grouping of digital modules so that an analog module will occupy bytes 0 to 3 or 4 to 7. In this way, the analog modules will begin on even-byte boundaries to avoid an analog value being split between two words.

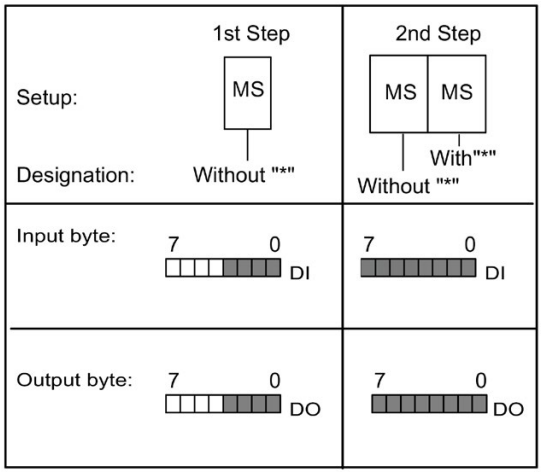
Grouping of modules in Automatic Configuration mode (default)



Grouping of modules in User Configured mode



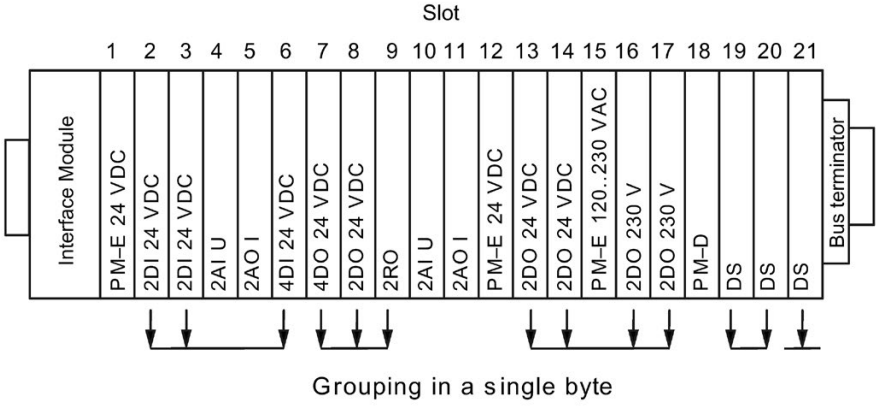
Grouping of Motor Starters



Configuration example

The following example describes how to use User Configured mode in the configuration of an ET 200S setup:

Setup of the ET 200S



Configuration table in your configuration software and address space

The byte and bit addresses result from the sequence of the grouped modules in User Configured mode.

Slot	Module	Grouping	I/O address	
			Inputs	Outputs
1	6ES7138-4CA00-0AA0 PM-E 24 VDC	---	---	---
2	6ES7131-4BB00-0AB0 2DI 24 VDC	Yes	0.0 to 0.1	
3	6ES7131-4BB00-0AB0*2DI 24 VDC		0.2 to 0.3	
4	6ES7134-4FB00-0AB0 2AI U	No	1 to 4	
5	6ES7135-4GB00-0AB0 2AO I	No		0 to 3
6	6ES7131-4BD00-0AA0*4DI 24 VDC	Yes	0.4 to 0.7	
7	6ES7132-4BD00-0AA0 4DO 24 VDC	Yes		4.0 to 4.3
8	6ES7132-4BB00-0AB0*2DO 24 VDC			4.4 to 4.5
9	6ES7132-4HB00-0AB0*2DO Rel.			4.6 to 4.7
10	6ES7134-4FB00-0AB0 2AI U	No	5 to 8	
11	6ES7135-4GB00-0AB0 2AO I	No		5 to 8
12	6ES7138-4CA00-0AA0 PM-E 24 VDC	---	---	---
13	6ES7132-4BB30-0AB0 2DO 24 VDC	Yes		9.0 to 9.1
14	6ES7132-4BB30-0AB0* 2DO 24 VDC	Yes		9.2 to 9.3
15	6ES7138-4CA00-0AA0 PM-E 230 VAC	---	---	---
16	6ES7132-4BB00-0AB0*2DO 24 VDC/0.5 A	Yes		9.4 to 9.5
17	6ES7132-4BB00-0AB0*2DO 24 VDC/0.5 A	Yes		9.6 to 9.7
18	3RK1903-0BA00 PM-D	---	---	---
19	3RK1301-xxB00-0AA0 DS	Yes	9.0 to 9.3	10.0 to 10.3
20	3RK1301-xxB00-0AA0 *DS		9.4 to 9.7	10.4 to 10.7
21	3RK1301-xxB00-0AA0 DS	Yes	10.0 to 10.3	11.0 to 11.3

No grouping

If you do not want to group the configuration of the ET 200S distributed I/O system digital input/output modules and motor starters in a single byte, use only those module designations without " * " in the hardware catalog of your configuration software.

Each electronic module/motor starter will then occupy one byte in the input or output area of the process image.

4.2 Commissioning and startup of the ET 200S

Software requirements

To configure the EIP-200S Ethernet/IP Adapter interface module, use the ZNX-EIP-200S Configuration Tool software package. Refer to its documentation for information on how to configure the system.

Requirements for commissioning the ET 200S

The requirements for commissioning the ET 200S are shown below:

- Adapter installed
- Adapter wired
- Switch on supply voltage for the Adapter
- Switch on the supply voltage for the load as necessary
- Adapter configured and parameters assigned
- Supply voltage switched on for scanner
- Scanner set to RUN mode

4.3 Configuring the EIP-200S Ethernet/IP Adapter

Use the EIP ET200 Configuration Tool to configure the EIP-200S Ethernet/IP Adapter. Refer to the EIP ET200 Configuration Tool User Manual for complete instructions.

4.4 Setting the IP address

DHCP is the factory default. When the EIP-200S Ethernet/IP Adapter is using DHCP, IP addresses can be set using Microsoft Windows and Linux DHCP/BOOTP servers. There are several free servers for Microsoft Windows available for download from the Internet. Use discretion when downloading software from the Internet.

After the IP address is set with DHCP, you can use the EIP ET200 Configuration Tool to set a permanent IP address and turn off DHCP. See the EIP ET200 Configuration Tool User Manual for more information.

4.5 Using QuickConnect

What is QuickConnect?

QuickConnect technology enables Ethernet/IP devices to quickly power up and join an Ethernet/IP network. Examples of typical implementations might include the following:

- A robotic application where a robot arm quickly exchanges tools to switch tasks.
- A pallet application where a large frame consisting of many I/O modules moves down an assembly line and connects to different controllers at different locations on the line.

Connection time

The ET200S EtherNet/IP interface module is a Class B QuickConnect target device. The module is able to power up, send the first gratuitous ARP packet, and be ready to accept a TCP connection in 1100 ms or less

Architecture

A QuickConnect system consists of two sides: a controller side and a tool side.

The controller side might include some of the following components:

- Robot with a tool-changing coupler
- Robot controller
- Managed switch
- Ethernet/IP communication modules
- Ethernet/IP network
- Ethernet/IP-based I/O devices

The tool side typically consists of multiple tools that include these components:

- A tool-changing coupler
- Ethernet/IP network
- Ethernet/IP-based I/O devices with QuickConnect capability

Advantages of using QuickConnect

QuickConnect accelerates the startup of distributed I/O devices. It shortens the time that the respective configured distributed I/O devices require in order to reach the cyclic user data exchange in the following cases:

- After distributed I/O devices have been activated.
- After the supply voltage has returned.
- After a station has returned.

Waiting times between the scheduled processes of a restart are reduced to a minimum with the use of QuickConnect. This accelerates the production process with removable I/O devices and enables a greater throughput in production.

4.5.1 Guidelines for using QuickConnect on your network

QuickConnect and the EIP ET200 Configuration Tool

Use the EIP ET200 Configuration Tool to enable QuickConnect, to turn off autonegotiation, and to set a fixed baud rate and duplex.

Note

Note that if QuickConnect is turned on in the ET 200S EtherNet/IP module, you should not use the ET 200 EtherNet/IP Configuration Tool to perform a firmware update because the self-checks are turned off in that mode.

Requirements

An Ethernet/IP QuickConnect system requires an electrical lock signal. The electrical lock signal indicates that the tool changer has applied power to the tool. This is a hard-wired signal that must be implemented by the system builder. This signal must run from the tool changer back to the control system and must be connected to a digital input module. This signal is the event that starts the QuickConnect sequence.

QuickConnect system guidelines

The following guidelines are required in order to enable setup with QuickConnect:

System component	Guidelines
Tool side devices	• Use a preconfigured, static IP address for the devices. This removes DHCP/BOOTP cycle time. • Configure the devices for 100 Mbps, full-duplex operation in both the switch and the end-node device. • Configure the devices to not autonegotiate and to not use Auto-MDIX. • Use straight-through Ethernet/IP cables on the devices. • Connect the devices in a linear topology. Ring topology is not supported.
Switches	• Make sure an Ethernet/IP managed switch on the controller side remains powered on at all times. Only the tool side is subject to power cycling. This is important so that the switch does not block communication to and from devices.
Data	• I/O data sizes must remain the same when nodes on a new device use the same IP address. If the I/O sizes are different, then the nodes need unique IP addresses.
Communication	• A QuickConnect I/O device issues a gratuitous ARP message announcing its presence on the network. The module continues to issue the gratuitous ARP message every 25 ms for a maximum of 40 times (1 second) until an I/O connection is established. • The module issues a TCP close when it receives a forward close message. Otherwise, connections may stay open for several seconds before they time out.
Controllers	• Upon receiving the electrical lock signal, the controller waits for a module-specific delay period and then uninhibits the QuickConnect module to open an I/O connection. • The controller knows the device startup time. You might need to alter the power-up time to delay the connection establishment procedure by that amount of time.

QuickConnect sequence

The following steps describe a robot system as an example:

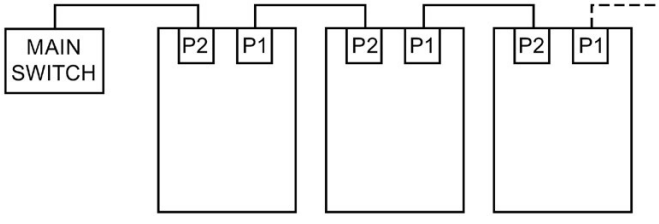
1. The controller inhibits current connections to QuickConnect modules, and the robot arm physically disengages the current tool.
2. The robot arm physically attaches a new QuickConnect module.
3. The new QuickConnect module powers up.
4. The controller acknowledges a successful attachment to a new tool via an electrical lock signal.
5. Upon receiving the electrical lock signal, the controller waits for the devices to start up before uninhibiting a new set of I/O connections and then connects to the new QuickConnect module.
6. When all connections are established, the robot is ready for operation.

Procedures for using QuickConnect

Port parameter	Setting
Negotiation	Off
Rate	100 Mbps
Duplex	Full
Auto-MDIX	Off

To enable the use of QuickConnect, perform the following steps:

1. Connect the EIP-200S Ethernet/IP Adapter to a managed switch with the switch port set to autonegotiation off and auto crossover (auto-MDIX) off, with the same fixed baud rate and duplex as the device. An Ethernet straight-through cable (1:1) can be used by connecting to Port 2 on the EIP-200S because Port 2 is crossed over internally. (A connection to Port 1 on the EIP-200S would require a crossover cable). Another option is to have more than one EIP-200S set up this way and connect them in a daisy chain with Port 2 of one device connected to Port 1 of the other. This can be done with straight-through cables.



2. Using the ZNX-EIP-200S Configuration Tool, turn autonegotiation off and set a fixed baud rate and duplex.
3. Turn on QuickConnect with the Configuration Tool.

Wiring rules for disabled autonegotiation

With auto crossover (MDIX) turned off, the EIP-200S ports are set as follows:

- Port 1 - normal (straight-through) pin assignment
- Port 2 - crossed over pin assignment

Crossed over pin assignment means that the pin assignment for the ports for sending and receiving between devices is exchanged internally.

4.5.2 Replacing a faulty QuickConnect Adapter

In case of QuickConnect Adapter failure, follow this process to replace the EIP-200S Ethernet/IP Adapter:

1. Prepare and mount the replacement Adapter.
2. Do one of the following:
   - Transfer the SD card from the old device to the replacement device. Power up the device so it will read the SD card and set the configuration in nonvolatile memory, OR
   - Power up the replacement device. Configure the replacement Adapter's IP address using DHCP, or set a fixed IP address. Then use the Configuration Tool to turn off autonegotiation, set a fixed baud rate and duplex, and turn QuickConnect on as described in the section "Guidelines for using QuickConnect on your network".
3. The replacement module is now ready for QuickConnect power-up.

4.5.3 Troubleshooting and optimization

Delayed connection time

Many factors can cause the controller connection time to be greater than 268 ms. These factors include the following:

- RPI (I/O cycle time)
- Time slice percentage
- Timer set in the application logic
- Ethernet/IP traffic
- Controller task load

If the optimum connection time cannot be achieved with the recommended settings, you may need to evaluate alternate Ethernet/IP configurations or controller requirements.

Timing errors

Once your initial system is configured, it is recommended that you test whether the connection timing is within your required timeframe. A QuickConnect I/O device issues a gratuitous ARP message on the network every 25 ms for a maximum of 40 times (1 second) until an I/O connection is established. If you experience periodic missed connections, perform these actions:

- Analyze network traffic for the root cause.
- Extend the timer in your application logic to allow more startup time if necessary.

4.6 Firmware updates

Firmware updates are performed using the EIP ET200 Configuration Tool and Ethernet. See the Configuration Tool user manual for specific instructions.

Note

If QuickConnect is turned on in the EIP-200S Ethernet/IP Adapter, the Configuration Tool should not perform a firmware update because the self-checks are turned off in that mode.

General technical specifications

5

5.1 General technical specifications

The general technical specifications comprise the standards and test specifications with which the ET 200S distributed I/O system complies, as well as the criteria on the basis of which the ET 200S distributed I/O system was tested.

5.2 Standards Compliance

Standards compliance

The ET 200S distributed I/O system design conforms with the following standards and test specifications. The test criteria for the ET 200S distributed I/O system are based on these standards and test specifications.

Note that not all ET 200S distributed I/O system components may be certified to these standards, and certification status may change without notification. It is the user's responsibility to determine applicable certifications by referring to the ratings marked on the product. Consult your local Siemens representative if you need additional information related to the latest listing of exact approvals by part number.

CE approval

The ET 200S distributed I/O system satisfies requirements and safety related objectives according to the EC directives listed below, and conforms to the harmonized European standards (EN) for the programmable controllers listed in the Official Journals of the European Community.

- EC Directive 2006/95/EC (Low Voltage Directive) "Electrical Equipment Designed for Use within Certain Voltage Limits"
  - EN 61131-2:2007 Programmable controllers - Equipment requirements and tests
- EC Directive 2004/108/EC (EMC Directive) "Electromagnetic Compatibility"
  - Emission standard
    EN 61000-6-4:2007: Industrial Environment
  - Immunity standard
    EN 61000-6-2:2005: Industrial Environment
- EC Directive 94/9/EC (ATEX) "Equipment and Protective Systems Intended for Use in Potentially Explosive Atmosphere"
  - EN 60079-15:2005: Type of Protection 'n'

The CE Declaration of Conformity is held on file and available to competent authorities at:

Siemens AktiengesellschaftAutomation and DrivesA&D AS RD4Postfach 1963D-92209 Amberg, Germany

cULus approval

Underwriters Laboratories Inc. complying with:

- Underwriters Laboratories, Inc.: UL 508 Listed (Industrial Control Equipment)
- Canadian Standards Association: CSA C22.2 Number 142 (Process Control Equipment)

Note

The ET 200S distributed I/O system components meet the CSA standard.

The cULus logo indicates that the ET 200S distributed I/O system has been examined and certified by Underwriters Laboratories (UL) to standards UL 508 and CSA 22.2 No. 142.

FM approval

Factory Mutual Research (FM)
Approval Standard Class Number 3600 and 3611
Approved for use in:
Class I, Division 2, Gas Group A, B, C, D, Temperature Class T4C Ta = 60° C
Class I, Zone 2, IIC, Temperature Class T4 Ta = 60° C
Canadian Class I, Zone 2 Installation per CEC 18-150

IMPORTANT EXCEPTION: See Technical Specifications for the number of inputs or outputs allowed on simultaneously. Some models are de-rated for Ta = 60° C.

WARNING
Risk of substituion of components
Substitution of components can impair the suitability for Class I, Division 2 and Zone 2.
Repair of units should only be performed by an authorized Siemens Service Center.

ATEX approval

ATEX approval applies to DC models only. ATEX approval does not apply to AC and Relay models.

EN 60079-0:2006: Explosive Atmospheres - General Requirements

EN 60079-15:2005: Electrical Apparatus for Potentially Explosive Atmospheres;
Type of protection 'nA'
II 3 G Ex nA IIC T4 Gc

IMPORTANT EXCEPTION: See Technical Specifications for the number of inputs or outputs allowed on simultaneously. Some models are de-rated for Ta = 60° C.

Install modules in a suitable enclosure providing a minimum degree of protection of IP54 according to EN 60529 and take into account the environmental conditions under which the equipment will be used.

When the temperature under rated conditions exceed 70° C at the cable entry point, or 80° C at the branching point of the conductors, the temperature specification of the selected cable should be in compliance with the actual measured temperature.

Provisions should be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40%.

C-Tick approval

The ET 200S distributed I/O system satisfies requirements of standards to AS/NZS 2064 (Class A).

Industrial environments

The ET 200S distributed I/O system is designed for use in industrial environments.

Table 5- 1 Industrial environments

Application field	Noise emission requirements	Noise immunity requirements
Industrial	EN 61000-6-4:2007	EN 61000-6-2:2005

Electromagnetic compatibility

Electromagnetic Compatibility (EMC) is the ability of an electrical device to operate as intended in an electromagnetic environment and to operate without emitting levels of electromagnetic interference (EMI) that may disturb other electrical devices in the vicinity.

Table 5- 2 Immunity per EN 61000-6-2

Electromagnetic compatibility - Immunity per EN 61000-6-2	
EN 61000-4-2 Electrostatic discharge	8 kV air discharge to all surfaces 6 kV contact discharge to exposed conductive surfaces
EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test	80 to 1000 MHz, 10 V/m, 80% AM at 1 kHz 1.4 to 2.0 GHz, 3 V/m, 80% AM at 1 kHz 2.0 to 2.7 GHz, 1 V/m, 80% AM at 1 kHz
EN 61000-4-4 Fast transient bursts	2 kV, 5 kHz with coupling network to AC and DC system power 2 kV, 5 kHz with coupling clamp to I/O
EN 6100-4-5 Surge immunity	AC systems - 2 kV common mode, 1 kV differential mode DC systems - 2 kV common mode, 1 kV differential mode For DC systems (I/O signals, DC power systems) external protection is required.
EN 61000-4-6 Conducted disturbances	150 kHz to 80 MHz, 10 V RMS, 80% AM at 1 kHz
EN 61000-4-11 Voltage dips	AC systems 0% for 1 cycle, 40% for 12 cycles and 70% for 30 cycles at 60 Hz

Table 5- 3 Conducted and radiated emissions per EN 61000-6-4

Electromagnetic compatibility - Conducted and radiated emissions per EN 61000-6-4		
Conducted Emissions EN 55011, Class A, Group 1	0.15 MHz to 0.5 MHz	<79dB (µV) quasi-peak; <66 dB (µV) average
	0.5 MHz to 5 MHz	<73dB (µV) quasi-peak; <60 dB (µV) average
	5 MHz to 30 MHz	<73dB (µV) quasi-peak; <60 dB (µV) average
Radiated Emissions EN 55011, Class A, Group 1	30 MHz to 230 MHz	<40dB (µV/m) quasi-peak; measured at 10m
	230 MHz to 1 GHz	<47dB (µV/m) quasi-peak; measured at 10m

Environmental conditions

Table 5- 4 Transport and storage

Environmental conditions - Transport and storage	
EN 60068-2-2, Test Bb, Dry heat and EN 60068-2-1, Test Ab, Cold	-40° C to +70° C
EN 60068-2-30, Test Db, Damp heat	25° C to 55° C, 95% humidity
EN 60068-2-14, Test Na, temperature shock	-40° C to +70° C, dwell time 3 hours, 5 cycles
EN 60068-2-32, Free fall	0.3 m, 5 times, product packaging
Atmospheric pressure	1080 to 660h Pa (corresponding to an altitude of -1000 to 3500m)

Table 5- 5 Operating conditions

Environmental conditions - Operating	
Ambient temperature range (Inlet Air 25 mm below unit)	-0° C to 60° C horizontal mounting -0° C to 50° C vertical mounting 95% non-condensing humidity Unless otherwise specified
Atmospheric pressure	1080 to 795 hPa (corresponding to an altitude of -1000 to 2000m)
Concentration of contaminants	$S0_2$: < 0.5 ppm; H2S: < 0.1 ppm; RH < 60% non-condensing
EN 60068-2-14, Test Nb, temperature change	5° C to 55° C, 3° C/minute
EN 60068-2-27 Mechanical shock	15 G, 11 ms pulse, 6 shocks in each of 3 axis
EN 60068-2-6 Sinusoidal vibration	DIN rail mount: 3.5 mm from 5-9 Hz, 1G from 9 to 150 Hz Panel Mount: 7.0 mm from 5-9 Hz, 2G from 9 to 150 Hz 10 sweeps each axis, 1 octave per minute

Table 5- 6 High potential isolation test

High potential isolation test	
24 V/5 V nominal circuits 115/230 V circuits to ground 115/230 V circuits to 115/230 V circuits 115 V/230V circuits to 24 V/5 V circuits	520 VDC (type test of optical isolation boundaries) 1500 VAC 1500 VAC 1500 VAC (3000 VAC / 4242 VDC type test)
Ethernet port to 24V/5V circuits and ground[1]	1500 VAC (type test only)

[1] Ethernet port isolation is designed to limit hazard during short term network faults to hazardous voltages. It does not conform to safety requirements for routine AC line voltage isolation.

Protection class

Protection Class II according to EN 61131-2 (Protective conductor not required)

Degree of protection

- IP20 Mechanical Protection, EN 60529
- Protects against finger contact with high voltage as tested by standard probe. External protection required for dust, dirt, water and foreign objects of < 12.5mm in diameter.

Rated voltages

Table 5- 7 Rated voltages

Rated voltage	Tolerance
24 VDC	20.4 VDC to 28.8 VDC

Note

When a mechanical contact turns on output power to the ET 200S or to any digital signal module, it sends a "1" signal to the digital outputs for approximately 50 microseconds. This could cause unexpected machine or process operation which could result in death or serious injury to personnel and/or damage to equipment. You must plan for this, especially if you are using devices which respond to short duration pulses.

Reverse voltage protection

Reverse voltage protection circuitry is provided on each terminal pair of +24 VDC power or user input power for CPUs, signal modules (SMs), and signal boards (SBs). It is still possible to damage the system by wiring different terminal pairs in opposite polarities.

Some of the 24 VDC power input ports in the ET 200S distributed I/O system are interconnected, with a common logic circuit connecting multiple M terminals. For example, the following circuits are interconnected when designated as "not isolated" in the data sheets: the 24 VDC power supply of the CPU, the power input for the relay coil of an SM, or the power supply for a non-isolated analog input. All non-isolated M terminals must connect to the same external reference potential.

⚠ WARNING

Connecting non-isolated M terminals

Connecting non-isolated M terminals to different reference potentials will cause unintended current flows that may cause damage or unpredictable operation in the PLC and any connected equipment.

Failure to comply with these guidelines could cause damage or unpredictable operation which could result in death or serve personal injury and/or property damage.

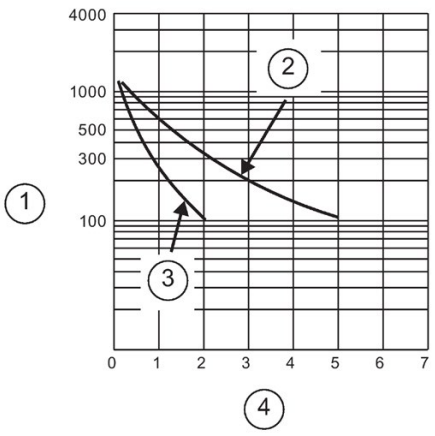
Always ensure that all non-isolated M terminals in an ET 200S distributed I/O system are connected to the same reference potential.

DC Outputs

Short circuit protection circuitry is not provided for DC outputs on signal modules unless otherwise stated.

Relay electrical service life

The typical performance data supplied by relay vendors is shown below. Actual performance may vary depending upon your specific application. An external protection circuit that is adapted to the load will enhance the service life of the contacts.



① Service life (x 10^3 operations)

② 250 VAC resistive load
30 VDC resistive load

③ 250 VAC inductive load (p.f=0.4)
30 VDC inductive load (L/R=7ms)

④ Rated Operating Current (A)

5.3 Use of subassemblies/modules in a Zone 2 hazardous area

Below you will find important information on the installation of the subassemblies/modules in a hazardous area.

You can find the list of approved devices/modules on the Siemens Service & Support Website/ (http://support.automation.siemens.com).

Enter the associated article ID in the search window on the website. See table below for article IDs by product.

Production location/certification

II 3 G Ex nA II T3 .. T6 To EN 60079-15

Test number *see table below*

Production location	Subassemblies/ modules	Test number	Article ID
Siemens AG, Industry Sector Werner-von-Siemens-Straße 50 92224 Amberg	ET 200S ET 200S fault-tolerant modules ZNX-EIP-200S	KEMA 01 ATEX 1238X DEKRA 12ATEX0077 X	24037700
	S7-300 ET 200M DP/PA bus interface Diagnostics repeater S7-300 fault-tolerant modules	KEMA 02 ATEX 1096X	24038475
	PROFIBUS Bus Connector Plug	KEMA 04 ATEX 1151X	24028800
	S7-1200 TS Adapter IE Basic	KEMA 10 ATEX 0166X	46641616
Siemens AG, Industry Sector Östliche Rhein-brűcken-straβe 50 76187 Karlsruhe Germany	S7-400	KEMA 03 ATEX 1125X	21479867
	S7-300 CP TS Adapter II TS Adapter IE	KEMA 03 ATEX 1128X	214976722
	ET 200M Marshalled Termination Assemblies	KEMA 05 ATEX 1137X	24193554

Zone	Explosion hazard	Example
2	Explosive gas atmosphere occurs only seldom and for a short time	Areas around flange joints with flat gaskets in pipes in enclosed spaces
Safe area	No	• Outside zone 2 • Standard distributed I/O applications

Below you will find important information on the installation of the ET 200S distributed I/O system in a hazardous area.

Note

Subassemblies/modules with ATEX II 3 G Ex nA II T3 .. T6 certification can only be used in SIMATIC systems rated as category 3 equipment.

Maintenance

If repair is necessary, the affected module must be sent to the production location. Repairs can only be carried out there.

Special conditions for:

Special conditions for the following are shown below:

KEMA 01 ATEX 1238X
KEMA 02 ATEX 1096A
KEMA 03 ATEX 1125X, ATEX 1228X

- Subassemblies/modules must be installed in an adequate housing. This must comply with the IP54 degree of protection (according to EN 60529) as a minimum. The environmental conditions under which the equipment is installed must be taken into account. There must be a manufacturer's declaration for zone 2 available for the housing (in accordance with EN 60079-15).
- If a temperature of > 70° C is reached in the cable or at the cable entry of this housing under operating conditions, or if a temperature of > 80° C can be reached at the junction of the conductors under operating conditions, the temperature-related properties of the cables must correspond to the temperatures actually measured.
- The cable entries used must comply with the required IP degree of protection and the information in the section on "Commissioning" (in accordance with EN 60079-15).
- Steps must be taken to ensure that the rated voltage through transients cannot be exceeded by more than 40%.

Special conditions for KEMA 04 ATEX 1151X

Special conditions for the KEMA 04 ATEX 1151X is shown below:

- The connecting or disconnecting of live conductors or operation of device switches (for example, for installation or servicing purposes) is only allowed when it has been ensured that the area is not explosive.

Special conditions for KEMA -5 ATEX 1137X

Special conditions for the following are shown below:

- You must install subassemblies/modules in an adequate housing. This must comply with the IP54 degree of protection (according to EN 60529) as a minimum. The environmental conditions under which the equipment is installed must be taken into account. There must be a manufacturer's declaration for zone 2 available for the housing (in accordance with EN 60079-15).
- If a temperature of > 70° C is reached in the cable or at the cable entry of this housing under operating conditions, or if a temperature of > 80° C can be reached at the junction of the conductors under operating conditions, the temperature-related properties of the cables must correspond to the temperatures actually measured.
- You must take steps to ensure that the rated voltage through transients cannot be exceeded by more than 40%.

WARNING

Risks in opening the housing

The housing can only be opened for a short time (for example, for visual diagnostics). If you do this, do not operate any switches, remove or install any modules, or disconnect any electrical cables (plug-in connections).

You can disregard this warning if you know that the atmosphere is not hazardous (in other words, there is no risk of explosion).

WARNING

Risks in disconnecting plug-in connections

Personal injury and property damage can occur.

There is a risk of injury or damage if you disconnect any plug-in connections in potentially explosive environments while the ET 200S system is in operation.

Always de-energize the ET 200S system in potentially explosive environments before disconnecting plug-in connections.

WARNING

Explosion hazard

Components may no longer qualify for Class I, Div. 2 if they are substituted.

WARNING

This device is only appropriate for use in Class I, Div. 2, Group A, B, C, D, or in non-hazardous areas.

Order number

A

Designation	Order number
EIP-200S Ethernet/IP Adapter interface module package	ZNX-EIP-200S
SD memory card	6ES7954-8LC03-0AA0

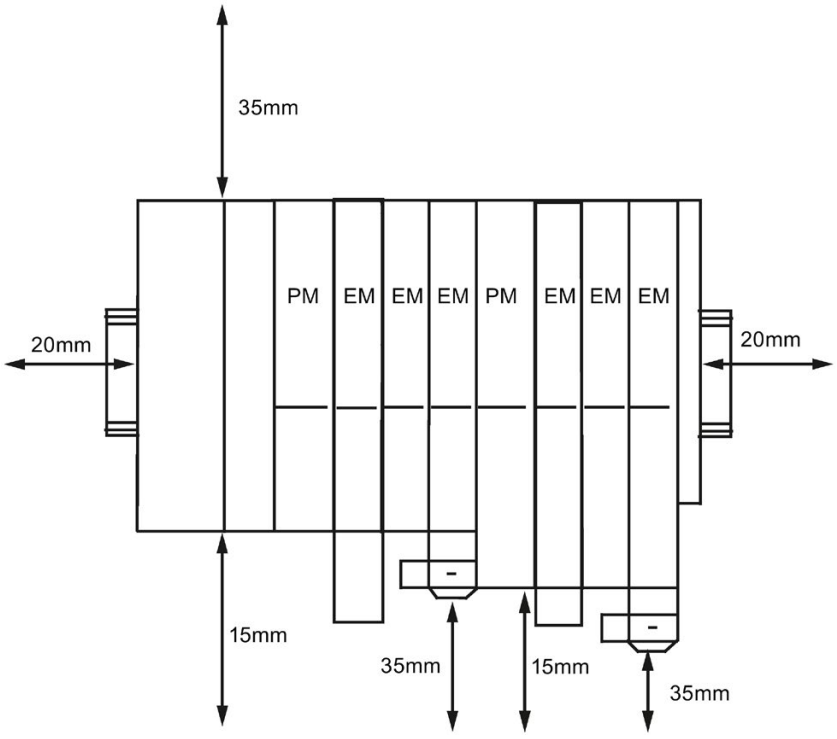
Dimension drawings

B

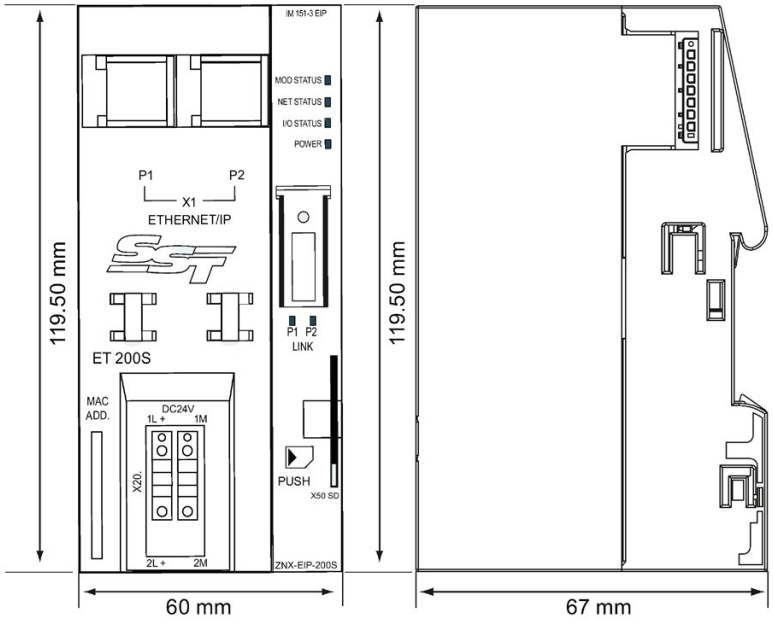
Introduction

Following are dimension drawings of the ET 200S system and EIP-200S Ethernet/IP Adapter.

Minimum clearances for installation, wiring, and ventilation for ET 200S



EIP-200S Ethernet/IP Adapter front and side views



Address space of the ET 200S inputs and outputs

C

Address area of the modules

The following table shows address area inputs and outputs for the ET 200S.

Module	Address space of the inputs		Address space of the outputs	
	Without grouping	With grouping [1]	Without grouping	With grouping [1]
Digital input modules	1 byte	2 bits (2DI) 4 bits (4DI)	---	---
	1 byte (8DI)			
Digital output modules	---	---	1 byte	2 bits (2DO) 4 bits (4DO)
			1 byte (8DO)	
NAMUR input	2 bytes		—	
Analog input modules	4 bytes		---	---
Analog output modules	---	---	4 bytes	
Direct-on-line starter	1 byte	4 bits	1 byte	4 bits
Reversing starter	1 byte	4 bits	1 byte	4 bits

[1] See the section "Configuring the ET 200S"

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