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SIMATIC

ET 200S distributed I/O Interface module IM151-3 PN (6ES7151-3AA23-0AB0)

Manual

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CAUTION

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Preface

Preface

Purpose of the manual

This manual supplements the *ET 200S Distributed I/O System* Operating Instructions. General functions of the ET 200S are described in the SIMATIC Distributed I/O System ET 200S (http://support.automation.siemens.com/WW/view/en/1144348) Operating Instructions.

The information in this document along with the operating instructions enables you to commission the ET 200S.

Basic knowledge requirements

To understand these operating instructions you should have general knowledge of automation engineering.

Scope of the manual

The manual applies to this ET 200S module. It describes the components that are valid at the time of publication.

The manual is valid for the IM151-3 PN(6ES7151-3AA23-0AB0) as of firmware version V7.0.

Changes since the previous version

The following changes have been implemented compared to the IM151-3 PN(6ES7151-3AA23-0AB0), Manual, Edition 03/2009 with the number A5E01638906-02.

- Shared Device
- Media redundancy
- Option handling
- LED display of the configuration and parameter assignment errors

Recycling and disposal

Thanks to the fact that it is low in contaminants, this ET 200S module is recyclable. For environmentally compliant recycling and disposal of your electronic waste, please contact a company certified for the disposal of electronic waste.

Additional support

If you have any questions relating to the products described in this manual and do not find the answers in this document, please contact your local Siemens representative.

Your contact persons are listed in the Internet (http://www.siemens.com/automation/partner).

A guide to the technical documentation for the various SIMATIC products and systems is available on the Internet (http://www.siemens.com/simatic-tech-doku-portal)

The online catalog and ordering systems are available on the Internet (http://mall.automation.siemens.com).

Training Center

We offer courses to help you get started with the ET 200S and the SIMATIC S7 automation system. Please contact your regional training center or the central training center in D -90327, Nuremberg, Germany.

You will find more information in the Internet (http://www.sitrain.com).

Technical Support

You can contact Technical Support for all Industry Automation products by means of the Internet Web form (http://www.siemens.com/automation/support-request) for the Support Request.

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In addition to our documentation, we offer a comprehensive knowledge base on the Internet (http://www.siemens.com/automation/service&support).

There you will find:

- Our Newsletter, which constantly provides you with the latest information about your products.
- The right documentation for you using our Service & Support search engine.
- The bulletin board, a worldwide knowledge exchange for users and experts.
- Your local contact for Automation & Drives in our contact database.
- Information about on-site services, repairs, spare parts, and lots more.

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Properties

1

1.1 Interface module IM151-3 PN

Properties

The IM151-3 PN interface module offers the following features:

- It connects the ET 200S with PROFINET IO.
- It prepares the data for the assembled electronic modules and motor starters.
- It supplies the rear panel bus.
- Transfer and backup of the device name on SIMATIC Micro Memory Card
- Updating firmware
  - Via SIMATIC Micro Memory Card
  - Via PROFINET IO
- The reference potential M of the rated supply voltage of the IM151-3 PN to the rail (protective conductor) is connected by means of an RC combination and therefore enables earth-free configuration.
- Interrupts
  - Diagnostic interrupts
  - Process interrupts
  - Insert/remove module interrupts
  - Maintenance interrupts
- The maximum address space is 256 bytes I/O data.
- IM151-3 PN can be operated with up to 63 I/O modules.
- The maximum bus length at the rear panel bus is 2 m.
- Grouping of modules within one byte (packing).
- Records for IO modules
- Option handling

Properties via PROFINET IO

- Integrated switch with 2 ports
- Supported Ethernet services: ping, arp, Net diagnostics (SNMP)/MIB-2, LLDP
- Port diagnostics
- Port disabling
- Isochronous Real-Time Communication
- Minimum update time 250 µs
- Prioritized startup
- Device replacement without exchangeable media/programming device
- Shared Device
- Media redundancy

Isochronous Real-Time Communication

Synchronized transmission procedure for the cyclic exchange of IRT data between PROFINET devices. A reserved bandwidth within the send clock is available for the IRT IO data. The reserved bandwidth ensures that the IRT data can be transmitted at reserved, synchronized intervals whilst remaining uninfluenced even by other greater network loads (e.g. TCP / IP communication or additional real time communication).

- IRT option "high flexibility"

  Maximum flexibility in planning and extending the system. A topological configuration is not required.

- IRT option "high performance"

  Topological configuration is required.

Note

IO controller as a sync master at IRT communication with the IRT option "high performance"

We recommend also operating the IO controller as a Sync-Master if you configure the IRT communication with the option "high performance".

Otherwise, IRT and RT configured IO devices may fail if the sync master fails.

Note

Quantity structure of modules up to EZ3 and IRT option "high performance"

The maximum address space is 146 bytes I/O data when the IRT option "high performance" is used. If you use a module having the product version EZ1, EZ2 or EZ3, you should limit the quantity structure to 146 bytes I/O data. Otherwise communication may be interrupted.

For more information about configuring synchronized PROFINET devices in Sync domains, refer to the STEP 7 online help and the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) manual.

Prioritized startup

Prioritized startup denotes the PROFINET functionality for accelerating the startup of IO devices within a PROFINET IO system with IRT and RT communication.

The function reduces the time that the correspondingly configured IO devices require in order to return to the cyclic user data exchange in the following cases:

- After the power supply has returned
- After a station has come back online
- After IO devices have been activated

Note

At a prioritized startup a firmware update using the Micro Memory Card is not possible. It is possible to perform a firmware update via the LAN network.

Note

The ramp-up time depends on the number and type of modules.

Cabling with fixed connection setting

If you set a fixed connection setting of the port in STEP 7, you will also have to disable "Autonegotiation/Autocrossover."

For additional information, refer to the STEP 7 online help and the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) manual.

Device replacement without exchangeable media/programming device

IO devices having this function can be replaced simply:

- An exchangeable medium (such as Micro Memory Card) with the stored device name is not required.
- The device name does not have to be assigned using the programming device.

Instead of being assigned a device name from the exchangeable medium or programming device, the IO device is now assigned a device name by the IO controller. The IO controller uses the configured topology and the correlations derived from the IO devices. The configured setpoint topology must agree with the actual topology.

We recommend that you reset IO devices that have already been operated to their default settings before you use them again.

For additional information, refer to the STEP 7 Online Help and the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) Manual.

Reset to factory settings

NOTICE
The stations of a bus segment can fail during the reset to factory settings.

SNMP parameters in non-volatile memory are reset to factory settings (as of *STEP 7* V5.3 SP 3) in the HW Config dialog "Target system > Ethernet > Edit Ethernet nodes", "Reset" button at "Reset to factory settings".

The following data is **not** deleted during the reset:

- The MAC address
- The I&M0 data

Note

Deleting the device name

Deleting the device name using a "Reset to factory setting".

Note

Substitute value behavior at a reset to factory setting

At a "Reset to factory setting" the modules in the station take on the configured substitute value behavior or the non-configured state.

Compatibility with the predecessor module

The interface module IM151-3 PN(6ES7151-3AA23-0AB0) is compatible with interface module IM151-3 PN (6ES7151-3AA20-0AB0 and 6ES7151-3AA22-0AB0).

The new interface module directly replaces the predecessor module in an existing system without the need for reconfiguration.

An IM151-3AA23 that has been in operation and will now be used as spare part has to be reset to the state "resetting to default settings."

Firmware updates on the predecessor module IM151-3AA22 are not supported.

Spare parts of aIM151-3 PN (6ES7151-3AA10-0AB0)

In case of replacement, you can replace a IM151-3 PN (6ES7151-3AA10-0AB0) with a IM151-3 PN (6ES7151 3AA23-0AB0) if the following conditions are met:

- 15 mm of free space to the left of the IM151-3 PN
- *STEP 7* V5.3 SP 3
- The user program is adapted in accordance with the "From PROFIBUS DP to PROFINET IO" Programming Manual, Edition 01/06.

Media redundancy

Function for ensuring the network and system availability. Redundant transmission links (ring topology) ensure that an alternative communication path is made available if a transmission link fails.

For additional information, refer to the STEP 7 online help and the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) manual.

Shared Device

IO device that makes its data available to several IO controllers.

The function Shared Device is not available with the IRT option "high flexibility".

Note

Note that the power and electronics modules of a potential group have to be assigned to the same IO controller so that a load voltage failure can be diagnosed.

For additional information, refer to the STEP 7 online help and the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) manual.

Option handling

Option handling enables you to set up your automation system for future expansions or options. Option handling means that you configure the planned maximum configuration of your automation system in advance and can vary later depending on the user program. Option handling exists with and without RESERVE modules and adding options.

For additional information, refer to the sections Option handling (Page 24) in the STEP 7 online help and the PROFINET System Description (http://support.automation.siemens.com/WW/view/en/19292127) manual.

Configuring

You configure the interface module IM151-3 PN with *STEP 7* V5.4 SP 4.

Limitations for operation of the modules with IM151-3 PN

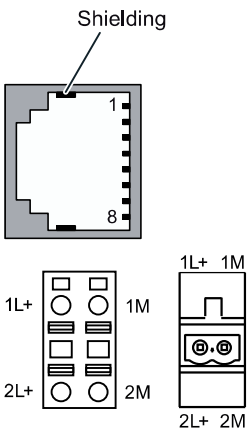
The following modules cannot be used with the IM151-3 PN:

Module	Up to order number	Up to product version
2AO U; HIGH FEATURE	6ES7135-4LB01-0AB0	3
2AO I; HIGH FEATURE	6ES7135-4MB01-0AB0	3
1SI serial interface module	6ES7138-4DF00-0AB0	4
Modbus/USS serial interface module	6ES7138-4DF01-0AB0	4
2PULSE	6ES7138-4DD00-0AB0	6
1Count 24V/100kHz	6ES7138-4DA03-0AB0	-
Motor starter • Direct starter • Reversing starter		 3RK1301-xxxxx-1AA1 3RK1301-xxxxx-1AA1

Pin assignment

The following table shows the pin assignment of the IM151-3 PN interface module for the 24 VDC voltage supply and of the RJ45 interfaces for PROFINET IO:

Table 1- 1 Pin assignment of the IM151-3 PN

View	Signal name		Description
	1	TD	Transmit Data +
	2	TD_N	Transmit Data –
	3	RD	Receive Data +
	4	GND	Ground
	5	GND	Ground
	6	RD_N	Receive Data –
	7	GND	Ground
	8	GND	Ground
	1L+		24 V DC
	2L+		24 V DC (for loop through)
	1M		Ground
	2M		Ground (for loop through)

Schematic circuit diagram

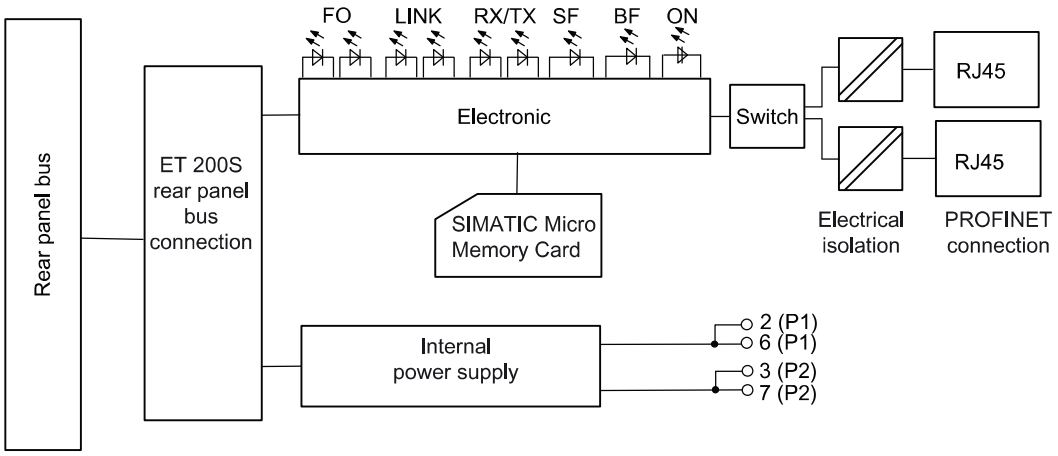


Figure 1-1 Block diagram of the IM151-3 PN interface module

Technical data IM151-3 PN (6ES7151-3AA23-0AB0)

Dimensions and weight	
Dimension B (mm)	60
Weight	Approx. 150 g
Module-specific specifications	
Data transmission rate	• 10 Mbps for Ethernet services • 100 Mbps full duplex for PROFINET IO
Transmission procedure	100BASE-TX
Send cycle	• IRT with the option "high performance" 250 µs to 4 ms in 125-µs increments • RT and IRT with the option "high flexibility": 250 µs, 500 µs, 1 ms
Autonegotiation	Yes
Autocrossing	Yes
Bus protocol	PROFINET IO
Supported Ethernet services	• ping • arp • LLDP • Net diagnostics (SNMP)/MIB-2 • Prioritized startup • Media redundancy • Shared Device
PROFINET interface	2x RJ45
Manufacturer ID (vendor ID)	$002A_H$
Device ID (DeviceID)	0301_H

Voltages, currents, potentials	
Rated supply voltage of the electronic components (1L+)	24 V DC
• Incorrect polarity protection	Yes
• Power failure bypass	Min. 20 ms
Galvanic isolation	
• Between the rear panel bus and electronic components	No
• Between Ethernet and electronic components	Yes
• Between the supply voltage and electronic components	No
Permitted potential difference (to the rail)	75 V DC/60 V AC
Insulation test voltage	500 V DC
Current consumption from rated supply voltage (1L+)	Approx. 200 mA
Power dissipation of the module	Approx. 3.3 W
Status, interrupts, diagnostics	
Interrupts	Yes
Diagnostic function	Yes
• Batch error • Bus monitoring PROFINET IO	Red LED "SF" Red "BF" LED
• Monitoring of the supply voltage of the electronics	Green "ON" LED
• Maintenance requirements (maintenance)	yellow "maint" LED
• Existing connection to network	One green LED "LINK" per interface

1.2 SNMP

SNMP

The interface module supports the Ethernet service SNMP. MIB-2 (RFC1213) is supported. R/W objects can be changed using SNMP tools and are stored in the module.

Following replacement with a brand new module, the R/W objects of the interface module are set to the factory settings.

1.3 SIMATIC Micro Memory Card

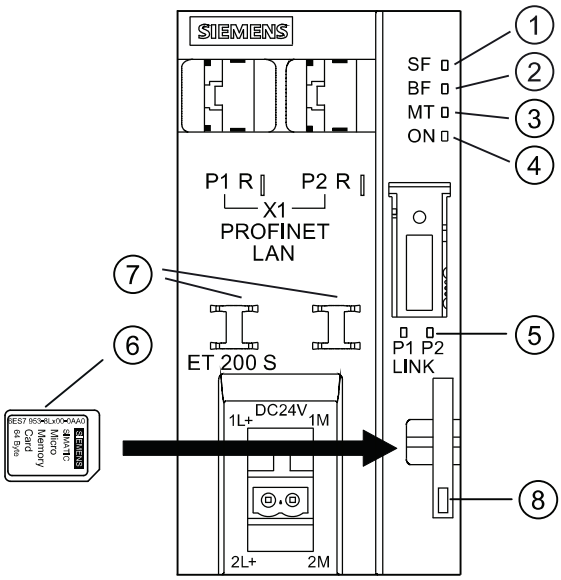
SIMATIC Micro Memory Card (MMC) as memory medium

A SIMATIC Micro Memory Card is used as a memory medium for the IM 151-3 PN.

A SIMATIC Micro Memory Card with 64 KB is sufficient for storing the name of the device.

An MMC of 4 MB or higher is required for a firmware update.

Position of the module slot for the SIMATIC Micro Memory Card



① Group error (red)
② Bus fault (red)
③ Maintenance display (yellow)
④ Supply voltage (green)
⑤ Connection to a switch or IO controller (green)
⑥ SIMATIC Micro Memory Card
⑦ Cable connection
⑧ Locking / unlocking of the Micro Memory Card

Insertion of the SIMATIC Micro Memory Card

Note

You can save **either** process-related data (device names) **or** firmware update data on **one** MMC.

Service life of a SIMATIC Micro Memory Card

The service life of a SIMATIC Micro Memory Card essentially depends on the following factors:

- Number of deletion or programming operations
- External factors, such as ambient temperature

At an ambient temperature of up to 60°C, a SIMATIC Micro Memory Card has a service life of 10 years, with a maximum of 100,000 write/delete operations.

NOTICE
Possible data loss
If the maximum number of write/delete operations is exceeded, data loss is possible.

Available SIMATIC Micro Memory Cards

Table 1- 2 Available SIMATIC Micro Memory Cards

Description	As of order number	Memory size
SIMATIC Micro Memory Card 64k	6ES7953-8LFxx-0AA0	64 KB
SIMATIC Micro Memory Card 128k	6ES7953-8LGxx-0AA0	128 KB
SIMATIC Micro Memory Card 512k	6ES7953-8LJxx-0AA0	512 KB
SIMATIC Micro Memory Card 2M	6ES7953-8LLxx-0AA0	2 MB
SIMATIC Micro Memory Card 4M	6ES7953-8LMxx-0AA0	4 MB
SIMATIC Micro Memory Card 8M	6ES7953-8LPxx-0AA0	8 MB

Inserting/replacing the SIMATIC Micro Memory Card

Note

In order to ensure that it will function correctly, the SIMATIC Micro Memory Card must only be inserted or removed with the power turned off.

The beveled corner of the SIMATIC Micro Memory Card prevents it from being inserted the wrong way round (reverse polarity protection).

To eject the card, push in the ejector with a suitable object (such as a small screwdriver or ball-point pen).

1.4 Firmware update

Updating firmware

You can update the firmware of an IM151-3 PN:

- Using a SIMATIC Micro Memory Card with at least 4 MB of memory.

  Additional information can be found on the Internet (http://support.automation.siemens.com/WW/view/en/19241998/133100).
- Via PROFINET IO, using HW Config or in the SIMATIC Manager via "Target system > Display accessible nodes".

  For additional information, refer to the *STEP 7* online help.

Requirements

To update the firmware of an IM151-3 PN you need:

- *STEP 7* as of V5.3 SP 2
- SIMATIC Micro Memory Card (MMC) for the MMC update
- A PC or programming device with a facility for writing to a SIMATIC Micro Memory Card

NOTICE
When the firmware is updated, the stations in a line can fail.

Note

A firmware update with SIMATIC Micro Memory Card is not possible for interface modules that were started with the "Prioritized startup" parameter. In this case you can delete the parameter "Prioritized startup" by a "Reset to factory settings". Firmware updating with the SIMATIC Micro Memory Card is subsequently possible again.

Parameters 2

2.1 Parameters for the IM151-3 PN interface module

Table 2- 1 Parameters for IM151-3 PN interface module

IM151-3	Value range	Default setting	Applicability
Bus length	≤ 1 m/> 1 m	≤ 1 m	ET 200S
Interference frequency suppression	50 Hz/60 Hz	50 Hz	ET 200S
Reference junction slot	None/2 to 63	None	ET 200S
Reference junction input	RTD on channel 0/ RTD on channel 1	0	ET 200S
Release option handling	Yes/no	No	ET 200S

2.2 Parameter description

2.2.1 Bus length

≤ 1 m: The default setting for the maximum bus length is 1 m.

> 1 m: The bus length of the ET 200S is > 1 m and can be up to 2 m. However, this setting will increase the response time of the ET 200S.

2.2.2 Interference frequency suppression

The frequency of your AC power system can interfere with the measured value especially when measuring in low voltage ranges and using thermocouple elements. Enter the line frequency for your system here (50 Hz or 60 Hz).

The interference frequency suppression parameter applies to analog electronic modules. This parameter is also used to specify the integration and conversion time of the various modules. See the technical data for the analog electronic modules.

2.2.3 Reference junction slot

This parameter allows you to assign a slot (none, 2 to 63) with a channel for measuring the reference temperature (calculation of the compensation value).

Reference

Refer to the *manuals* for the *analog electronic modules* for information on connecting thermocouples.

2.2.4 Reference junction input

This parameter can be used to set the channel (0/1) for measuring the reference temperature (calculation of the compensation value) for the assigned slot.

Reference

Refer to the *manuals* for the *analog electronic modules* for information on connecting thermocouples.

2.2.5 Release option handling

Release option handling

Use this parameter to release the function option handling in the ET 200S.

Note

If you configure the release, then the ET 200S requires a control data record from the user program so that the station can serve the I/O modules.