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SIEMENS

SIMATIC

Distributed I/O Device ET 200M

Manual



The following supplement is part of this documentation:

No.	Designation	Drawing number	Edition
1	Product information	A5E000272208-01	11/2003

Preface, Contents

1 Product Overview

2 Getting Started

3 Configuration Options with the ET 200M

4 Installation

5 Wiring

6 Commissioning and Diagnostics

7 Maintenance

8 Technical Specifications

9 Compatibility Between the IM 153-x Modules

Appendix

A Order Numbers for the ET 200M

Glossary, Index

This manual is part of the documentation package
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Edition 10/2002
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Preface

Purpose of the Manual

The information in this manual enables you to operate an IM 153 slave interface with the modules of the S7-300 range in the ET 200 distributed I/O device as a DP slave.

Required Basic Knowledge

You will need general knowledge of automation technology to understand the content of this manual.

Furthermore, you also need to know how to use computers or similar PC tools (e.g. programming devices) under the operating system Windows 95/98/2000 and NT. You should also be familiar with the basic software STEP 7. The required information and basic knowledge can be found in the manual ”Programming with STEP 7 V5.1”.

Scope of Validity of the Manual

Module	Order Number	As of Version
IM 153-1	6ES7 153-1AA03-0XB0	02
	6ES7 153-1AA83-0XB0	01
IM 153-2	6ES7 153-2AA02-0XB0	07
	6ES7 153-2BA00-0XB0	01
IM 153-2 FO	6ES7 153-2AB01-0XB0	06
	6ES7 153-2BB00-0XB0	01

Convention: The designation IM 153-x is used in this manual, except when a description refers specifically to a special version of the IM 153-x.

One version of the IM 153-1 can also be used as a module in the extended range of environmental conditions (outdoors) (see Section 1.3). You can find out the climatic and mechanical environmental conditions in which you can use this IM 153-1 in the Reference Manual *Module Specifications*.

We reserve the right in the case of the new releases of IM 153-x modules to include a product information document containing current information with the IM 153-x slave interface or the manual.

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Changes Since the Previous Version

The following changes have been made since the previous version of this manual, *ET 200M Distributed I/O Device* (order number 6ES7 153-1AA00-8BA0, edition 05):

The IM 153-2Bx00 as of the above mentioned versions has the following new functions:

- DPV1 operation (with IM 153-1/153-2/153-2 FO)
- Clock synchronism
- Configuration modification in RUN (in non-redundant system)
- Identification data
- Time stamping with improved features
- Shorter switchover times with redundancy
- Update via PROFIBUS-DP or MMC
  (The MMC was introduced additionally and specifically in preparation for future functional expansions.)
- Setting the PROFIBUS address using the 8-pin DIP switch
  Switch 0 (bottom switch) has no effect.

You can find a detailed overview of the functions and features and how the IM 153-x modules and their previous versions differ in Chapter 9

Standards, Certificates and Approvals

The ET 200M satisfies the requirements and criteria of IEC 61131, Part 2 and IEC 61784-1:2002 Ed1 CP 3/1. The ET 200M satisfies the requirements for obtaining the CE symbol. The ET 200M has CSU, UL and FM certificates and approvals. Please refer to Section 8.1 for further details on standards, certificates and approvals.

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Position in the Information Landscape

This delivery package (order number 6ES7 153-1AA00-8BA0) consists of three manuals, with contents as follows:

ET 200M Distributed I/O Device



- Mechanical and electrical configuration
- Installation and wiring
- Commissioning and Diagnostics
- IM 153 slave interface
- Order numbers for the ET 200M

S7-300, M7-300 Programmable Controllers, Module Specifications



- General technical specifications
- Power supply modules
- Digital modules
- Analog modules
- Order numbers for the S7-300

ET 200M Distributed I/O Device Signal modules for process automation



- Overview of applications in process automation
- Parameterization with SIMATIC PDM
- Digital input module
- Digital output module

In addition to this manual you will also need the manual for the DP master you are using and the *ET 200 Distributed I/O Device* manual.

ET 200 Distributed I/O Device



- System overview of the ET 200 and PROFIBUS bus system
- Planning and commissioning
- Description of the RS 485 repeater
- Description of the IM 308C
- Description of the S5-95U

DP Master manual



- Configuration and commissioning a DP master system
- Description of the DP master

In Appendix A you can find a list of additional sources of information on SIMATIC S7 and the ET 200 distributed I/O device.

A description of the parameter assignment and configuration frames is not included in this manual. You can find the description on the Internet at `http://www.ad.siemens.de/simatic-cs`

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CD-ROM

You can also obtain the complete set of ET 200 documentation on CD-ROM. Order number of the CD-ROM: 6ES7 998-8XC01-8YE0.

Aids to Finding Information

You can quickly access specific information in the manual by using the following aids:

- At the start of the manual you will find a complete table of contents and a list of the diagrams and tables that appear in the manual.
- An overview of the contents of each section is provided in the left-hand column on each page of each chapter.
- Following the appendices, you will find a glossary in which important technical terms used in the manual are defined.
- At the end of the manual you will find a comprehensive index enabling rapid access to the information you are looking for.

Recycling and Disposal

The ET 200M hardware is low in contaminants and can thus be recycled.

Please consult a certified disposal company specializing in electronics waste to ensure that your old device is recycled and disposed of in an environment-friendly manner.

Additional Support

Please contact your local Siemens representative if you have any queries about the products described in this manual. You will find an overview on the Internet at `http://www.siemens.com/automation/partner`.

If you have any questions or suggestions concerning this manual, please fill in the form at the end of this manual and return it to the specified address. We would be grateful if you could also state your personal opinion of the manual on this reply form.

If you require the device master file, you can download this from the **S**chnitt**S**tellen**C**enter Fürth via modem by dialing +49 (911) 737972 or on the Internet at `http://www.ad.siemens.de/csi_e/gsd`.

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Training Center

We offer courses to introduce you to the ET 200 Distributed I/O System and the SIMATIC S7 Programmable Controller. Please contact your local training center or the central training center in Nuremberg, D-90327 Germany.
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- information on on-site service, repairs, spare parts. You will find a lot more information under ”Services”.

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Contents

Preface

1 Product Overview

2.1 What Are Distributed I/O Devices? 1-1
2.2 What Is the ET 200M Distributed I/O Device? 1-4
2.3 IM 153-x: Variants and Features 1-8

2 Getting Started

2.1 Introduction 2-2
2.2 Order Numbers for the Sample Configuration 2-3
2.3 Prerequisites 2-4
2.4 Installation 2-4
2.5 Wiring 2-5
2.6 Putting Hardware into Service 2-7
2.7 Configuration 2-8
2.8 Integration into the User Program 2-10
2.9 Switching On 2-10
2.10 Diagnostics 2-11

3 Configuration Options with the ET 200M

3.1 Distributed I/Os with the IM 153-1 3-2
3.2 Forwarding Parameterization Data from the PG/PC with the IM 153-2 3-3
3.3 Parameterizable FM in a Configuration with an IM 153-2 3-4
3.4 Time Stamping with the IM153-2 3-5
3.4.1 Time Stamping with 10 ms Accuracy 3-6
3.4.2 Time Stamping with 3 ms Accuracy 3-8
3.4.3 Time Synchronization with Flexible Time Interval 3-8
3.5 Redundancy with the IM 153-2 3-9
3.6 Configuration Modification in RUN 3-11
3.6.1 Configuration Modification in RUN in Redundant System 3-11
3.6.2 Configuration Modification in RUN in Non-Redundant System 3-14

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3.7 Clock Synchronism 3-15
3.8 Identification Data 3-22
3.9 Fiber-Optic Network with the IM 153-2 FO 3-25
3.10 Direct Communication 3-26

4 Installation

4.1 Mechanical Configuration 4-2
4.1.1 Horizontal and Vertical Installation 4-2
4.1.2 Clearance Measurements 4-3
4.1.3 Arrangement of the Modules in an ET 200M Configuration 4-4
4.1.4 Rules for Configuring the ”Module Change During Operation” and ”Redundancy” Functions 4-5
4.2 Installation 4-8
4.2.1 Installing the Rail 4-8
4.2.2 Standard Configuration (Installing Modules on the Rail) 4-12
4.2.3 Configuration with Active Bus Modules (Installing Active Bus Modules and Modules) 4-14
4.2.4 After Installation 4-15
4.3 Connecting the Bus Connector 4-17
4.4 Connecting the Fiber-Optic Cable to the IM 153-2 FO 4-18
4.5 Setting the PROFIBUS Address 4-20

5 Wiring

5.1 Electrical Configuration 5-2
5.1.1 General Rules and Regulations on Operating an ET 200M 5-2
5.1.2 Operating the ET 200M with Process I/O Modules on a Grounded Supply 5-5
5.1.3 Configuring the ET 200M with Ungrounded Reference Potential 5-9
5.1.4 Configuring the ET 200M with Galvanically Isolated Modules 5-10
5.1.5 Configuring the ET 200M with Non-Isolated Modules 5-12
5.2 Wiring 5-13
5.2.1 Wiring Rules 5-13
5.2.2 Wiring the Power Supply and IM 153-x 5-15
5.2.3 Wiring the Front Connectors of the Signal Modules 5-17
5.2.4 Connecting Shielded Cables via a Shield Contact Element 5-21

6 Commissioning and Diagnostics

6.1 Commissioning and Startup of the DP Slave 6-1
6.1.1 Prerequisites for Commissioning 6-2
6.1.2 Startup of the IM 153-1 6-4
6.1.3 Startup of the IM 153-2/153-2 FO 6-5
6.1.4 PROFIBUS-DPV1 Mode 6-8
6.2 Diagnostics Using LEDs 6-10
6.3 Diagnostics Using STEP 7 and STEP 5 6-13
6.4 Structure of the Diagnosis 6-16
6.4.1 Structure of the Slave Diagnosis 6-17
6.4.2 Station Statuses 1 to 3 6-19

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6.4.3 Master PROFIBUS Address 6-21
6.4.4 Manufacturer ID 6-21
6.4.5 Module Diagnosis 6-22
6.4.6 Module Status 6-23
6.4.7 Channel-Specific Diagnosis 6-24
6.4.8 H Status (with S7-400H and Standard Redundancy Only) 6-28
6.4.9 Interrupts 6-29
6.4.10 Evaluating Interrupts from the Station Diagnosis 6-38

7 Maintenance

7.1 Replacing the Power Supply Module 7-1
7.2 Replacing the IM 153-1 7-3
7.3 Replacing the IM 153-2 or IM 153-2 FO 7-4
7.4 Replacing Modules without the ”Module Change During Operation” Function 7-8
7.5 Replacing Modules with the ”Module Change During Operation” Function 7-11
7.6 Replacing the Bus Module 7-13
7.7 Changing Fuses in Digital Output Modules 7-14
7.8 Update of the IM 153-x 7-16
7.8.1 Update of the IM 153-1/-2Ax0x 7-16
7.8.2 Update of the IM 153-2Bx00 7-16

8 Technical Specifications

8.1 Standards, Certificates and Approvals 8-2
8.2 Parameters of the IM 153-x 8-7
8.3 Technical Specifications 8-9
8.4 Time Delay of the ET 200M 8-12
8.5 Use of the ET 200M/S7-300 in Zone 2 Hazardous Area 8-13

9 Compatibility Between the IM 153-x Modules

9.1 Compatibility Between the Versions of the IM 153 and IM 153-1 9-2
9.2 Compatibility Between the Versions of the IM 153-2/-2 FO 9-5
9.3 RC Network with 1 MW for a Configuration with Ungrounded Reference Potential 9-8

A Order Numbers for the ET 200M

Glossary

Index

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Figures

1-1	Typical PROFIBUS-DP network structure	1-3
1-2	Structure of the ET 200M distributed I/O device (example)	1-4
1-3	Front view of the IM 153-1 and IM 153-2AA02/-2AB01	1-10
1-4	Front view of the IM 153-2Bx00	1-11
2-1	ET 200M components needed for the sample configuration	2-2
2-2	Setting the PROFIBUS address 3	2-4
2-3	Wiring of the ET 200M	2-6
2-4	Configuration table for ET 200M	2-8
2-5	DP slave properties dialog box for SM 322	2-9
3-1	Distributed I/Os with the IM 153-1	3-2
3-2	Forwarding parameterization data with an IM 153-2 and HART modules	3-3
3-3	Parameterizable FM in an ET 200M with an IM 153-2	3-4
3-4	Sample configuration for time stamping of signal changes with IM 153-2	3-6
3-5	Sample configuraton with 2 IM 153-2 for redundancy in a fault-tolerant system	3-7
3-6	Redundancy with 2 IM 153-2 modules in an H system	3-10
3-7	”Clock-synchronized interrupts” dialog box	3-17
3-8	”Option” dialog box	3-18
3-9	”DP Slave Properties” dialog box	3-19
3-10	Fiber-optic network with the IM 153-2 FO	3-25
3-11	Direct communication with the IM 153-x	3-26
4-1	Horizontal and vertical installation of an ET 200M	4-2
4-2	Clearance measurements for an ET 200M installation on a mounting rack	4-3
4-3	Arrangement of the modules of an ET 200M	4-4
4-4	Installation setup with active bus modules	4-7
4-5	Fixing holes of the 2 m rail	4-9
4-6	Connecting the protective conductor to the rail	4-11
4-7	Applying slot numbers to the modules	4-16
4-8	Inserting the fiber-optic cables into the IM 153-2 FO	4-19
4-9	Setting the PROFIBUS address	4-21
5-1	S7-300 modules operated on a grounded incoming supply	5-7
5-2	S7-300 modules operated from the PS 307	5-8
5-3	Configuring the ET 200M with ungrounded reference potential	5-9
5-4	Simplified illustration of the configuration with isolated modules	5-11
5-5	Potentials in a configuration with the non-isolated analog input/output module SM 334; AI 4/AO 2 8/8Bit	5-12
5-6	Wiring the PS 307 power supply module and the IM 153-x with the jumper	5-16
5-7	Bringing the front connector into the wiring position	5-18
5-8	Attaching shielded 2-wire cables to a shield contact element	5-22
6-1	Startup of the IM 153-1	6-4
6-2	Startup behavior in the case of module change during operation	6-4
6-3	Startup of the IM 153-2	6-6
6-4	Startup for time synchronization/time stamping	6-7
6-5	Structure of the slave diagnosis	6-18
6-6	Structure of the module diagnosis	6-22
6-7	Structure of the module status for the ET 200M	6-23
6-8	Structure of the channel-specific diagnosis	6-25

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6-9 Structure of the H status of the IM 153-2 (only for S7-400H) 6-28
6-10 Structure of the interrupt status of the interrupt section 6-31
6-11 Structure of bytes x+4 to x+7 for diagnostic interrupt (digital and analog modules) 6-32
6-12 Structure as of byte x+8 for diagnostic interrupt (digital inputs) 6-33
6-13 Structure as of byte x+8 for diagnostic interrupt (digital outputs) 6-34
6-14 Structure as of byte x+8 for diagnostic interrupt (analog inputs) 6-35
6-15 Structure as of byte x+8 for diagnostic interrupt (analog outputs) 6-36
6-16 Structure as of byte x+4 for process interrupt (analog inputs) 6-37
6-17 Structure as of byte x+4 for process interrupt (analog inputs) 6-37
6-18 Structure as of byte x+4 for module removal/insertion interrupt 6-38
7-1 Removing the front connector coding key 7-9
7-2 Location of the fuses on digital output modules 7-14
7-3 Update via PROFIBUS-DP (PG/PC directly connected to IM 153-2) 7-18
7-4 Update via PROFIBUS-DP (PG/PC connected to IM 153-2 via CPU) . . . 7-18
7-5 Update via MMC 7-19
8-1 Dimensioned drawing of the IM 153-1 and IM 153-2 8-11
8-2 Basic circuit diagram of the IM 153-1 and IM 153-2 8-11
8-3 Basic circuit diagram of the IM 153-2 FO 8-11
8-4 Response time of the ET 200M 8-12

Tables

1-1 Components of an ET 200M 1-6
1-2 IM 153-x: features and variants 1-9
3-1 Structure of data record 248 for ET 200M 3-22
3-2 Structure of data records with identification data 3-23
3-3 Identification data 3-24
4-1 Fixing holes for rails 4-10
4-2 Module accessories 4-12
4-3 Installing the modules on the rail 4-13
4-4 Slot numbers for S7 modules 4-15
5-1 DIN VDE specifications for configuring a PLC system 5-5
5-2 Wiring rules for the power supply and the IM 153-x 5-13
5-3 Wiring rules for module front connectors 5-14
5-4 Wiring the front connector 5-19
5-5 Preparing the signal module for operation 5-20
5-6 Assignment of cable cross-sections and terminal elements 5-21
6-1 Software prerequisites for commissioning 6-2
6-2 Commissioning prerequisites for the DP slave 6-3
6-3 Procedure for commissioning the DP slave 6-3
6-4 Comparison between DPV1 and DPV0 slave 6-8
6-5 Status and error LEDs on the IM 153-1 6-10
6-6 Status and error messages of the IM 153-2 6-11
6-7 Displaying the diagnosis using STEP STEP 7 and STEP 5 6-13
6-8 Structure of station status 1 (Byte 0) 6-19
6-9 Structure of station status 2 (Byte 1) 6-20
6-10 Structure of station status 3 (Byte 2) 6-20
6-11 Structure of the manufacturer ID (Bytes 4, 5) 6-21
6-12 Channel-specific error messages to PROFIBUS standard 6-26
6-13 Channel-specific error messages – manufacturer-specific 6-27
7-1 Removing modules without ”module change during operation” 7-8

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7-2	Installing new modules	7-9
7-3	Putting new modules into service	7-10
7-4	Removing modules with ”module change during operation”	7-11
7-5	Installing new modules	7-12
7-6	Response of the ET 200M when modules are removed or inserted	7-12
7-7	Removing the bus module	7-13
7-8	Update via MMC	7-19
7-9	MMCs available for updating the IM 153-2	7-19
8-1	Use in industrial environments	8-5
8-2	Parameters of the IM 153-x	8-7
8-3	Parameters for time stamping	8-8
8-4	Parameters for clock synchronism	8-8
9-1	Features and variants of the IM 153-1	9-2
9-2	Features and variants of the IM 153-2	9-5
9-3	Restrictions with DP Master CPUs and FMs for the IM 153-2	9-6
A-1	Components for the ET 200M	A-1
A-2	STEP 7 and SIMATIC S7 Manuals	A-2
A-3	Manual for the ET 200 in SIMATIC S5	A-3
A-4	Technical Literature	A-4

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Product Overview

1

In This Chapter

The product overview tells you:

- How to incorporate the ET 200M distributed I/O device into the Siemens programmable controller landscape.
- The components that make up the ET 200M distributed I/O device

Chapter Overview

Section	Subject	Page
1.1	What Are Distributed I/O Devices?	1-1
1.2	What Is the ET 200M Distributed I/O Device?	1-4
1.3	IM 153-x: Variants and Features	1-8

1.1 What Are Distributed I/O Devices?

Distributed I/O Device – Area of Application

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

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

Distributed I/O devices are the ideal solution for such systems:

- The controller CPU is located centrally.
- The I/O devices (inputs and outputs) operate locally on a distributed basis.
- The high-performance PROFIBUS-DP ensures with its high baud rates that the controller CPU and I/O devices communicate smoothly.

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What Is PROFIBUS-DP?

PROFIBUS-DP is an open bus system based on the *IEC 61784-1:2002 Ed1 CP 3/1* standard with the ”DP” transmission protocol (DP being the German abbreviation for distributed I/O).

Physically, PROFIBUS-DP is either an electrical network based on a shielded two-wire line or an optical network based on a fiber-optic cable.

The ”DP” transmission protocol allows a rapid, cyclic exchange of data between the controller CPU and the distributed I/O devices.

What Are DP Masters and DP Slaves?

The DP master links the controller CPU with the distributed I/O devices. The DP master exchanges data by means of PROFIBUS-DP with the distributed I/O devices and monitors PROFIBUS-DP.

The distributed I/O devices (= DP slaves) prepare the data of the sensors and actuators so that it can be transferred via PROFIBUS-DP to the controller CPU.

Which Devices Can be Connected to PROFIBUS-DP?

A wide range of devices can be connected to the PROFIBUS-DP bus system as DP masters or DP slaves, provided their behavior conforms to *IEC 61784-1:2002 Ed1 CP 3/1*. The devices that can be used include the following:

- SIMATIC S7/M7/C7
- SIMATIC S5
- SIMATIC PG/PC
- SIMATIC HMI (OP, OS and TD operator interfaces)
- Devices from other manufacturers

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Structure of a PROFIBUS-DP Network

The figure below shows you a typical PROFIBUS-DP network configuration. The DP masters are integrated in the relevant device – for example, the S7-400 has a PROFIBUS-DP interface, and the IM 308-C master interface module is inserted in the S5-115U. The DP slaves are the distributed I/O devices connected to the DP masters via PROFIBUS-DP.

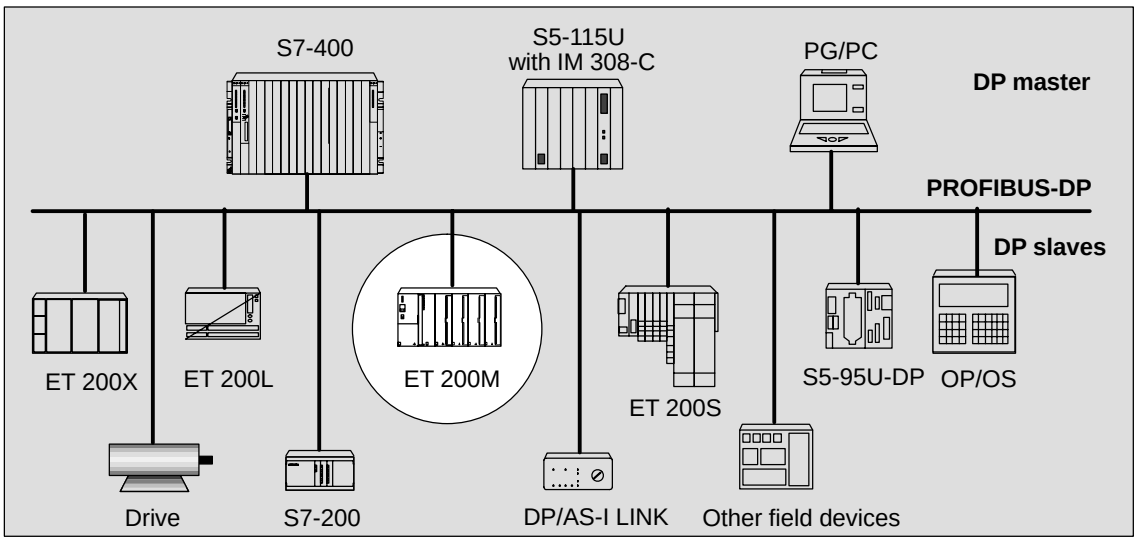


Figure 1-1 Typical PROFIBUS-DP network structure

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1.2 What Is the ET 200M Distributed I/O Device?

Definition

The ET 200M distributed I/O device is a modular DP slave with IP 20 protection.

ET 200M uses the same installation system as the S7-300 programmable controller and consists of IM 153-x and I/O modules of the S7-300.

Structure of the ET 200M (Example)

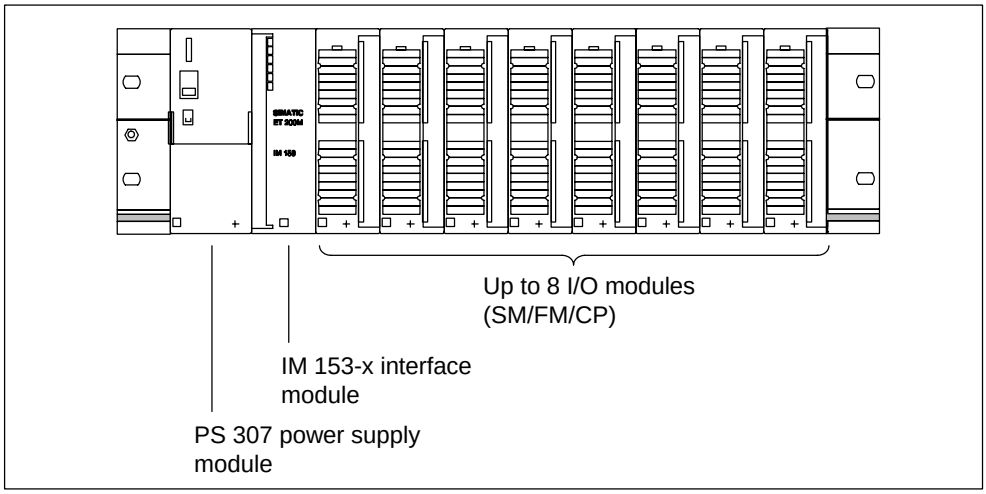


Figure 1-2 Structure of the ET 200M distributed I/O device (example)

You can find a list of modules you can use with the ET 200M in the *STEP 7* module catalog or in the device master file.

You will find the current device master file on the Internet at

http://www.ad.siemens.de/csi_e/gsd.

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”SIMATIC S7-DP Slave”

The ET 200M distributed I/O system is part of the *SIMATIC S7* programmable controller.
This means *STEP 7* supports you when you configure, program and assign parameters to the ET 200M in the DP master system and during commissioning and diagnostics. Certain services and functions of the IM 153-2 (for example parameterizable FM or redundancy) can only be used fully in *SIMATIC S7/PCS 7*.

If you use the ET 200M with a DP standard master (e.g. S5-95U), you will also be supported by the configuration tool in the device master file, but you must pay attention to the technical specifications (typical application specifications) of the DP master (possible parameter assignment frame length and diagnostic frame length etc.).

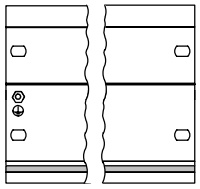
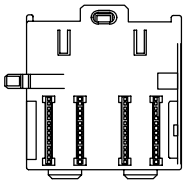
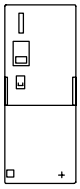
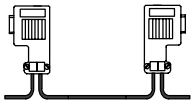
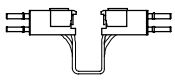
The PROFIBUS standard IEC 61784-1:2002 Ed1 CP 3/1 also includes DPV1 operation. You can only use this operating mode if you integrate the device master file revision $\geq$ 3.
The device master file revision 2 is still available to ensure compatibility with previous versions of the IM 153-x interface module.

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Components

There are a number of components available for the setup and commissioning of the ET 200M. Table 1-1 lists the major components and their functions:

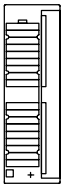
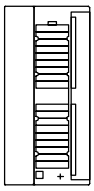
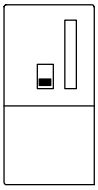
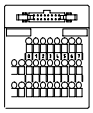
Table 1-1 Components of an ET 200M

Component	Function	Drawing
DIN rail Accessory: • Shield contact element	... accommodates the ET 200M modules	
Rail for the active bus modules Accessory: • Shield contact element • Active bus modules	... is the special mounting rack for the ET 200M for the ”module change during operation” and ”redundancy” functions.	
Active bus modules (BM) • BM IM/IM for redundancy with 2 × IM 153-2[1] • BM IM/IM for redundancy with 2 × IM 153-2Bx00[1] • BM PS/IM for PS 307; 2 A and IM 153-x • BM 2 × 40 for two S7-300 modules 40 mm wide • BM 1 × 80 for an S7-300 module 80 mm wide Accessories • Explosion-proof partition • Backplane bus cover and bus module cover	... ensures that the S7-300 backplane bus is available. This means that if one module is not in place all the other modules are still available via the backplane bus.	
Power supply (PS) Accessory: • Jumper	... converts the line voltage (120/230 V AC) to 24 V DC operating voltage to supply the ET 200M. ... can be used as load power supply for the 24 V DC load circuits.	
IM 153-x (for variants see Section 1.3) Accessory: • Slot number label (to assign slot numbers)	... is the slave interface module; connects the S7-300 modules to the PROFIBUS-DP field bus; supplies operating voltage to the backplane bus.	
PROFIBUS cable with bus connector	... interconnects nodes in a PROFIBUS-DP configuration.	
Fiber-optic duplex cable with Simplex connector (in the plug-in adapter for IM 153-2 FO)	... interconnects nodes in a PROFIBUS-DP configuration.	

1 Assignment of the IM 153-2 to the two active bus modules BM IM/IM can be found in Section 4.1.4.

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Table 1-1 Components of an ET 200M, continued

Component	Function	Drawing
Signal modules (SM) Accessory: • Front connector • Bus connector	... adapt different process signal levels.	
Function modules (FM) Accessory: • Front connector • Bus connector	... for time-critical and memory-intensive process signal processing tasks, such as positioning or closed-loop control	
Communication processor (CP) Accessory: • Connecting cable	... relieves the CPU of communication tasks.	
SIMATIC TOP connect Accessory: • Front connector with ribbon cable connection	... to wire the digital modules or for 1-, 2- or 3-conductor connection.	

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1.3 IM 153-x: Variants and Features

Brief Overview of the Different IM 153-x

The IM 153-x modules are I/O interfaces for signal modules (SM), function modules (FM) and communication processors (CP).
They have an RS 485 interface (IM 153-2 also available with fibre-optic cable interface) and provide a graduated range of functions. The respective variants of the IM 153-2 with RS 485 and fiber-optic cable interface have identical functionality.
The IM 153-1 is also available as a variant for use in the extended range of environmental conditions (outdoor).

Features and Functions

You can find a detailed overview of the features and functions of the different IM 153-x and their current versions in Table 1-2 on page 1-9.

You can find a comparison with the previous versions, which are not included in this table, in Chapter 9.

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Table 1-2 IM 153-x: features and variants

Functions/ Features	Interface Module and Order Number 6ES7 ...		
	153-1AA..	153-2Ax..	153-2Bx..
Module change during operation	×[2]	×	×
Direct communication (see Section 3.10)	×	×	×
Enhanced diagnostics (see Section 6.4)	×	×	×
SYNC, FREEZE	×	–	×
Forwarding of parameterization data from PG/PC (see Section 3.2)	–	×	×
Parameterizable FM in an ET 200M (see Section 3.3)	–	×	×
Time synchronization on the PROFIBUS bus system, time stamping of input signals (see Section 3.4)	–	×	×
Redundancy [1] (see Section 3.5)	–	×	×
Configuration modification in RUN • In the redundant system • In the non-redundant system (See Section 3.6)	 – –	 × –	 × ×
Clock synchronism [1] (see Section 3.7)	–	–	×
Identification data (see Section 3.8)	–	–	×
Update (see Section 7.8.2)	–	–	×

1 SYNC, FREEZE should not be used with these functions (see Section 3.5 and 3.7).
2 Not with IM 153-1AA8x

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Front View of IM 153-1 and IM 153-2AA02/-2AB01

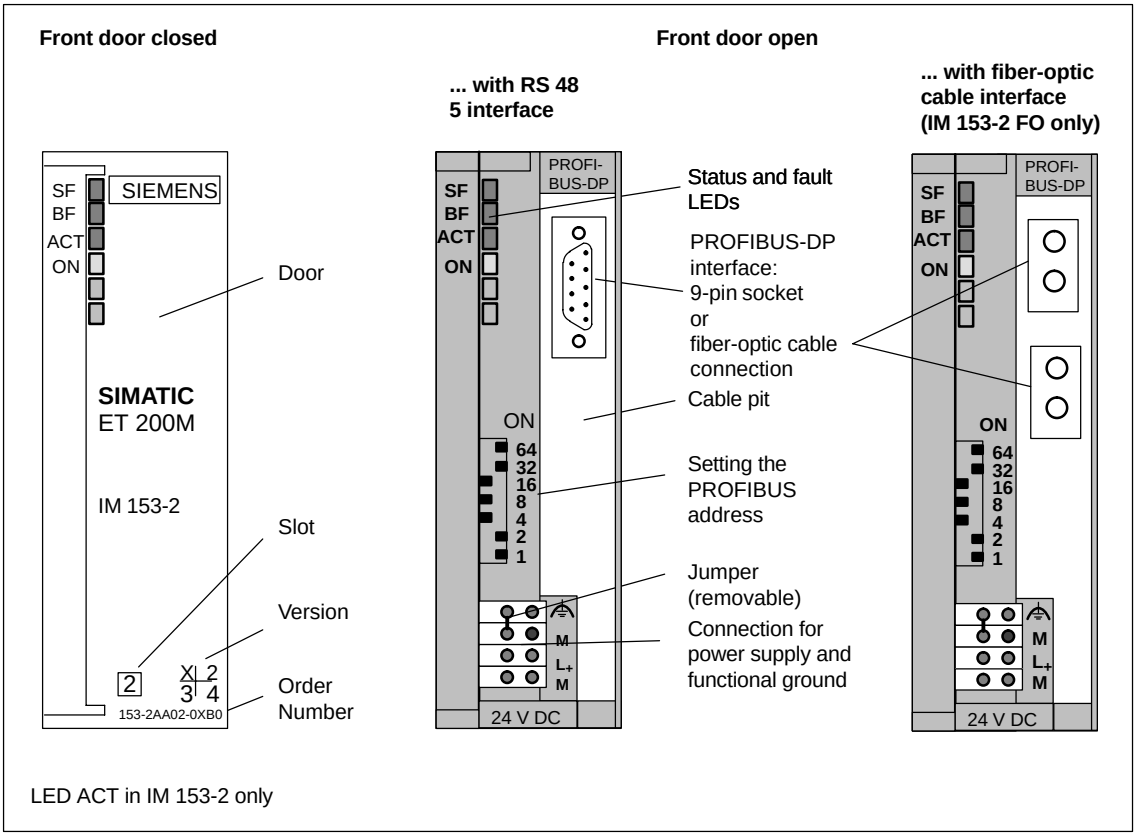


Figure 1-3 Front view of the IM 153-1 and IM 153-2AA02/-2AB01

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Front View of the IM 153-2Bx00

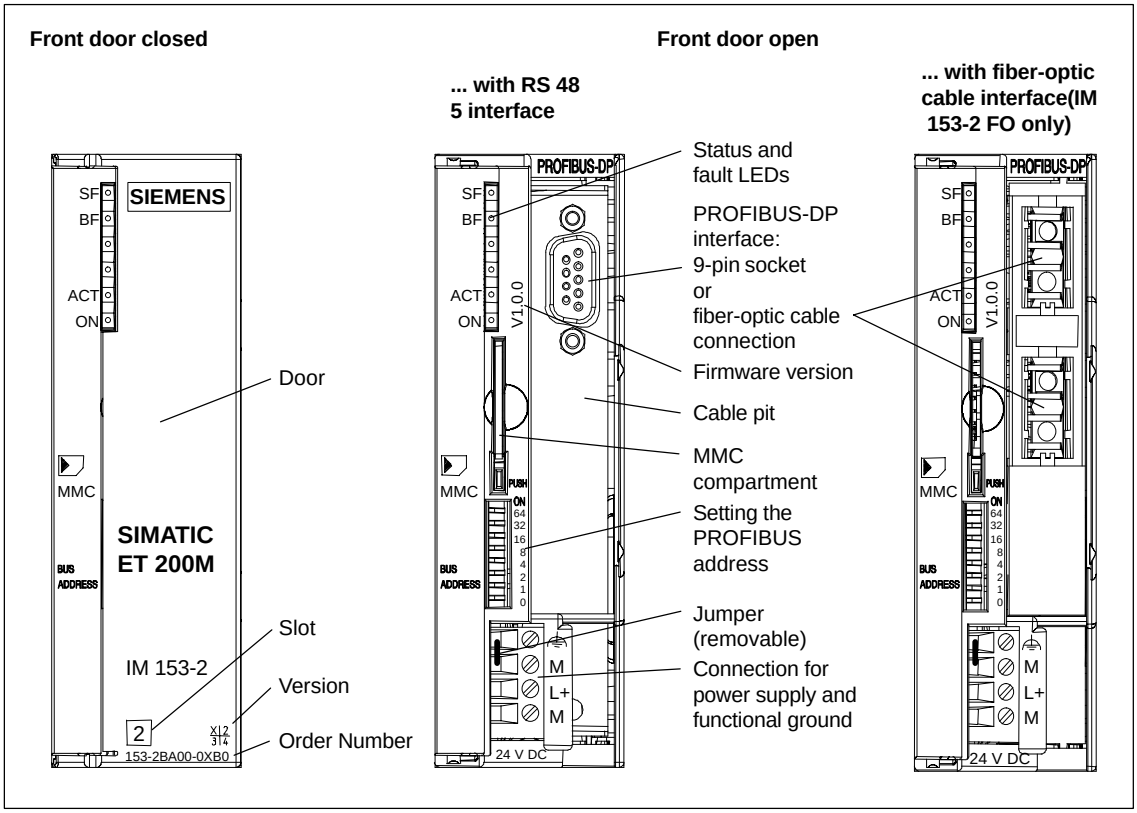


Figure 1-4 Front view of the IM 153-2Bx00

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Getting Started

2

Chapter Overview

Section	Subject	Page
2.1	Introduction	2-2
2.2	Order Numbers for the Sample Configuration	2-3
2.3	Prerequisites	2-4
2.4	Installation	2-4
2.5	Wiring	2-5
2.6	Putting Hardware into Service	2-7
2.7	Configuration	2-8
2.8	Integration into the User Program	2-10
2.9	Switching On	2-10
2.10	Diagnostics	2-11

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2.1 Introduction

In this chapter the following simple sample configuration will show you step by step how to put the ET 200M into service.

- Installation and wiring of the ET 200M
- Configuration with STEP 7
- Integration into the user program
- Switching on the ET 200M
- Evaluation of the diagnostics:
  - short circuit of the sensor power supply to M at the digital input module
  - short circuit to L+ at the digital output module

The illustration below shows you which ET 200M components you need for the sample configuration.

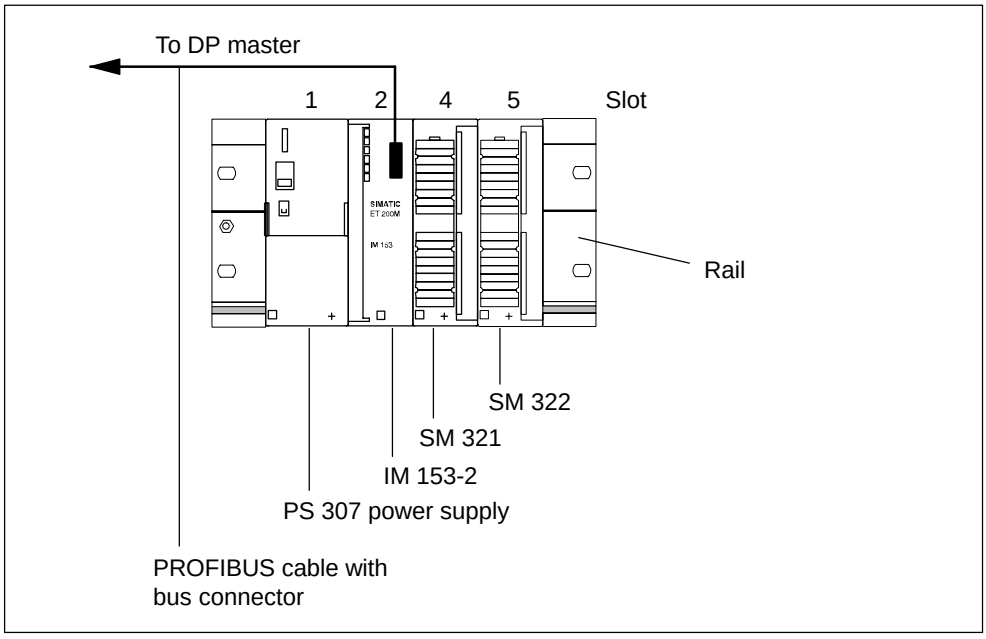


Figure 2-1 ET 200M components needed for the sample configuration

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2.2 Order Numbers for the Sample Configuration

Quan-tity	Article	Order number (Siemens)
1	Rail	e. g. 6ES7 390-1AE80-0AA0
1	Power supply PS 307 with jumper	e. g. 6ES7 307-1BA00-0AA0
1	Interface module IM 153-2	6ES7 153-2BA00-0XB0
1	DI module SM 321	e. g. 6ES7 321-7BH00-0AB0
1	DO module SM 322	e. g. 6ES7 322-8BF00-0AB0
2	20-pin front connector with screw-type contacts	6ES7 392-1AJ00-0AA0
X m	PROFIBUS cable with bus connector	Depends on version
X m	Cable for grounding the rail, with 10 mm^2 cross section and cable lug for M6, length depends on installation position	Commercially available
Various	M6 screws and nuts (lengths depend on installation position) supplied with appropriate wrench/screwdriver	Commercially available
1	Screwdriver with 3.5 mm tip	Commercially available
1	Screwdriver with 4.5 mm tip	Commercially available
1	Side cutter and tool for stripping wires	Commercially available
1	Tool for attaching wire end ferrules	Commercially available
Appr. 2 m	Stranded wire with 1 mm^2 cross section with appropriate wire end ferrules, type A, length 6 mm	Commercially available
2	Single-pole ON button	Commercially available
1	Indicator lamp 24 V	Commercially available

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2.3 Prerequisites

- You have set up an S7 station consisting of a power supply module and a DP master (e.g. CPU 315-2 DP). In this sample configuration a CPU 315-2 DP is used as the DP master. It is, of course, possible to use a different DP master (IEC 61784-1:2002 Ed1 CP 3/1 standard).
- The latest STEP 7 version is fully installed on your programming device (PG). The functionality of the configuration may be restricted if older STEP 7 versions are used. You should be familiar with STEP 7.

2.4 Installation

1. Mount the rail on a firm base so that there is at least 40 mm clearance above and below the rail.
2. Starting from the left side, mount the individual modules on the rail (plug in the bus connectors (not for PS 307 and the last module) – engage – swing in – screw down). Observe the following sequence:
   - Power supply PS 307
   - Interface module IM 153-2
   - DI module SM 321
   - DO module SM 322
3. Set PROFIBUS address 3 at the interface module IM 153-2.

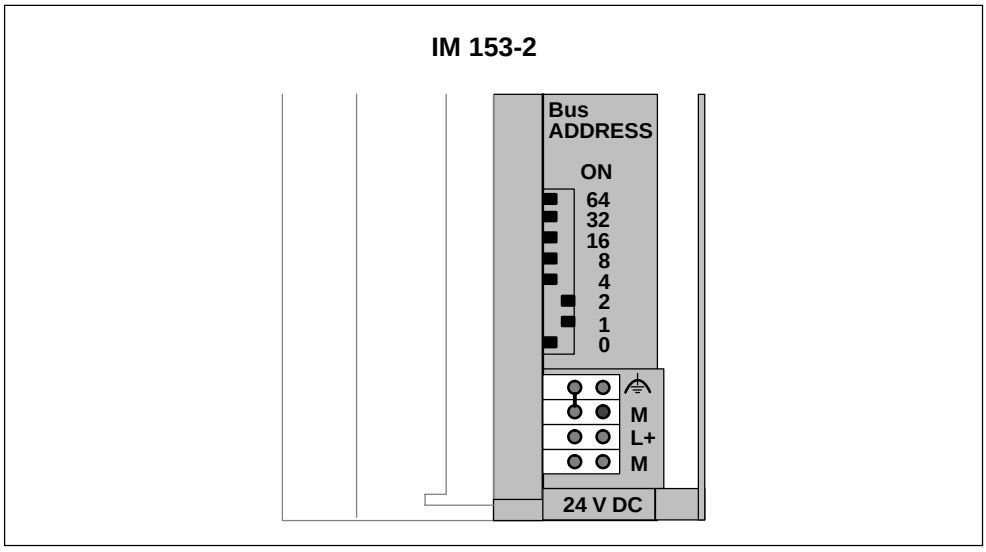


Figure 2-2 Setting the PROFIBUS address 3

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2.5 Wiring

Rail

1. Connect the rail to the protective conductor. An M6 screw is provided for this purpose on the rail.
   Minimum cross-section from the conductor to the protective conductor: 10 $mm^{2.}$

Warning:
You could touch live wires if the power supply module PS 307 is switched on or the supply cable of the power supply is connected to the mains supply.
Make sure the ET 200M is de-energized before doing any wiring.

Power Supply and IM 153-2

1. Open the front doors of the PS and IM.
2. Undo the strain-relief assembly on the PS 307.
3. Strip the power supply cable. If necessary, attach wire end ferrules (in the case of multi-conductor cables). Then connect to the PS 307 (see Figure 2-3).
4. Screw the strain-relief assembly tight.
5. Insert the jumper into the PS 307 and IM 153-2, and screw it tight (see Figure 2-3).
6. Check that the switch for selecting the mains voltage on the PS 307 is set to your mains voltage.
   The power supply module is factory-set to a mains voltage of 230 V AC. You can change the setting in the following way: remove the protective cover using a screwdriver, set the switch to the available mains voltage and reattach the protective cover.
7. Connect the PROFIBUS-DP cable between the DP master (2nd DP interface) and the IM 153-2. The terminating resistors in the connectors must be switched on.

Front Connectors of the DI and DO

1. Open the front doors of the DI and DO.
2. Move the front connector to the wiring position:
   To do so, push a front connector into each DI and DO until it engages. The front connector still protrudes from the module in this position. In the wiring position a wired front connector has no contact with the module.
3. Strip 6 mm of insulation off the ends of the wires you want to insert into the front connector and then attach appropriate wire end ferrules to the wire ends.

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4. Wire the front connector of the DI in the following way:
   Terminal 1: L+ of PS;
   Terminal 20: M of PS;
   Terminal 3: button 1;
   Terminal 4: button 2;
   Terminal 10: free cable ends of button (see Figure 2-3)
5. Wire the front connector of the DO in the following way:
   Terminal 1: L+ of PS;
   Terminal 20: M of PS;
   Terminals 3 and 20: indicator lamp (see Figure 2-3)
6. Guide the wires down and out of the front connectors.
7. Press the release button of the front connector on the top of the module and simultaneously push the front connector into the module until the release button returns to its original position.
8. Close the front doors of PS, DI and DO.

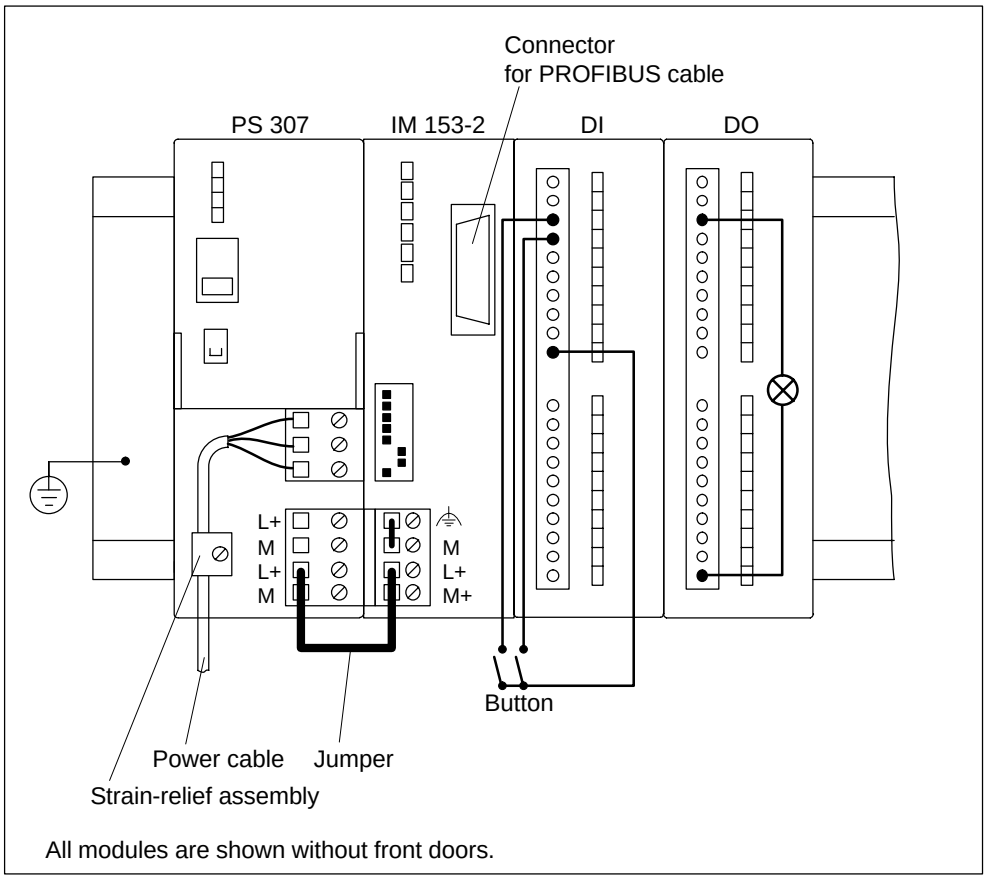


Figure 2-3 Wiring of the ET 200M

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2.6 Putting Hardware into Service

Step	Activity	Result
1	Connect the programming device to the DP master (MPI interface) using the programming device cable. Make sure that the terminating resistors in the connectors are switched on. Set the mode switch to STOP.	
2	Connect the power supply cable to the mains supply and switch on the power supply module for the DP master.	The 24 V DC LED lights up on the PS. All of the LEDs light up briefly on the CPU; the SF LED, BATF LED and 5V DC LED remain lit. The STOP LED flashes rapidly for 3 s and then remains on.
3	Insert the backup battery: • Plug the backup battery connector into the appropriate socket in the battery compartment of the CPU. The notch on the connector must point to the left. • Insert the backup battery into the battery compartment of the CPU. • Close the front door of the CPU.	The BATF LED goes out, followed by the SF LED shortly afterwards.
4	Start the programming device.	
5	Carry out a general reset at the CPU 315-2 DP: Turn the mode switch to MRES. Hold the mode switch at this position until the STOP LED lights up twice and then remains permanently lit (takes 3 s). You must turn the mode switch back to MRES within 3 s. The STOP LED starts to flash rapidly and the CPU carries out a general reset. The CPU has completed the general reset when the STOP LED remains permanently lit again.	

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2.7 Configuration

1. Start the SIMATIC Manager and create a new project with a DP master (e.g. CPU 315-2 DP). In addition to OB 1 also create OB 82 for the project.
2. Add the IM 153-2 from the hardware catalog to the PROFIBUS.
3. Set PROFIBUS address 3 for IM 153-2.
4. Drag the individual modules out of the hardware catalog and drop them onto the configuration table.

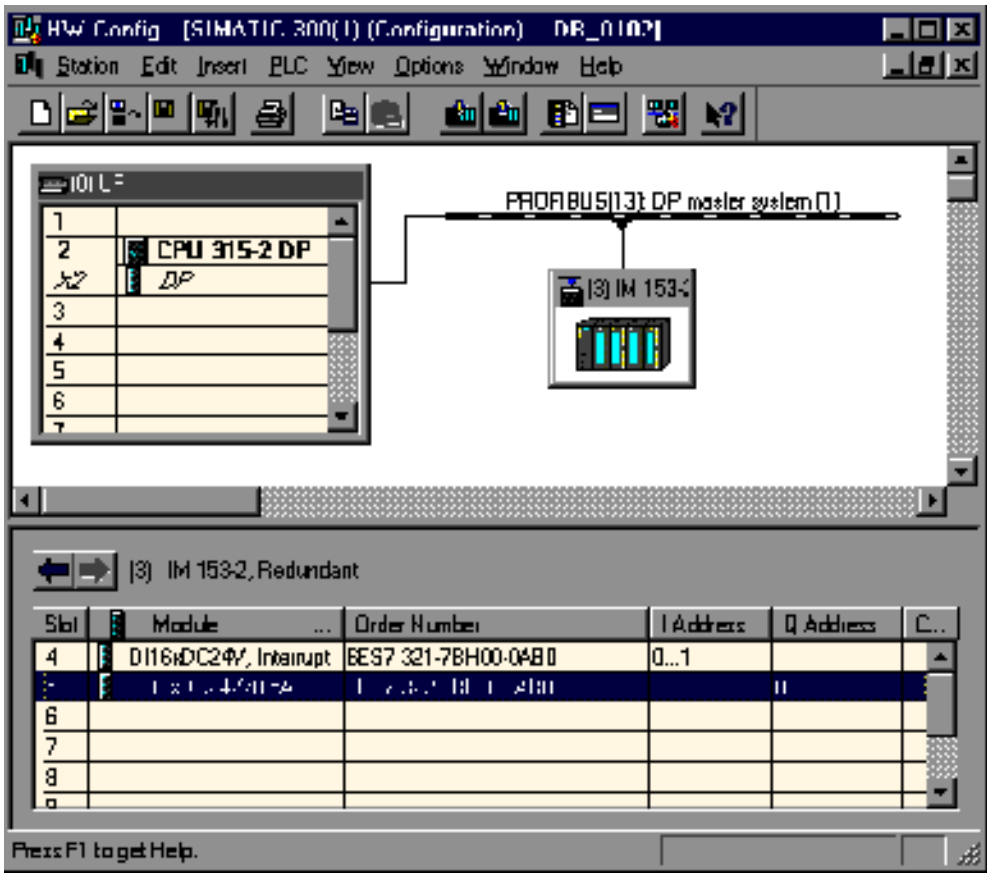


Figure 2-4 Configuration table for ET 200M

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5. Set the following parameters:
   - in the DP slave properties dialog box for ET 200M, accept the default settings
   - in the DP slave properties dialog box for SM 321, slot 4 in the configuration table
     Diagnostics: No load voltage yes
     Diagnostic alarm: yes
   - in the DP slave properties dialog box for SM 322, slot 5 in the configuration table (see Figure 2-5)

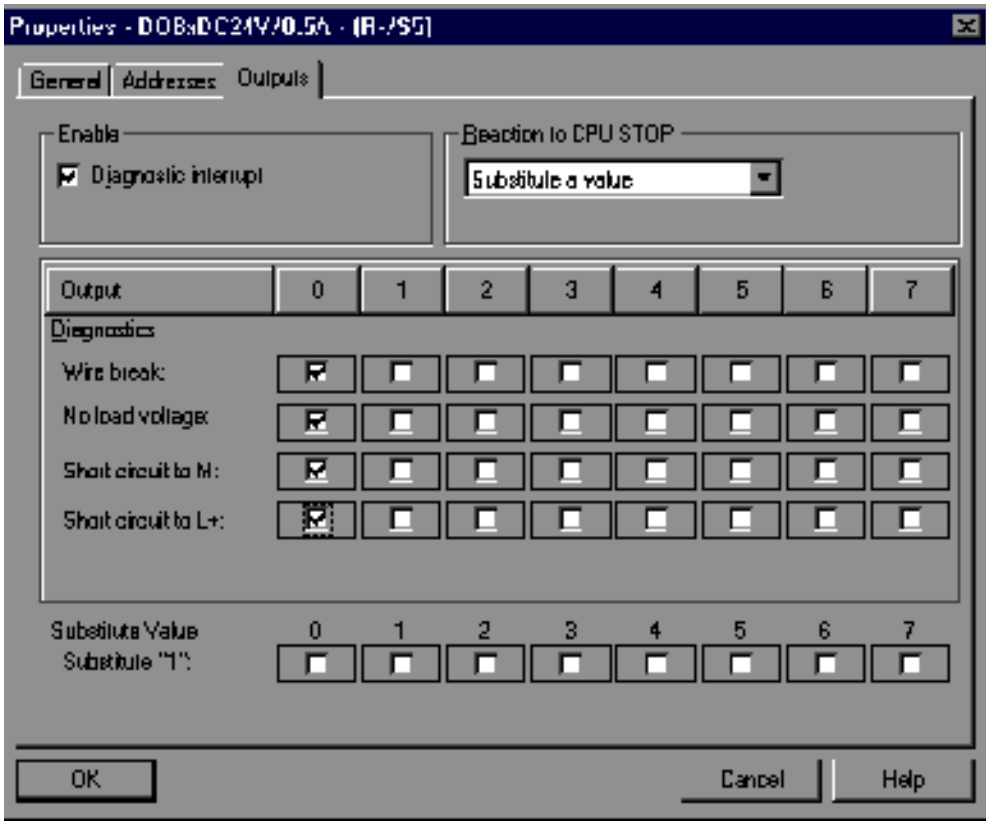


Figure 2-5 DP slave properties dialog box for SM 322

6. Save and compile the configuration.
7. Load the configuration into the CPU 315-2 DP.

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2.8 Integration into the User Program

1. Create the user program in the LAD/STL/FBD editor in OB 1.
   Example: Reading in the inputs and activating an output

STL	Description
U E 0.1 U E 0.2 = A 4.0	If input E 0.1 is set and input E 0.2 is set, then assign the RLO to output A 4.0

2. Save the project in the SIMATIC Manager.
3. Load the configuration into the DP master.

2.9 Switching On

1. Switch on the power supply at the ET 200M.
2. Watch the status LEDs on the DP master and ET 200M
   - CPU 315-2 DP:
     5V DC: ON
     SF DP: OFF
     BUSF: OFF
   - ET 200M:
     SF: OFF
     BF: OFF
     ON: ON

Dry Run

1. Press the two buttons on the ET 200M alternately.

   ⇒ The LEDs of inputs E0.1 and E0.2 light up alternately.
   The channel status display 0 (LED of output A4.0) and the indicator lamp do not light up.

2. Press the two buttons simultaneously.

   ⇒ The LEDs of inputs E0.1 and E0.2 light up simultaneously.
   The channel status display 0 (LED of output A4.0) and the indicator lamp light up.

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2.10 Diagnostics

1. If a fault occurs, the OB 82 is started. Evaluate the start information in the OB 82.
   Tip: Call SFC 13 within OB 82 and evaluate the diagnostic frame. (See Section 6.3)

SM 321: Short Circuit of Sensor Power Supply to M

1. Open the front door of the DI module and use a wire to short-circuit the sensor power supply Vs (terminal 10) to M (terminal 20).
2. Watch the status LEDs.

   IM 153-2:

   – SF: lights up

   SM 321; DI 16 x 24 V DC:

   – SF: lights up ⇒ Diagnostic message has been issued

   – Vs: does not light up (terminal 10)
3. Evaluate the diagnostic message.

   Result:

   – Station status 1: diagnostics — Byte x.3 is set — ⇒ External

   – Module diagnosis: — Byte (x+7).3 is set — ⇒ Slot 4

   – Channel-specific diagnosis:
     Byte (x+16).0 to (x+16).5: 000011_B ⇒ Slot 4
     Byte (x+17).0 to (x+17).5: not relevant
     Byte (x+18).0 to (x+18).4: 00001_B ⇒ Short circuit
4. Remove the wire between terminal 10 and terminal 20. Evaluate the diagnostic LEDs again.

   IM 153-2:

   – SF: Off

   SM 321; DI 16 x 24 V DC:

   – SF: Off

   – Vs: lights up (terminal 10)

   The diagnostic message is erased.

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SM 322: Short Circuit to L+

1. Open the front door of the DO module and use a wire to short-circuit the digital output 0 (terminal 3) to L+ (terminal 1).
2. Watch the status LEDs.

   IM 153-2:

   – SF: comes on

   SM 322; DO 8 x 24 V DC/0.52 A:

   – SF: comes on ⇒ Diagnostic message has been issued

   – F0: comes on ⇒ Channel error

   – 0: Off ⇒ Output is not active

3. Evaluate the diagnostic message.

   Result:

   – Station status 1: diagnostics — Byte x.3 is set ⇒ External

   – Module diagnosis — Byte (x+7).4 is set ⇒ Slot 5

   – Channel-specific diagnosis:
     Byte (x+16).0 to (x+16).5: 000100_B ⇒ Slot 5
     Byte (x+17).0 to (x+17).5: 000000_B ⇒ Channel 0
     Byte (x+18).0 to (x+18).4: 00001_B ⇒ Short circuit

4. Remove the wire between terminal 3 and terminal 1.
   Evaluate the diagnostic LEDs again.

   IM 153-2:

   – SF: Off

   SM 322; DO 8 x 24 V DC/0.52 A:

   – SF: Off

   – F0: Off

   – 0: On

   The diagnostic message is erased.

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Configuration Options with the ET 200M

3

This chapter shows you when to use which IM 153-x for what purpose, and provides examples.

Chapter Overview

Section	Subject	Page
3.1	Distributed I/Os with the IM 153-1	3-2
3.2	Forwarding Parameterization Data from the PG/PC with the IM 153-2	3-3
3.3	Parameterizable FM in a Configuration with an IM 153-2	3-4
3.4	Time Stamping with the IM 153-2	3-5
3.5	Redundancy with the IM 153-2	3-9
3.6	Configuration Modification in RUN	3-11
3.7	Clock Synchronism	3-15
3.8	Identification Data	3-22
3.9	Fiber-Optic Network with the IM 153-2 FO	3-25
3.10	Direct Communication	3-26

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3.1 Distributed I/Os with the IM 153-1

The IM 153-1 is the slave interface module of the ET 200M for standard applications.

Figure 3-1 shows an example of an ET 200M with an IM 153-1 and 4 I/O modules of the S7-300 as distributed I/Os on a CPU 315-2 DP as S7-DP master.

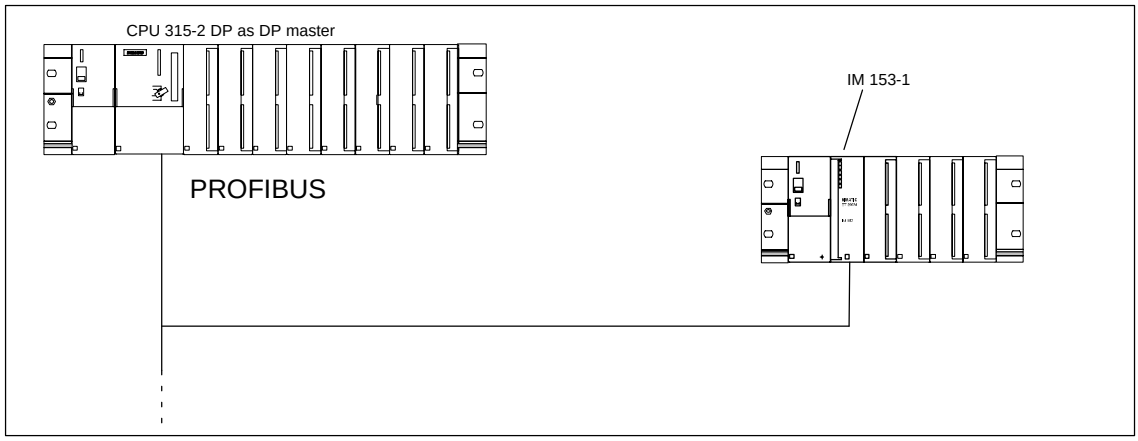


Figure 3-1 Distributed I/Os with the IM 153-1

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3.2 Forwarding Parameterization Data from the PG/PC with the IM 153-2

Sample Configuration with an IM 153-2 and a HART Module

You can use HART modules in the ET 200M. In this application, the ET 200M is the HART master for HART slaves (intelligent field devices) in the explosion-proof area. The IM 153-2 forwards parameterization data from the PG/PC via the HART analog input module to and from the intelligent field devices (the gray line indicates the communication path). You can find a detailed description in the *Intrinsically Safe I/O Modules* Reference Manual.

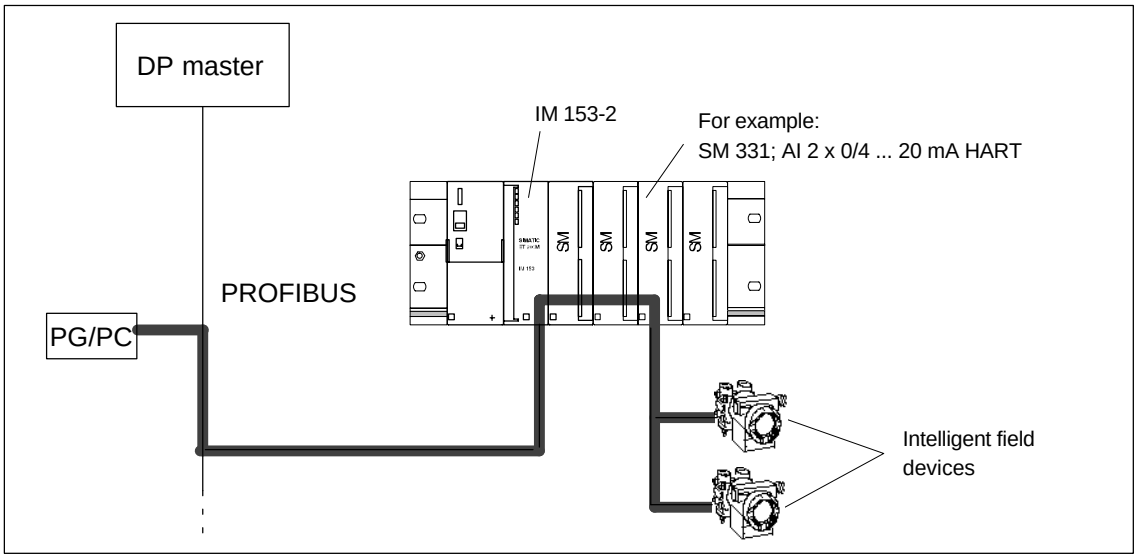


Figure 3-2 Forwarding parameterization data with an IM 153-2 and HART modules

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3.3 Parameterizable FM in a Configuration with an IM 153-2

Sample Configuration with an IM 153-2 and FM

Figure 3-3 shows an example of an ET 200M with an IM 153-2 and two SMs and two FMs of the S7-300 I/O modules. The S7 DP master and PG/OP can communicate directly with the parameterizable FM via the IM 153-2 (the gray line indicates the communication path). Parameterizable FMs are, for example, the FM 353/354/355.

The following S7 functions are supported by the IM 153-2:

- FM parameter assignment by means of the DP master CPU
- Commissioning and diagnostics of the FM by means of a PG/PC
- Operation and monitoring of the FM by means of an OP.

You can find out in Section 9.2 if the DP master and the FM you are using have the functionality for distributed FMs.

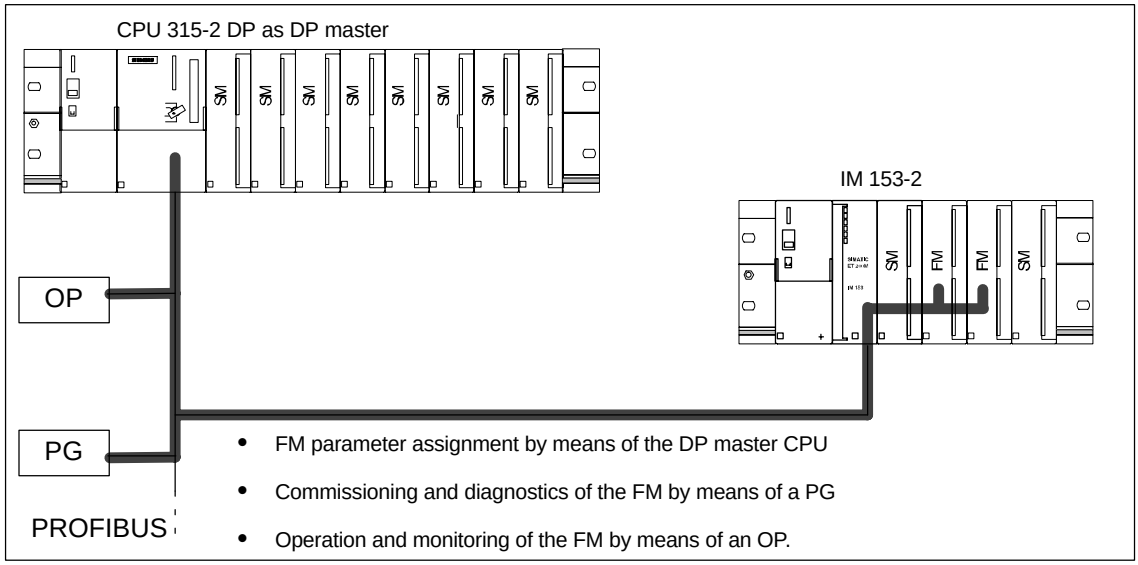


Figure 3-3 Parameterizable FM in an ET 200M with an IM 153-2

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3.4 Time Stamping with the IM153-2

Time stamping with IM 153-2 is possible

- in customer applications which use FB 62 (FB TIMESTMP)
  (see online help for STEP 7)
- with the PCS 7 system solution with accuracy of 10 ms

  A detailed description of time stamping with 10 ms accuracy and time synchronization can be found in the *PCS 7* function manual ”10 ms Time Stamping”.

Operating Principle

You set parameters to determine which user data of the IM 153-2 is monitored. For time stamping it is digital inputs which are monitored for signal changes.
A changed input signal is given a time stamp and stored in a buffer (data record). If time-stamped signals exist or a data record is full, a process interrupt for the DP master is generated. The buffer is evaluated with ”Read Data Record”. Special messages are generated in the case of results which influence time stamping (interrupted communication with DP master, message failure from time master, ...).

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3.4.1 Time Stamping with 10 ms Accuracy

The time stamping of signal changes is supported throughout the *PCS 7* system by all the hardware and software components: from the IM 153-2 via an S7-400 to the OS.

Prerequisite

The synchronization interval must be set to 10 seconds.

Principle

By carrying out configuration in *STEP 7* you can monitor digital inputs for signal changes in a system. The ”coming/going signal” (rising or falling edge) is monitored. The IM 153-2 records these altered input signals with the current time (time stamp) and stores them as message lists. A message list is a record with a maximum of 20 messages about time-stamped signal changes. The IM 153-2 can store up to 15 records.
After a certain time has elapsed and if there are any messages **or** if a record is full, the IM 153-2 triggers a process interrupt in the DP master (S7-400). The CPU then reads the record and forwards the message lists to WinCC in an OS using the FB 90 “IM_DRV” driver block (included in PCS 7 software package).

Sample configuration for time stamping of signal changes with IM 153-2

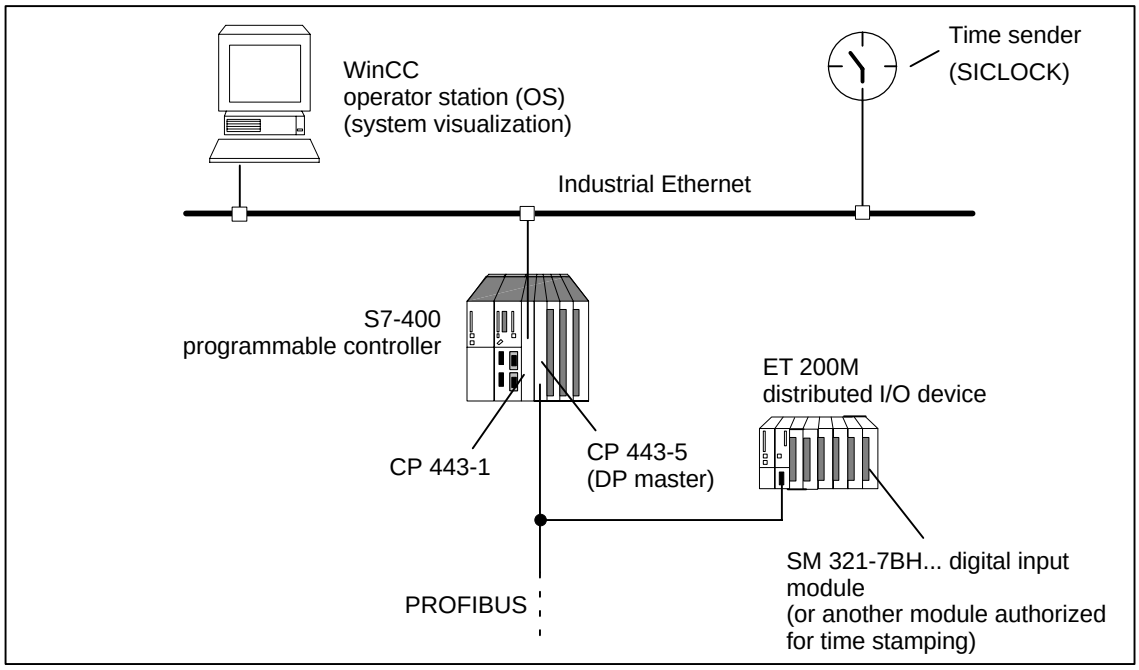


Figure 3-4 Sample configuration for time stamping of signal changes with IM 153-2

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In the Redundant System

The IM 153-2 also supports the time stamp function in the redundant S7-400H system.

Time Stamping Signal Changes in a S7-400H

The two IM 153-2 modules store the messages of the time-stamped signals. This makes it possible, after a switchover operation from the active to passive IM 153-2, for the “new” active IM 153-2 to forward the current messages to WinCC.

Note: During switchover between the two IM 153-2, signal changes are not time stamped. You can see in WinCC when time stamping hasn’t taken place.
You can find further information on time stamping in redundant systems in the *PCS 7* documentation.

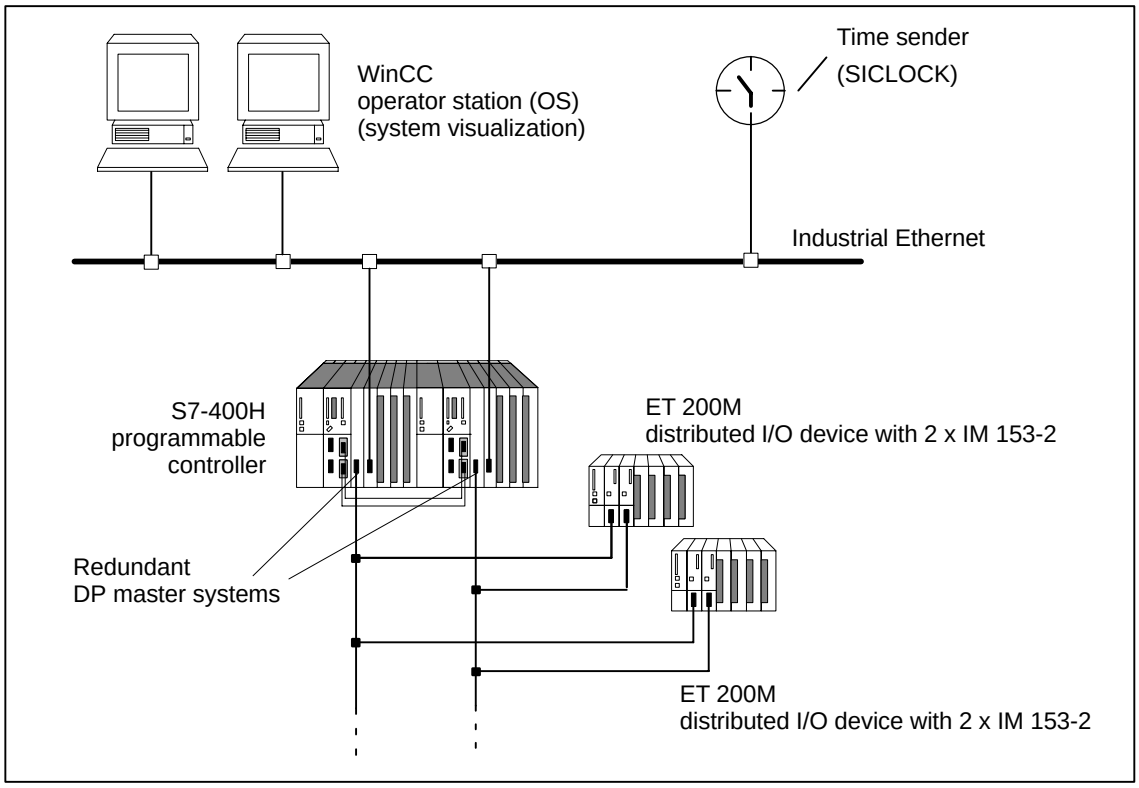


Figure 3-5 Sample configuraton with 2 × IM 153-2 for redundancy in a fault-tolerant system

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3.4.2 Time Stamping with 3 ms Accuracy

Prerequisites

The following configuration is permitted for time stamping with 3 ms accuracy:

- IM 153-2 (as of 6ES7 153-2Bx00-0XB0)
- DI modules
  - SM 321; DI 16 x 24 V DC; with diagnostics
    6ES7 321-7BHx0-0AB0

The synchronization interval must be set to 10 seconds.

Rules

The following rules must be observed:

- The accuracy level applies throughout the entire station.
- A station can have a maximum of 128 DI modules.
- The parameterized input delay must be identical for all DI modules.
- No analog signals are processed in the station.
- No CP or FM modules are permitted in the station.

3.4.3 Time Synchronization with Flexible Time Interval

The synchronization interval can be set in the configuration tool.

The longer the set synchronization interval is, the lower the accuracy of time stamping will be.

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3.5 Redundancy with the IM 153-2

You can operate the IM 153-2 with redundancy

- on S7 DP masters (e.g. S7-400H)
- on S5 DP masters (e.g. S5-115H)
- with software redundancy
- in accordance with the relevant standard (Specification System Redundancy (SR) V1.0, Dec. 2001 of the PROFIBUS user organization)

Prerequisites for the ET 200M

- Installation on active bus modules
- The bus module 6ES7 195-7HD10-0XA0 ensures a high level of availability for the ET 200M and shorter switchover times in the case of redundancy.
- 2 × IM 153-2 on bus module BM IM/IM
  The rules given in Section 4.1.4 apply for the used active bus modules and interface modules.
- Possible with the IM 153-2/-2 FO as of 6ES7 153-2AA02/-2AB01
- In redundant mode, the SYNC/FREEZE function should not be activated.

Note

If the SYNC/FREEZE function is activated in a redundant system, the user must assume responsibility for the resulting behavior of the H system (e.g. at switchovers).

- In a redundant system you can only use the IM 153-2 on DP masters that support the fail-safe parameter. The IM 153-2 will not start up on DP masters that don't support this parameter, and the BF LED flashes.
  Tip: You can tell from the DDB file of the DP master whether it supports the fail-safe parameter or not.

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Sample Configuration of a Redundant DP Master System and the IM 153-2

Figure 3-6 shows an example of a configuration on an S7-400H. For the S7-400H, the ET 200M is a single-channel switched (distributed) I/O module. You will find a detailed description of H systems in the *S7-400H Programmable Controller, Introduction to the System* Manual.

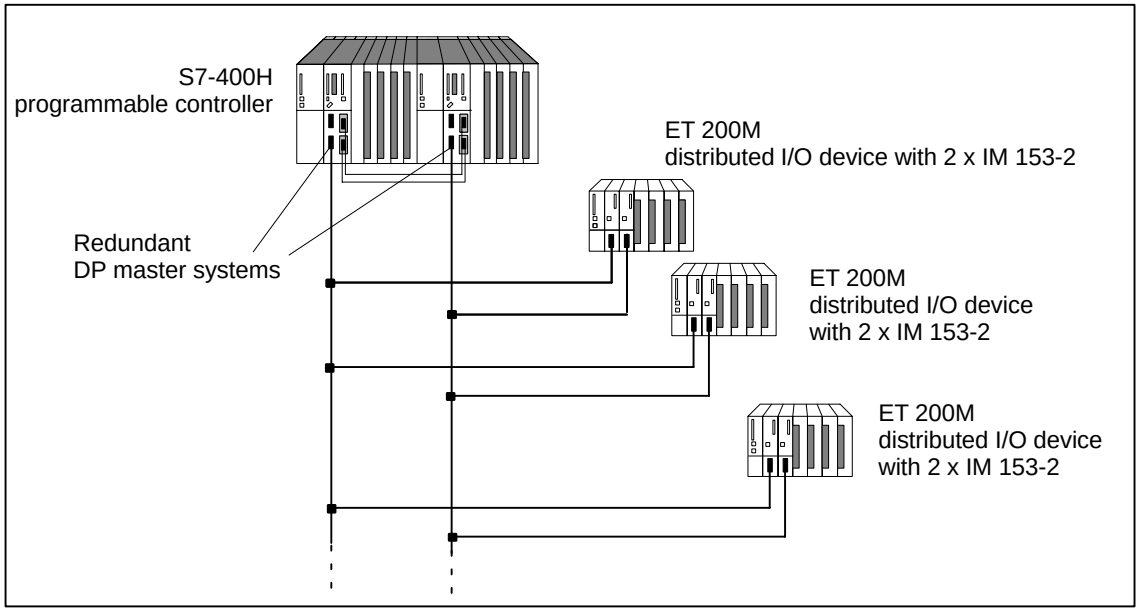


Figure 3-6 Redundancy with 2 × IM 153-2 modules in an H system

Identical Versions

If you use the ET 200M in a redundant configuration, you must use compatible versions of the IM 153-2 and IM 153-2 FO.
You can replace compatible versions of the IM 153-2/IM 153-2 FO in the case of configuration modification in RUN without switching off the I/Os. Compatible versions are:
IM 153-2BA00 and IM 153-2AA02, as of version 05
IM 153-2BB00 and IM 153-2AB01, as of version 04.

Note: The usable range of functions is limited to the lower order number and lower version number in each case.

S7-400H as DP master

You need *STEP 7* (V 5.0 or higher) and the software package *SIMATIC S7 H Systems* to configure the S7-400H system.
The DP master 1 and DP master 2:

- Process the same user program.
- Have the same parameter assignment and configuration for the IM 153-2.

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S5-115H/155H as DP Master

If you use the IM 153-2 on an S5-H system, you must configure two DP master systems in *COM PROFIBUS*.

Power Supply of the IM 153-2

To safeguard availability in redundancy mode with 2 × IM 153-2, we recommend you use a dedicated power supply module for each IM 153-2.

3.6 Configuration Modification in RUN

With IM 153-2, configuration modification in RUN is possible in both redundant and in non-redundant systems:

- In the redundant system
  - with IM 153-2AA02 as of version 05
  - with IM 153-2AB01 as of version 04
  - with IM 153-2Bx00
- In the non-redundant system with IM 153-2Bx00

3.6.1 Configuration Modification in RUN in Redundant System

Configuration with STEP 7/PCS 7

Information on using this function in the redundant system can be found in the manual *Programmable Controller S7-400H, High-Availability Systems* and in the online help of the optional H package for *STEP 7*.

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Configuration with Device Master File

Principle

With the IM 153-2Bx00, a configuration modification in RUN is also possible when configuring with device master file. In this case, modules are added to or removed from an ET 200M during operation. Existing modules and modules which are not to be modified are unaffected.
During this reconfiguration process, the two IM 153-2 modules temporarily use different configuration data. The redundant operating mode for the unaffected modules is, however, retained.

Prerequisites

- ”Configuration modification in RUN” must be enabled during configuration. This must be performed for both IM 153-2 modules of the redundant system. If this is not the case, one of the IM 153-2 modules will not start, i.e. redundancy mode will not be possible.

Note

If configuration modification in RUN is not enabled, parameterization and configuration must be identical for the two IM 153-2 modules.

- The parameters ”Startup If Preset Configuration ≠ Actual Configuration” and ”Module Change During Operation” must be enabled for both IM 153-2 modules.
- The slots for modules which are to be added must be available on the active backplane bus. Adding or removing active bus modules is not possible during operation.

Rules

- At the I/Os of an ET 200M, it is always the configuration of the currently active IM 153-2 which is applicable.
- If there is a difference between the configurations of the two IM 153-2 modules, the passive IM 153-2 delivers the fixed value ”zero” as input data for all inputs. The passive IM 153-2 does not deliver the real input data again until the configurations are identical.

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Configuration modification procedure

Reconfiguration is performed in the following way (example):

1. Make the appropriate modifications to the configuration offline (remove or add module).

Note

The parameters of a module can only be changed by making two configuration modifications in RUN:

1. Remove the module.
2. Add the module with new parameters.

3. Switch one master of the redundant system to passive (all slaves are active at the other master).
4. Load the configuration in the master on the passive line and restart the master →
   The parameters and configuration data are loaded in the slave.
5. Switch over to the line with the new configuration →
   The previously loaded configuration now becomes effective. Removed modules are taken out of the data communication and added modules with the new parameters are included in the data communication.
6. The changes are checked by the user.
   If the changes are OK, the new configuration must also be loaded in the second master. If the changes are not OK, the previous status can be restored by switching over to the second master (with the old configuration). In this case, the old configuration must be loaded on the first master again.

Note

A reconfigured module can be removed and inserted both before and after configuration modification in RUN. The module does not become available for the process until it has actually been inserted and the IM 153-2 which contains the configuration for the module is active.

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Attention

It is the user's responsibility to ensure that the configuration within the master system is uniform. The system does not indicate whether the two IM 153-2 modules are operating with different configurations.
If the two masters in the redundant system have different configurations, a configuration modification in RUN is carried out whenever a switchover is performed.

Interrupts and diagnoses which the active IM 153-2 generates for an I/O module are reported to the master by the passive IM 153-2, even if this module does not exist in the configuration of the passive IM 153-2. The user must decide which interrupts and diagnoses from the passive IM 153-2 he should ignore during the time period of different configuration data.

3.6.2 Configuration Modification in RUN in Non-Redundant System

A detailed description of this function and its parameterization in non-redundant systems can be found in the function manual *System Modification During Operation Using CiR*.

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3.7 Clock Synchronism

Reproducible response times (i.e. response times with identical length) are implemented in the SIMATIC using the equidistant DP bus cycle, synchronization of the user program with the DP bus cycle, and clock-synchronized transmission of the I/O data to the I/O modules. The clock-synchronized components of the user program are processed using the clock-synchronized interrupts (OB 61 to OB 64) synchronously to the DP bus cycle. The I/O data is transferred to the I/O modules via the backplane bus of the DP slave at defined and constant (clock-synchronized) intervals and switched through to the ”terminal” with clock synchronism.
Clock synchronism therefore results in the synchronization of all free-running single cycles (from the user program in the CPU, through the DP cycle on the PROFIBUS subnetwork and right up to the cycle in the I/O modules of the DP slaves).
The maximum jitter is 10 µs.

Features

- In equidistance mode, the transition into data exchange at startup can be delayed by up to 150 DP cycles compared to the mode without clock synchronism.
- With asynchronous events (e.g. removal and insertion, diagnoses and interrupts of I/O modules), the response of the IM 153-2 to the I/Os can fail for one clock cycle.
  To be able to process diagnoses and interrupts without clock cycle failure, the interval between Ti and To must be increased to at least 500 µs. Increasing the interval beyond this minimum further improves the performance of asynchronous events. As a general guideline, you should increase the interval by 500 µs for every asynchronous event which is be processed simultaneously (diagnosis, interrupt, data record).
  The clock synchronism adjusts automatically following a failure.
- Deactivating the watchdog has no effect with clock synchronism.

Note

Output of the IM 153-2 at the I/O modules and input of the I/O modules at the IM 153-2 are only performed with clock synchronism if no bus modules are active. With active bus modules, there is a time offset depending on the slot used by the I/O module in the ET 200M.

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Prerequisites

- Interface module IM 153-2; Order number 6ES7 153-2Bx00-0XB0 as of E01
- STEP 7 V5.2 or higher
- PROFIBUS-DP must have a data transfer rate of at least 1.5 Mbaud (low equidistance times can be achieved using high baud rates).
- The maximum equidistance cycle is 32 ms.
- The equidistance master must be a DP master of class 1, i.e. a PG/PC cannot be an equidistance master.
- In equidistance mode, only one DP master (class 1) can be active on the PROFIBUS-DP. PGs and PCs (class 2) can be connected additionally.
- The clock synchronism can only be activated at the ET 200M if the equidistant bus cycle has been activated on the DP master system and at least one module with synchronization support has been configured.

Optimizing the Equidistance Time

- The longest (parameterizable) delay for the digital input/output modules determines the length of the equidistant DP cycle.
  Tip: With clock synchronism, make sure that all of the digital modules in the ET 200M station have the same delay.
- The smaller the input delays are that you set for the digital input modules, the shorter the possible equidistance times will be.
  Tip: Wherever possible, set an input delay of 0.1 ms for the digital input modules.
- In the case of modules which support clock synchronism, the processing time at the module must also be taken into consideration.
- The minimum possible equidistance times in the station depend on the number of modules in the ET 200M.
  You can also achieve small equidistance times if you distribute the modules of an ET 200M (with a large number of modules) between two ET 200M stations.
- The equidistance time is reduced if you increase the baud rate.
  Tip: Set the highest possible baud rate.

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Procedure for Parameterizing Clock Synchronism

1. Settings at the CPU:

   ”Object Properties” of the CPU > ”Clock-Synchronized Interrupts” tab

   – Set CPU clock-synchronized interrupt.

   – Select the used DP master system.

   – Select the desired subprocess image.

   – Recommended delay time:
   Accept the default setting.

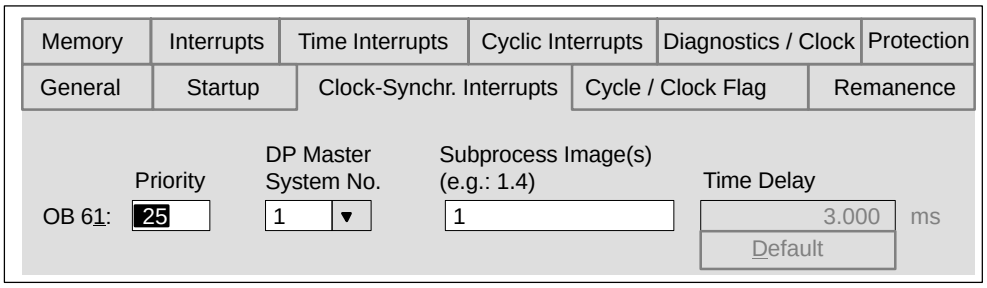


Figure 3-7 ”Clock-synchronized interrupts” dialog box

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2. Settings at the DP master system:

   ”Object Properties” of the DP master > ”General” tab > ”Properties” button > ”Parameters” tab > ”Properties” button > ”Network Settings” tab > ”Options” button

   – Activate the equidistance at the DP master system.
   – Set the length of the equidistant DP cycle (max. 32 ms).
   – Set ”Times Ti and To identical for all DP slaves” (synchronizes the I/O data of the various DP slaves).
   – Times Ti and To can be set separately.
     Recommendation: Accept the default settings for Ti and To.

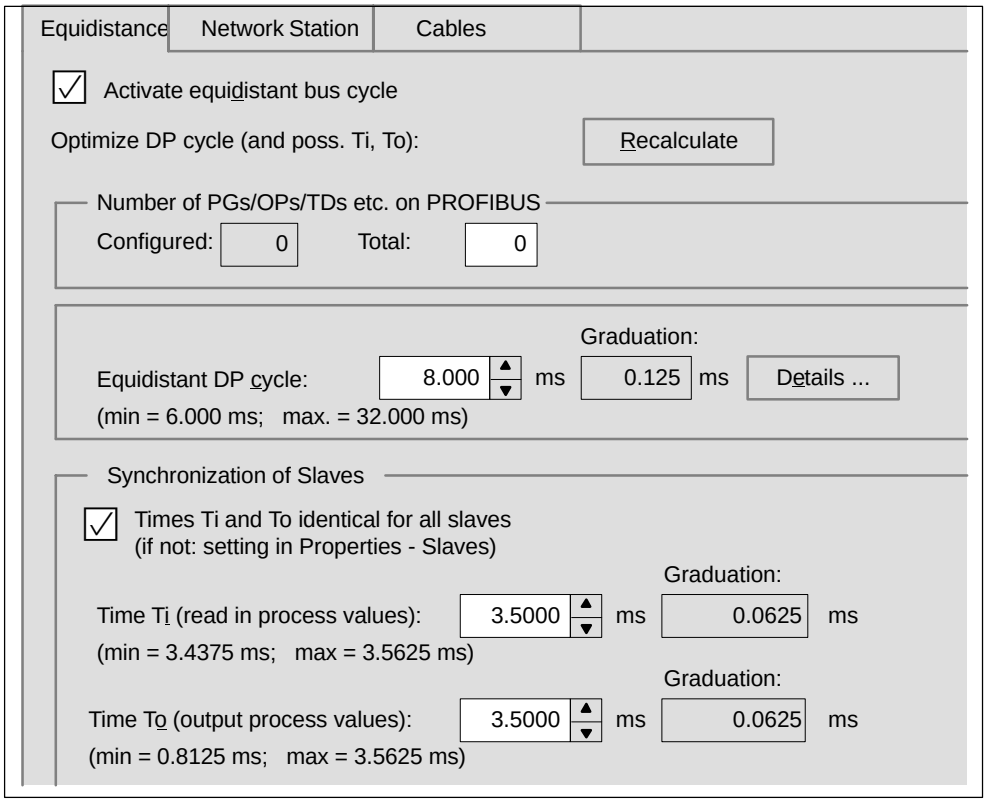


Figure 3-8 ”Option” dialog box

Note

If you click the ”Recalculate” button, STEP 7 calculates a value for the equidistant DP cycle; this value takes the current PROFIBUS-DP configuration into consideration. The value is then automatically entered in the ”Equidistant DP cycle”, ”Time Ti (...)” and ”Time To (...)” fields.

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3. Settings at the DP slave:

   ”Object Properties” of the DP slave> ”Clock Synchronization” tab

   – Activate ”Synchronize DP slave with equidistant DP cycle”.

   – Enter the times Ti and To (if not set at the master system under ”Times Ti and To identical for all DP slaves”). Recommendation: Accept the default settings for Ti and To.

   – Select the modules to be synchronized and, in the ”Addresses” tab, assign them to the subprocess image defined in the CPU.

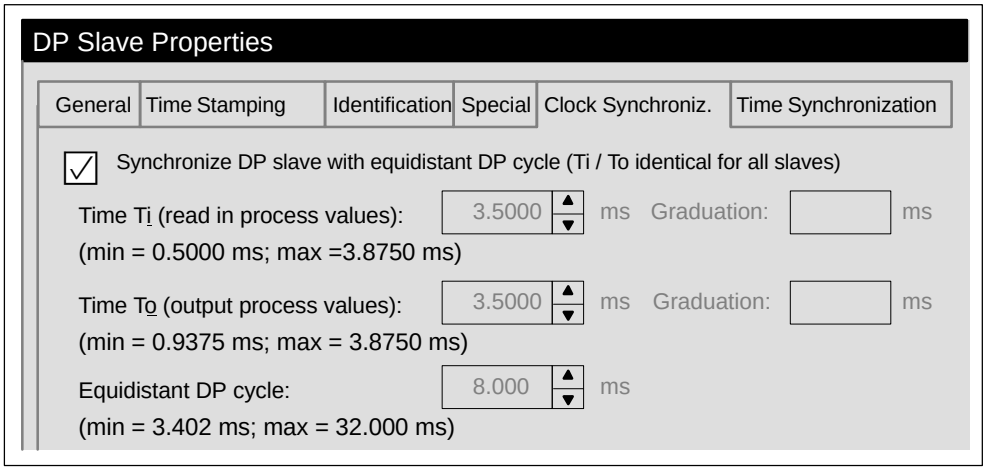


Figure 3-9 ”DP Slave Properties” dialog box

Note

If you click ”Clock Synchronization” in the ”Edit” menu, a configuration overview of the clock-synchronized modules is displayed.

4. Create the user program:

   – Create the OB 61.

   – At the beginning of the OB 61, the SFC 126 must be called to update the subprocess image of the inputs.

   – At the end of the OB 61, the SFC 127 must be called to update the subprocess image of the outputs.

   – The subprocess image parameterized in the CPU (”Clock-Synchronized Interrupts” tab) must be used as the subprocess image.

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Time Calculation

Only the processes in the IM 153-2 interface module are taken into consideration in the formulae below. Times for data exchange and processes in the I/O modules are not taken into consideration. The values only apply to the system without active bus modules.

Inputs

$$t_i\ [\mu s] = K_t + \sum_{n=4}^{11} [di_n\ (1 + 8b_n) + ai_n\ (35 + 16w_n)]$$

b_n: Number of input bytes (digital) at slot n

w_n: Number of input words (analog, ...) at slot n

di_n = 1, if the slot is configured with a digital module and inputs are available
= 0 otherwise

ai_n = 1, if the slot is configured with a non-digital module and inputs are available
= 0 otherwise

K_t = 200

Outputs

$$t_o\ [\mu s] = K_o + \sum_{n=4}^{11} [do_n\ (1 + 6b_n) + ao_n\ (35 + 10w_n)]$$

b_n: Number of output bytes (digital) at slot n

w_n: Number of output words (analog, ...) at slot n

do_n = 1, if the slot is configured with a digital module and outputs are available
= 0 otherwise

ao_n = 1, if the slot is configured with a non-digital module and outputs are available
= 0 otherwise

K_o = 90

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Internal Processes of the IM 153-2

$$K\,[\mu s] = \sum_{m=1}^{5} s_m\, k_m$$

S_1 = 1	k_1 = 100 µs
S_2 = 1, if time synchronization is active = 0 otherwise	k_2 = 100 µs
S_3 = 1, if parameterizable modules are used = 0 otherwise	k_3 = 400 µs
S_4 = 1, if I&C/HART modules or parameterizable FMs are used = 0 otherwise	k_4 = 500 µs
S_5 = 1, if time stamping is active = 0 otherwise	k_5 = 500 µs

Note

With IM 153-2 (6ES7 153-2Bx00-0XB0), the use of active bus modules is not intended for clock-synchronized operation since the synchronization conditions for this application are fulfilled by certain modules only.
If active bus modules are to be used despite this, the user must include an extra time of 500 µs for both Ti and To, therefore adding 1 millisecond to the equidistant DP cycle.

Further Information

Further information on clock synchronism can be found in the online help of STEP 7.

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3.8 Identification Data

Identification data is information stored in a module and supports the user when

- eliminating faults in a system
- checking the system configuration
- locating hardware modifications in a system

The identification data allows modules to be clearly and unambiguously identified online. As of IM 153-2Bx00 this data is available on the ET 200M.
In STEP 7 the identification data is displayed in the tabs ”Module Status – IM 153-2” and ”Properties – DP Slave”.

Reading the Identification Data

The user can access specific identification data using **Read Data Record**. The data is accessed in two stages:

1. A directory containing the data record numbers for the various indices is stored in data record 248 (see Table 3-1).

Table 3-1 Structure of data record 248 for ET 200M

Contents	Length (bytes)	Code (hex)
Header information		
ID of contents directory	2	00 01
Index of contents directory	2	00 00
Length of subsequent blocks in bytes	2	00 08
Number of blocks	2	00 05
Block information for identification data		
SSL ID Associated data record number Length of data record Index	2 2 2 2	F1 11 00 E7 00 40 00 01
SSL ID Associated data record number Length of data record Index	2 2 2 2	F1 11 00 E8 00 40 00 02
SSL ID Associated data record number Length of data record Index	2 2 2 2	F1 11 00 E9 00 40 00 03
SSL ID Associated data record number Length of data record Index	2 2 2 2	F1 11 00 EA 00 40 00 04
8 byte block information for additional data record objects		
	Σ: 48	

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2. The item of identification data assigned to the respective index can be found under the associated data record number (see Table 3-3).
   – All data records with identification data have a length of 64 bytes.
   – The data records are structured in the way shown in Table 3-2.

Table 3-2 Structure of data records with identification data

Contents	Length (bytes)	Code (hex)
Header information		
SSL ID	2	F1 11
Index	2	00 0x
Length of identification data	2	00 38
Number of blocks with identification data	2	00 01
Identification data		
Index	2	00 0x
Identification data for respective index (see Table 3-3)	54	

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The identification data is assigned to the indices in the way shown in Table 3-3.

Table 3-3 Identification data

Identification data	Access	Default	Description
Index 1			
Manufacturer	Read (2 bytes)	2A hex (= 42 dec)	The name of the manufacturer is stored here. (42 dec = Siemens AG)
Device designation	Read (20 bytes)	6ES7 153-2Bx00-0XB0	Order number of the module
Device serial number	Read (16 bytes)	Depends on version	The serial number of the module is stored here. This allows clear and unambiguous identification of the module.
Hardware revision	Read (2 bytes)		Provides information on the module version. Is incremented if the version and/or firmware of the module changes.
Software revision	Read (4 bytes)		Provides information on the firmware version of the module. If the firmware version is incremented, the module version (hardware version) also increases.
Statistical revision No.	Read (2 bytes)	–	Provides information on the parameterized modifications on the module. The statistical revision No. is incremented after each modification.
Index 2			
TAG	Read/ write (max. 32 characters)	–	Location identifier of the module. Here you enter a unique identifier for the module.
Index 3			
Installation date	Read/ write (max. 16 characters)	–	Contains the date on which the module was installed. Enter the date here. Format YYYY-MM-DD
Index 4			
Description	Read/ write (max. 54 characters)	–	Free text which is stored in the module. Here you can enter additional information regarding the properties of the module.

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3.9 Fiber-Optic Network with the IM 153-2 FO

In this section we show you a sample configuration of a fiber-optic network without considering the function performed by the IM 153-2 FO.

Sample Configuration

Figure 3-10 shows an example of how a fiber-optic network is configured with the ET 200M and the IM 153-2 FO as the slave interface.

Note the following points when using a fiber-optic network with nodes with integrated fiber-optic interfaces:

- The fiber-optic network can be set up as a line or star-type configuration.
- If you remove the fiber-optic cable from an integrated fiber-optic interface, the following nodes will also no longer be accessible:

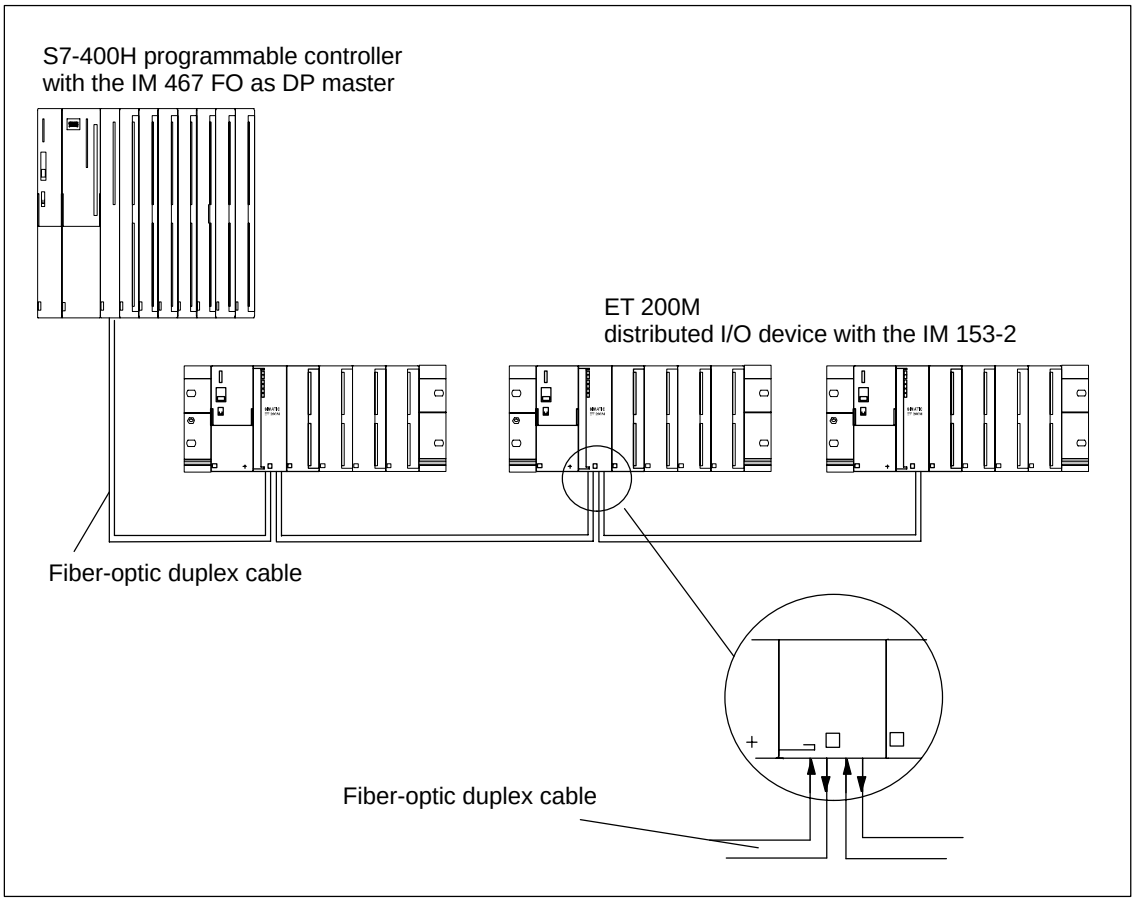


Figure 3-10 Fiber-optic network with the IM 153-2 FO

Further information on network configuration and network components can be found in the manual *SIMATIC NET; PROFIBUS Networks* (Order No. 6GK1 970-5CA20-0BA0).

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3.10 Direct Communication

As of *STEP 7* V 5.0 you can configure direct communication for the PROFIBUS nodes. The IM 153-x can participate in direct communication as the sender (publisher).

Principle

Direct communication is characterized by the fact that the PROFIBUS-DP nodes listen in to find out which data a DP slave is sending back to its DP master. Using this function the eavesdropper (recipient) can directly access changes in the input data of remote DP slaves.

During configuration in *STEP 7*, in addition to defining the relevant I/O input addresses, you can also define which of the recipient's address areas the required data from the sender will be read to.

Example

Figure 3-11 gives an example indicating which direct communication relationships you can configure with an ET 200M as the sender and which nodes can listen in as possible recipients.

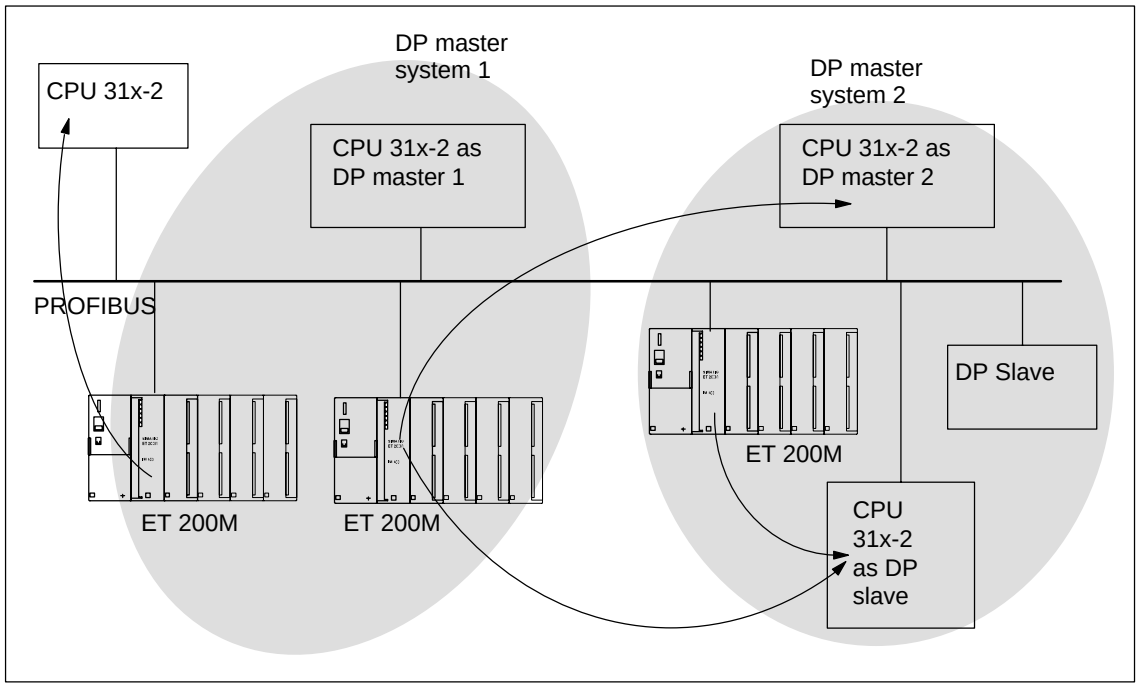


Figure 3-11 Direct communication with the IM 153-x

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Installation

4

Introduction

In this chapter we will show you how to carry out the mechanical configuration, and prepare and install the ET 200M components.

To set up an ET 200M, you must take into account the configuration of the electrical installation. Make sure you also read Chapter 5, entitled ”Wiring”.

Chapter Overview

Section	Contents	Page
4.1	Mechanical Configuration	4-2
4.2	Installation	4-8
4.3	Connecting the Bus Connector	4-17
4.4	Connecting the Fiber-Optic Cable to the IM 153-2 FO	4-18
4.5	Setting the PROFIBUS Address	4-20

Open Modules

The modules of an ET 200M are open equipment. That means you can only install the ET 200M in housings, cabinets or electrical operating areas. These housings, cabinets and electrical operating areas should only be accessible by means of a key or a special tool. Only trained or authorized personnel should have access to the housings, cabinets or electrical operating areas.

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4.1 Mechanical Configuration

In This Section

Section	Subject	Page
4.1.1	Horizontal and Vertical Installation	4-2
4.1.2	Clearance Measurements	4-3
4.1.3	Arrangement of the Modules in an ET 200M Configuration	4-4
4.1.4	Rules for Configuring the ”Module Change During Operation” and ”Redundancy” Functions	4-5

4.1.1 Horizontal and Vertical Installation

You can install the ET 200M horizontally or vertically.

Permissible Ambient Temperature

- Horizontal installation From 0 to 60 °C
- Vertical installation From 0 to 40 °C

Installing the ET 200M together with IM 153-1AA8x (outdoor) and outdoor modules extends the specified temperature range to –25 °C.

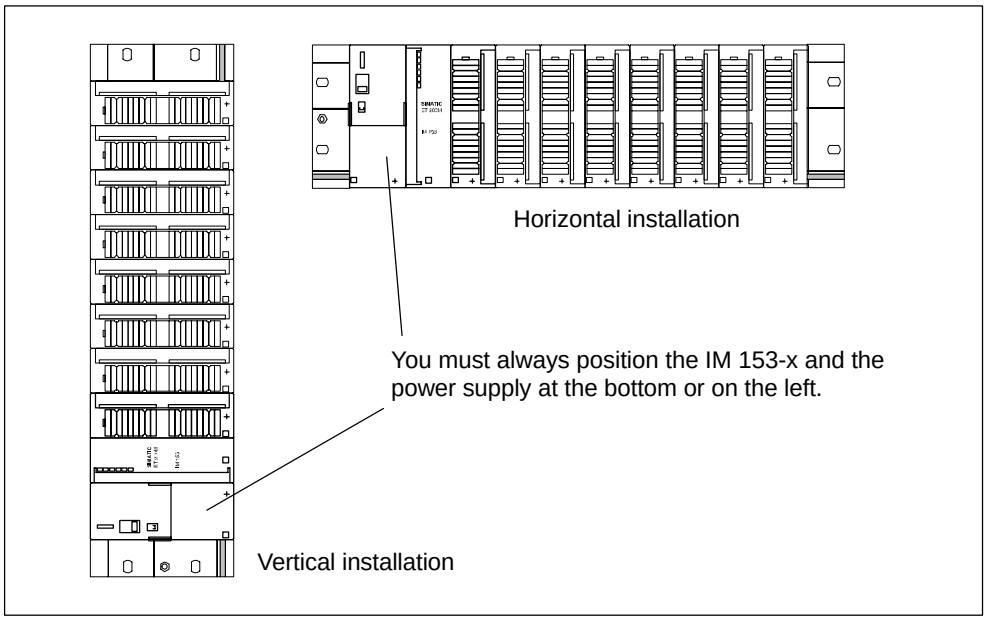


Figure 4-1 Horizontal and vertical installation of an ET 200M

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4.1.2 Clearance Measurements

Rules

If you adhere to the minimum clearance measurements:

- You will ensure that the S7-300 modules do not get too hot.
- You will have adequate space for inserting and removing the S7-300 modules.
- You will have sufficient space for running cables.
- If you use a shield contact element, you can connect shielded cables directly with the rail (see Section 5.2.4). This increases the height of the S7-300 mounting rack to 185 mm. You must, however, still maintain a clearance of 40 mm.

Clearance Measurements

Figure 4-2 shows you the clearance measurements to nearby cable ducts, apparatus, cabinet walls etc. for an ET 200M installation.

If you use a shield contact element, the dimension specifications apply from the lower edge of the shield contact element.

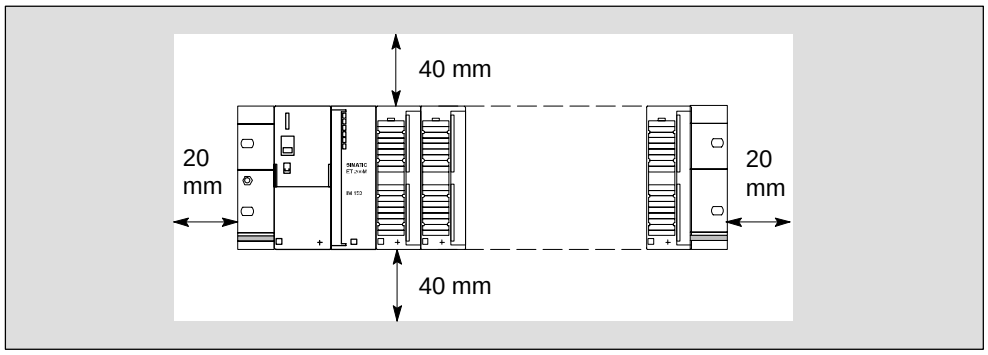


Figure 4-2 Clearance measurements for an ET 200M installation on a mounting rack

Installation Dimensions of the Modules

The dimensioned drawings of the S7-300 modules are contained in the *Module Specifications* Reference Manual.

You can find the installation dimensions of the IM 153-x in Section 8.3.

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Length of the Rails

Depending on the ET 200M installation you have, you can use the following rails:

Rail for ...		Usable length for modules	Remarks
"Standard"	Module change during operation		
160 mm 482.6 mm 530 mm – 830 mm	– 482.6 mm 530 mm 620 mm –	120 m 450 mm 480 mm 580 mm 780 mm	Comes with fixing holes
2000 mm	2000 mm	Cut to length required	Fixing holes must be drilled (see Section 4.2.1)

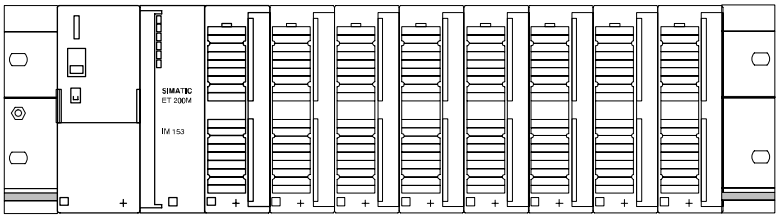
4.1.3 Arrangement of the Modules in an ET 200M Configuration

Rules

The following rules apply to the arrangement of the modules in an ET 200M:

- An ET 200M can only be installed on one mounting rack (rail), because coupling to other mounting racks via interface modules is not permissible.
- A maximum of 8 signal modules, function modules or communication processors can be installed to the right of the IM 153-x.

Figure 4-3 shows the arrangement of the modules in an ET 200M configuration with eight S7-300 modules.



PS IM 153-x S7-300 modules

Figure 4-3 Arrangement of the modules of an ET 200M

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Installation in an Intrinsically Safe Area

If you use the ET 200M in intrinsically safe areas, you must insert a DM 370 dummy module between the IM 153-x and the modules in the intrinsically safe area. This is the only way to adhere to the required thread length (see also the *Intrinsically Safe I/O Modules*) Reference Manual.

4.1.4 Rules for Configuring the ”Module Change During Operation” and ”Redundancy” Functions

Rules

The following rules apply in addition to those listed in Section 4.1.3:

- You must insert the IM 153-x and all SMs/FMs/CPs on active bus modules.

  For redundancy with IM 153-2 you must insert the interface module on the active bus module BM IM/IM in the following way:

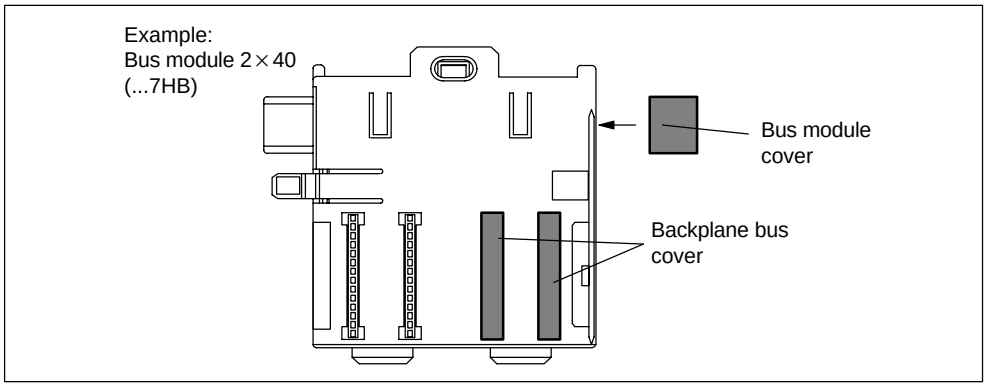
IM 153-2 6ES7 153-	on bus module 6ES7 195-	
	7HD00-0XA0	7HD10-0XA0
2AA02-0XB0 2AB01-0XB0	Yes	**No**
2BA00-0XB0 2BB00-0XB0	Yes The IM 153-2Bx00 then runs in compatible mode with the functionality of IM 153-2AA02/ -2AB01.	Yes The new functions of the IM 153-2Bx00 are only provided with this bus module.

Note

The active bus module 6ES7 195-7HD10-0XA0 has two yellow markings to aid identification. These markings indicate that only IM 153-2Bx00 modules should be inserted on this bus module.

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- Use the rails for ”module change during operation” (only these can take the active bus modules).
- Close unused slots with the backplane bus cover. Close the last bus module with the bus module cover. The bus module cover is included with the BM PS/IM and IM/IM bus modules. The backplane bus cover has to be ordered (see Appendix A).



- If you use the ET 200M in an intrinsically safe area, use an explosion-proof partition – preferably between the modules in the intrinsically safe area and the modules in the non-intrinsically safe area.

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Installation Options

You can install up to 9 active bus modules depending on the length of the rail:

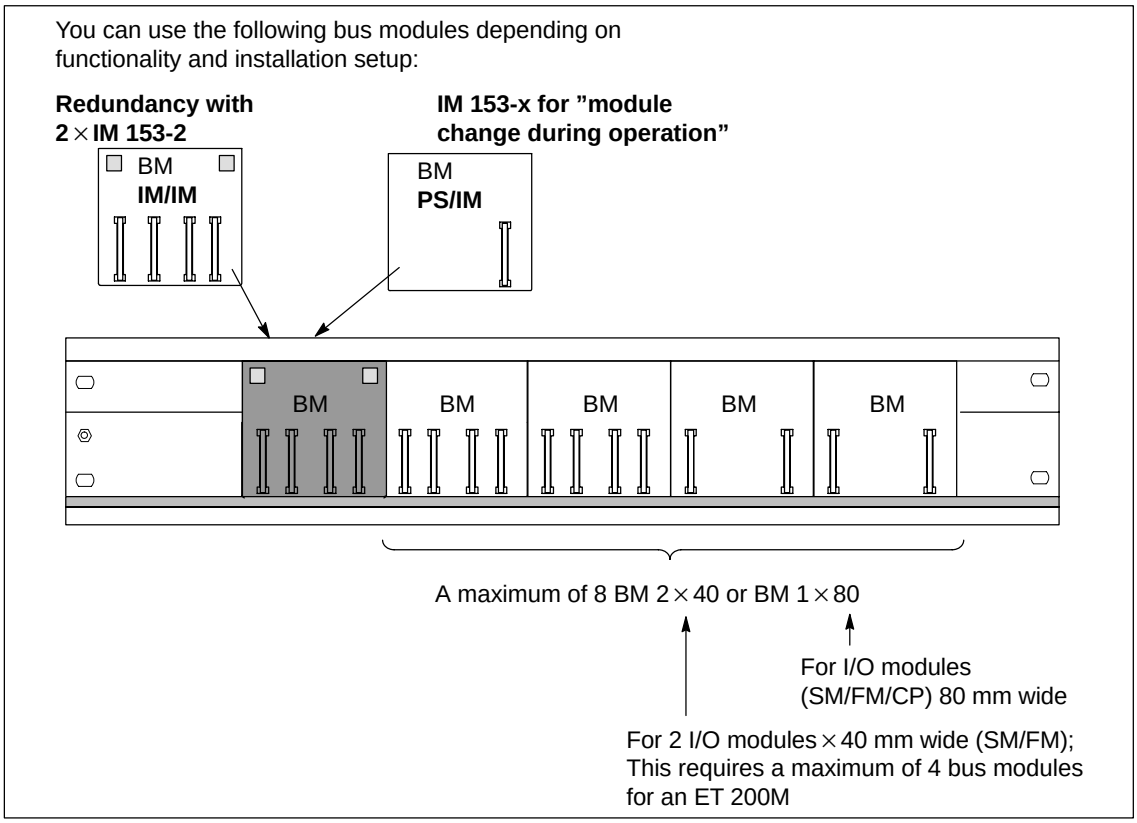


Figure 4-4 Installation setup with active bus modules

Placement of the PS 307 Power Supply Modules

Redundancy with 2 × IM 153-2	Are you using the 530 mm rail? Then you can install either 2 × PS 307; 2A or 1 × PS 307; 5A on the left next to the BM IM/IM on the rail. (If you install the BM IM/IM in the right latched position on the rail.) Otherwise, you must install the power supply modules on a separate S7 DIN rail. Recommendation: Each IM 153-2 should have its own PS.
IM 153-1/-2 for ”module change during operation”	The PS 307; 2A fits next to the IM 153-x on the BM PS/IM. The PS 307; 5A and 10 A don’t fit on the BM PS/IM. You must install these on a separate S7 DIN rail.

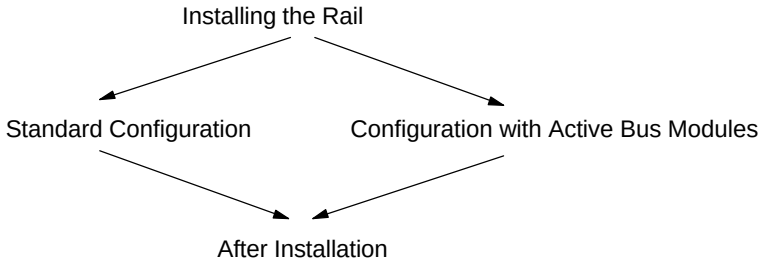
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4.2 Installation

There are two configuration types for the ET 200M:

- Standard configuration with rail and bus connectors between the modules
- Configuration with active bus modules for the ”Module Change During Operation” and/or ”Redundancy” functions

You should read the sections which are relevant to your needs:



Section	Subject	Page
4.2.1	Installing the Rail	4-8
4.2.2	Standard Configuration (Installing Modules on the Rail)	4-12
4.2.3	Configuration with Active Bus Modules (Installing Active Bus Modules and Modules)	4-14
4.2.4	After Installation	4-15

4.2.1 Installing the Rail

Uniform Installation

All the information in this section applies to both the DIN rail and the rail for active bus modules.

Rail for Active Bus Module

To configure an ET 200M with the ”module change during operation” and/or ”redundancy” function, use the associated rails (order number 6ES7 195-1Gxx0-0XA0). Only these rails can take the active bus modules.

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Are you Installing a 2-Meter Rail?

If not, you can skip this section and read on from the section entitled **Dimensioned Drawing for Fixing Holes**.

If so, the 2-meter rail has to be prepared for installation.
Proceed as follows:

1. Shorten the rail to the required length.
2. Mark out:
   - Four holes for fixing screws (for dimensions, see Figure 4-5 and Table 4-1)
   - A hole to take the fixing screw for the protective conductor.
3. Is the rail longer than 830 mm?

   If so: You must make additional holes for more fixing screws to ensure the rail is secure.Mark out these holes along the groove in the middle section of the rail (see Figure 4-5). These additional holes should be at 500 mm intervals.

   If not: No further steps must be taken.
4. Drill the marked holes to a diameter of 6.5 $^{+0.2}$ mm for M6 screws.
5. Tighten the M6 screw to fix the protective conductor.

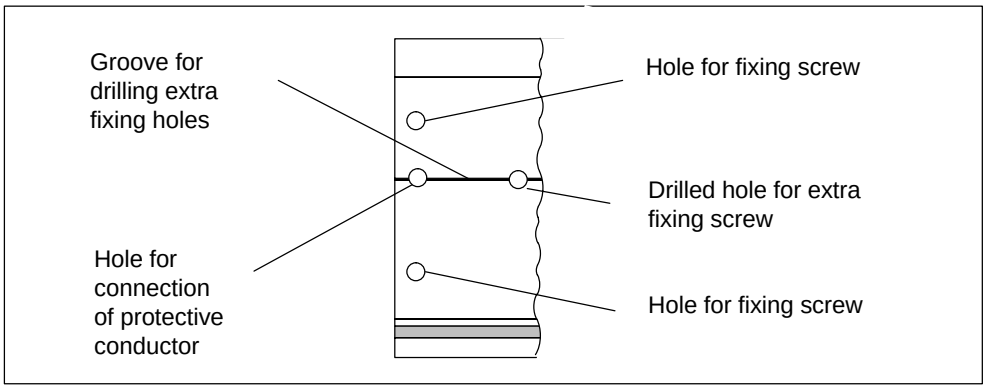


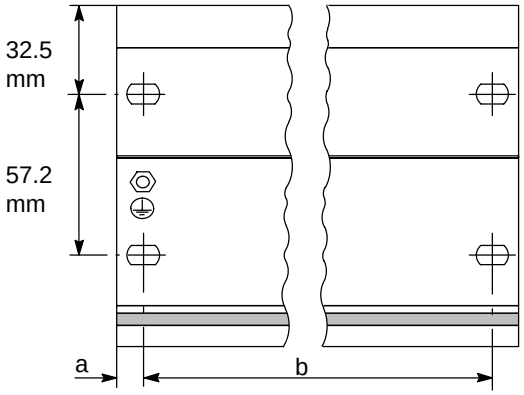
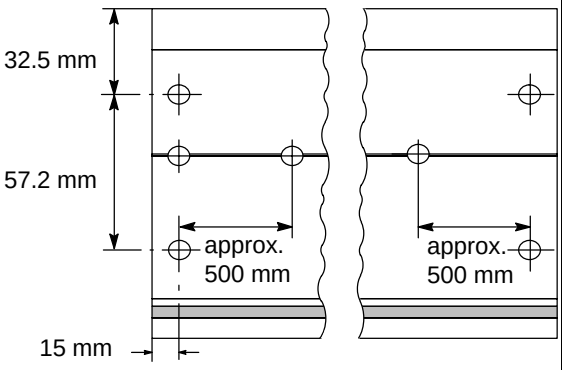
Figure 4-5 Fixing holes of the 2 m rail

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Dimensioned Drawing for Fixing Holes

The fixing-hole dimensions for the rail are shown in Table4-1.

Table 4-1 Fixing holes for rails

Din Rail	2 m Rail
	

Length of Rail	Dimension a	Dimension b
160 mm	10 mm	140 mm
482.6 mm	8.3 mm	466 mm
530 mm	15 mm	500 mm
620 mm	15 mm	590 mm
830 mm	15 mm	800 mm

–

Fixing Screws

You have a choice of the following screw types for fixing the rail.

For	Type of Screw	Description
Lateral fixing screws	M6 cheese-head screw M6 to ISO 1207/ ISO 1580 (DIN 84/DIN 85)	Choose a suitable screw length for your configuration. You will also require 6.4 washers to ISO 7092 (DIN 433)
	M6 hexagon-head screw to ISO 4017 (DIN 4017)	
Extra fixing screw (only for 2 m rail)	M6 cheese-head screw to ISO 1207/ ISO 1580 (DIN 84/DIN 85)	

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Installing the Rail

To install the rail, proceed as follows:

1. Choose a position for the rail that leaves enough room to install it properly and enough space to cope with the temperature rise of the modules (leave at least 40 mm free above and below the rail; see Figure 4-2 on page 4-3)
2. Screw the rail to its base (size: M6). Is this base a metallic plate or a grounded supporting plate?

   If so: Make sure there is a low-impedance connection between the rail and the base. In the case of painted or anodized metals, for instance, use a suitable contacting agent or contact washers.

   If not: No particular steps are required.
3. Connect the rail to the protective conductor. An M6 screw is provided for this purpose on the rail.

   Minimum cross-section from the conductor to the protective conductor: 10 mm^2.

Note

Ensure that your connection to the protective conductor is low-impedance (see Figure 4-6). If the ET 200M is mounted on a hinged rail, for example, you must use a flexible cable to establish the connection to the protective conductor.

Protective Conductor Connection

Figure 4-6 shows you how to connect the protective conductor to the rail.

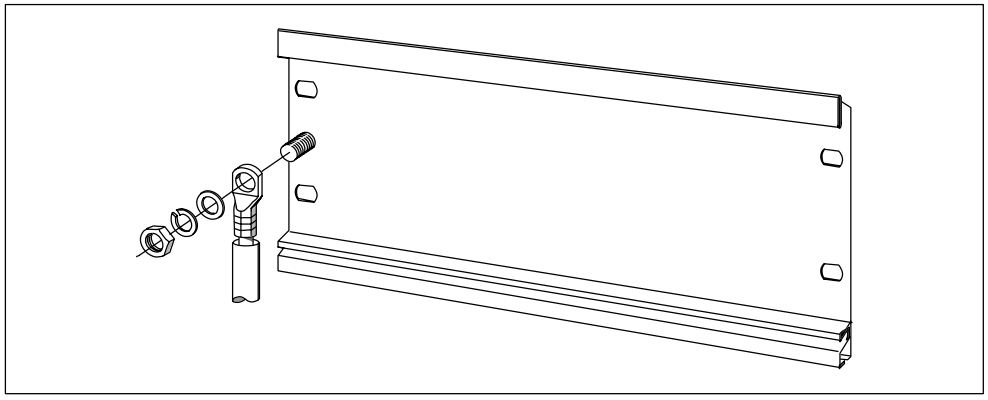


Figure 4-6 Connecting the protective conductor to the rail

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4.2.2 Standard Configuration (Installing Modules on the Rail)

Accessories

The accessories you need for installation are included with the modules. Appendix A contains a list of accessories and spare parts with the corresponding order numbers.

Table 4-2 Module accessories

Module	Accessories Included	Description
IM 153-x	1 × slot number label	For assigning slot numbers
Signal module (SM)	1 bus connector	For establishing the electrical connections between the modules
	1 labeling strip	For labeling the input and output points on the module

Sequence for Installing the Modules on the Rail

1. Power supply module
2. IM 153-x
3. Signal module(s)

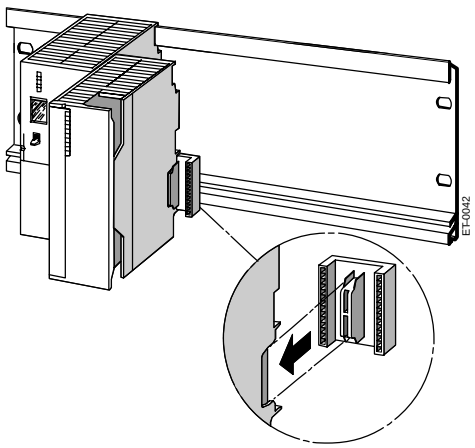
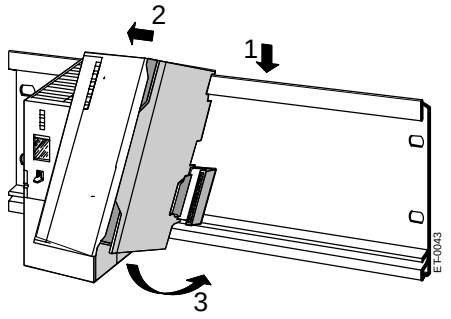
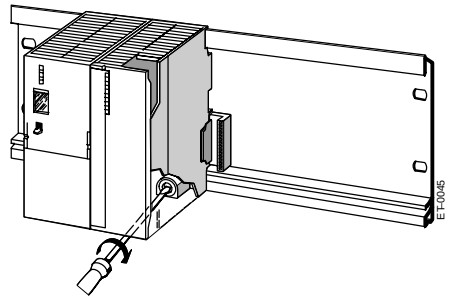
   Note: If you are installing SM 331 analog input modules, please check **before** installation whether you have to move the measuring range submodules on the side of the module. (see Chapter on analog modules in the *Module Specifications* Reference Manual).

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Sequence for Installation

The individual steps to be followed when installing the modules are described below.

Table 4-3 Installing the modules on the rail

Steps	Figure
Attach and secure the PS 307 power supply.	
Each signal module comes with a bus connector, but not the IM 153-x. When attaching the bus connectors, always start with the IM 153-x: • Remove the bus connector from the last module and plug it into the IM 153-x. • Do not plug a bus connector into the ”last” module. Do not plug in a bus connector between the PS 307 and IM 153-x!	
Hook the modules onto the rail (1), slide them along as far as the module on the left (2), and swing them down into place (3).	
Bolt the modules tight, applying a torque of between 0.8 and 1.1 Nm.	

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4.2.3 Configuration with Active Bus Modules (Installing Active Bus Modules and Modules)

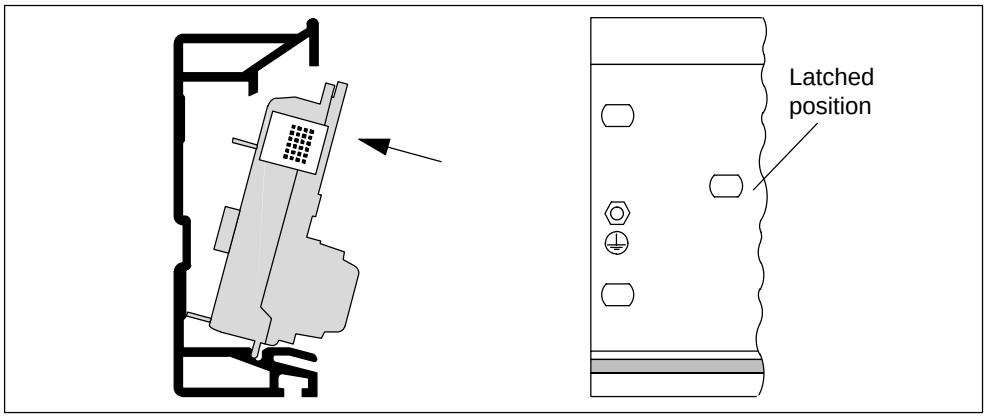
Installing Bus Modules and Modules

To install the active bus modules and modules, proceed as follows:

Only install the active bus modules in a de-energized state.

1. Hook the lower edge of the BM PS/IM or BM IM/IM bus module onto the rail, press it into the rail (**a**), and push it to the left until it engages (**b**).

   Are you using the 530 mm rail and the BM IM/IM?
   If you insert the BM IM/IM in the right latched position, you can install a further 2 × PS 307; 2A or 1 × PS 307; 5A to the left of the BM IM/IM.



2. Hook the next bus module (bus module BM 2 × 40 or BM 1 × 80) onto the rail and push it onto the rail. Push it towards the left bus module, so that the module connector has contact.
3. Are you installing the ET 200M in intrinsically safe areas? If so, you must insert the explosion-proof partition between the modules in the intrinsically safe and intrinsically unsafe area. To do this, simply insert the explosion-proof partition on the right-hand side guide of the bus module.
4. Hook the modules onto the rail and swing them down into place. Use the side guides of the bus modules to do this. When you screw in the modules, fix the bus module to the rail at the same time
5. Plug the bus module cover onto the last bus module. If there is a slot with no module, plug in the backplane bus cover on the unoccupied slot.

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Plugging in Output Modules During Operation of an ET 200M Installation



Warning

When you insert output modules, uncontrolled system states may occur.
This is also the case when you plug in input/output modules at an angle onto the bus module.
When you plug in an output module, the outputs set by the user program immediately become active!
We recommend that you set the outputs in the user program to ”0” when you remove an output module.
If modules are removed and plugged in incorrectly, neighboring modules may be affected via the backplane bus!

4.2.4 After Installation

Assigning Slot Numbers

After installation you can assign a slot number to each module. This makes it easier to assign the modules in the configuration table in *STEP 7* or in *COM PROFIBUS*. Table 4-4 shows the slot number assignment.

Table 4-4 Slot numbers for S7 modules

Slot Number	Module	Remarks
1	Power supply (PS)[1]	–
2	IM 153-x	–
3	–	Not applicable
4	1st S7-300 module	Next to the IM 153-x on the right
5	2nd S7-300 module	–
...	...	
11	8th S7-300 module	–

1 Use of the power supply is optional.

Unoccupied Slots

If you do not use all the slots in a configuration of an ET 200M with active bus modules (perhaps reserving them for later), you must leave these slots free in the *STEP 7* and *COM PROFIBUS* configurations.

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Applying Slot Numbers

Figure 4-7 shows you how to apply the slot numbers. The slot number labels are included with the IM 153-x.

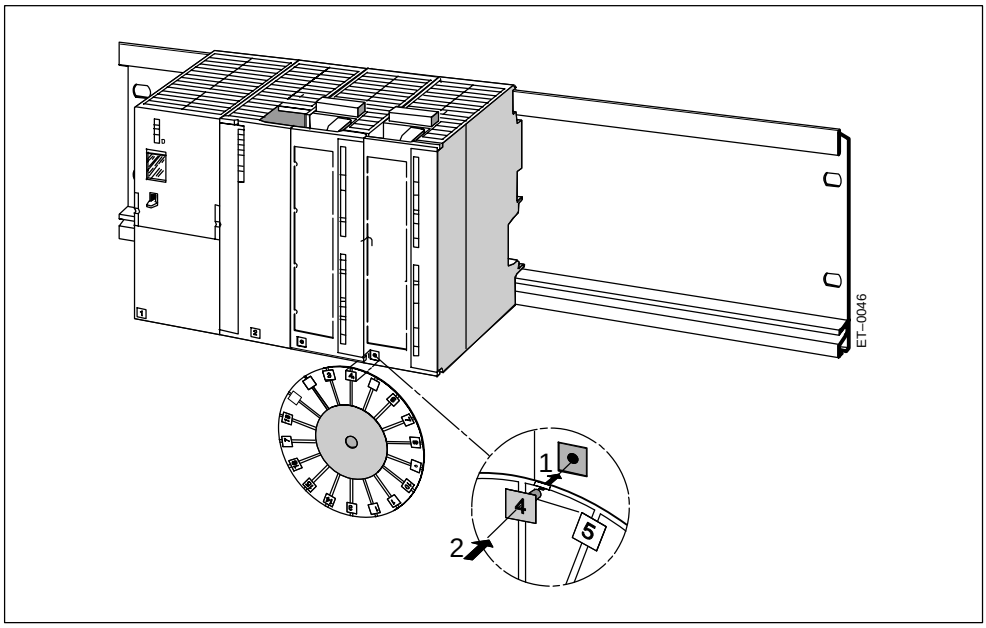


Figure 4-7 Applying slot numbers to the modules

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4.3 Connecting the Bus Connector

The following bus connectors are available:

- Up to 12 Mbaud
  - Without programming device socket (6ES7 972-0BA11-0XA0)
  - With programming device socket (6ES7 972-0BB11-0XA0)
- Up to 12 Mbaud, angular outgoing cable
  - Without programming device socket (6ES7 972-0BA40-0XA0)
  - With programming device socket (6ES7 972-0BB40-0XA0)

Connecting the Bus Connector

Proceed as follows to connect the bus connector:

1. Plug the bus connector into the IM 153-x.
2. Screw the bus connector tight on the IM 153-x.
3. If the bus connector is at the beginning or the end of a segment, you must connect the terminating resistor (switch position ”ON”).
   Alternatively, you can use the PROFIBUS terminator as an active bus terminating element.
4. Lay the interconnecting cable(s) to the designated area for the IM 153-x, placing it (them) to the right of the 24 V DC terminal.

The nodes with a terminating resistor must always be supplied with voltage during power-up and operation.

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4.4 Connecting the Fiber-Optic Cable to the IM 153-2 FO

Accessories Required:

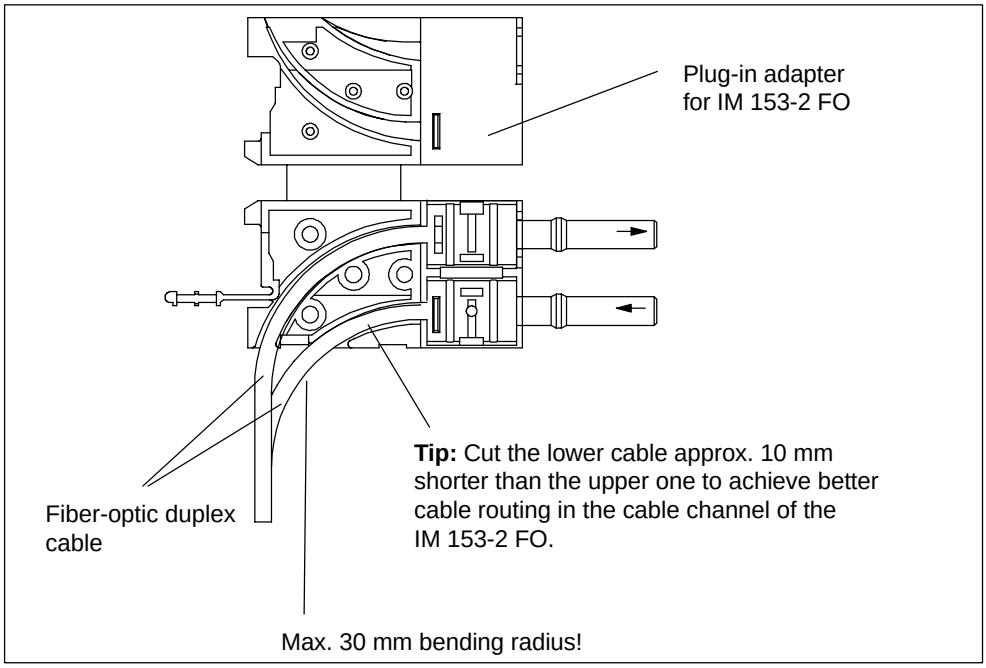
- Pack of Simplex connectors and polishing sets (6GK1 901-0FB00-0AA0)
- Pack of plug-in adapters (6ES7 195-1BE00-0XA0)
- Tool for removing the cable sheath (6GK1 905-6PA10)

Installing Connectors

1. Remove approximately 30 cm of the sheath from the fiber-optic duplex cable.
2. Install the fiber-optic duplex cable with the associated Simplex connectors. You can find detailed installation instructions for the Simplex connectors in the *"SIMATIC NET PROFIBUS Networks"* manual.

   IMPORTANT: The polished and smoothed surface of the plastic fibers must be absolutely smooth and even. The plastic sheath must not stick out or be cut unevenly. If this is not the case, considerable attenuation of the light signal via the fiber-optic cable may occur!
3. Place the Simplex connectors in the plug-in adapter for the IM 153-2 FO and the fiber-optic cable in the cable guides provided. Insert the plug-in adapter until you hear the sides clearly latch into position.

   Make sure when you insert the plugs in the plug-in adapter that the sender is always at the top and the recipient is underneath!



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Reusing Fiber-Optic Cables

Note

If you insert used fiber-optic cables in the plug-in adapter again, you must cut off the bent lengths of both fiber-optic cable cores and install the Simplex connectors again.
This avoids any attenuation losses due to parts of the cores of the fiber-optic duplex cables being bent again and overstressed.

Inserting the Fiber-Optic Cables into the IM 153-2 FO

Insert the fiber-optic cables and attached plug-in adapters into the IM 153-2 FO. Move the protruding handle of the plug-in adapter upwards.

Make sure the positioning is correct: the sender fiber-optic cable is plugged into the recipient socket and the recipient fiber-optic cable is inserted into the sender socket of the fiber-optic interface of the IM 153-2 FO.

If the IM 153-2 FO is the last node in the fiber-optic network, you must close the unoccupied fiber-optic cable interface with filler connectors (the connectors are already in place when the IM 153-2 FO is delivered).



Caution

Do not look directly into the opening of the optical sender diodes.
The light beam could damage your eyes.

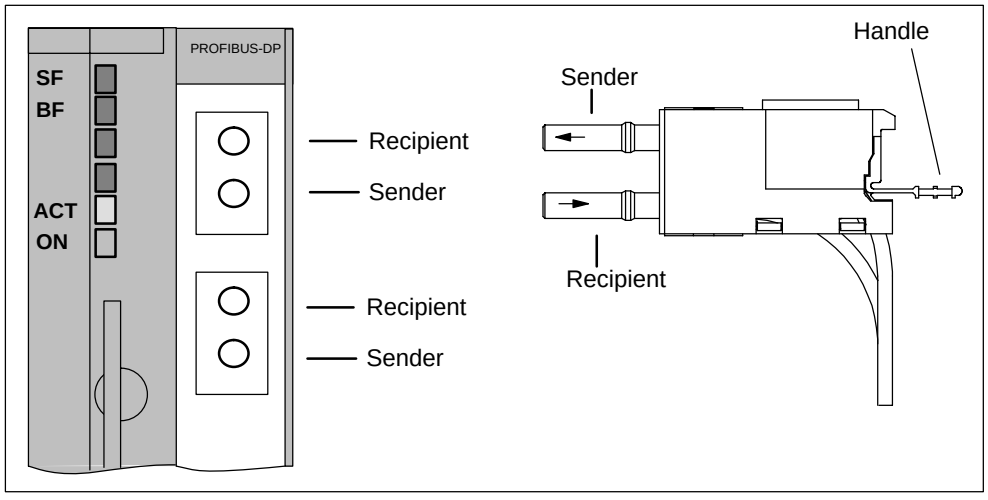


Figure 4-8 Inserting the fiber-optic cables into the IM 153-2 FO

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Bending Radius for the Fiber-Optic Cable

Make sure when you wire the fiber-optic duplex cable cores and insert them into the plug-in adapter, that the permissible bending radius of 30 mm is not exceeded. See also the installation guidelines on fiber-optic cables in the *ET 200M Distributed I/O Device* manual or the *SIMATICNETPROFIBUSNetworks* manual.

4.5 Setting the PROFIBUS Address

Definition

Each bus node must receive a PROFIBUS address to uniquely identify it on the PROFIBUS-DP bus system.

Rules

Observe the following rules for the PROFIBUS addresses of the IM 153-x:

- Permissible PROFIBUS address are: 1 to 125.
- Each PROFIBUS address can only be assigned once on the bus.

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Setting the PROFIBUS Address

Set the PROFIBUS address using a screwdriver and with the door open.

The PROFIBUS address is the addition of the switches that are on the right (”ON” position).

Note

To allow the PROFIBUS address to be set, the IM 153-2Bx00 has an 8-pin DIP switch instead of the previously used 7-pin switch.
The bottom switch has no function and is labeled with ”0” in line with the addition principle.

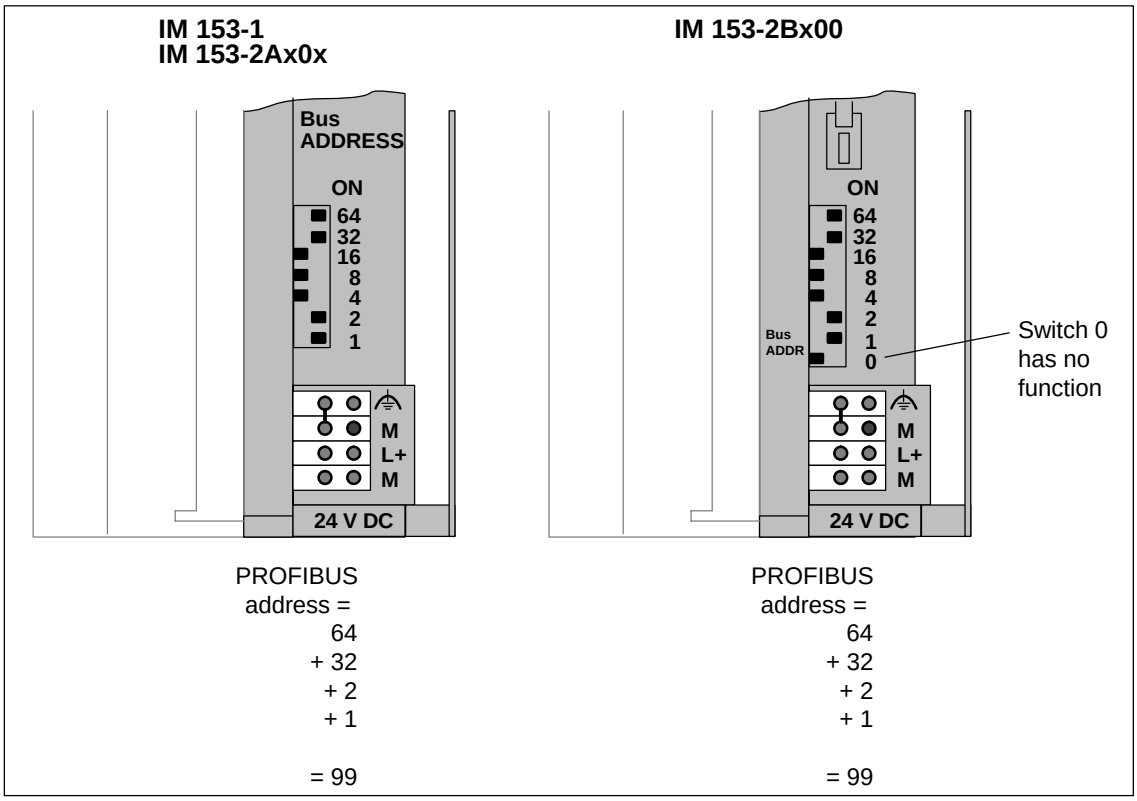


Figure 4-9 Setting the PROFIBUS address

Changing the PROFIBUS Address

You can change the set PROFIBUS address at any time. The IM 153-x will accept the changed PROFIBUS address once the 24 V DC supply has been turned off and on again.

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Wiring

5

Introduction

In this chapter we show you how to configure the electrical installation and how to wire an ET 200M.

To set up an ET 200M, you must take into account the mechanical configuration. Make sure you also read Section 4.1.

Basic Rules

In view of the many and varied applications of an ET 200M, this chapter can only describe a few basic rules on its electrical configuration. You must observe at least these basic rules if you want your ET 200M to operate faultlessly and satisfactorily.

PNO Installation Guidelines

With PROFIBUS networks, make sure you follow the PROFIBUS Nutzerorganisation (user organization) *Installation Guidelines for PROFIBUS-DP/FMS*. These contain important information on cable routing and the commissioning of PROFIBUS networks.

Published by: PROFIBUS-Nutzerorganisation e.V.
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Internet: `http://www.profibus.com`

Guideline, order no. 2.112

Chapter Overview

Section	Contents	Page
5.1	Electrical Configuration	5-2
5.2	Wiring	5-13

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5.1 Electrical Configuration

Section	Subject	Page
5.1.1	General Rules and Regulations on Operating an ET 200M	5-2
5.1.2	Operating the ET 200M with Process I/O Modules on a Grounded Supply	5-5
5.1.3	Configuring the ET 200M with Ungrounded Reference Potential	5-9
5.1.4	Configuring the ET 200M with Galvanically Isolated Modules	5-10
5.1.5	Configuring the ET 200M with Non-Isolated Modules	5-12

5.1.1 General Rules and Regulations on Operating an ET 200M

Depending on the particular area of application, the ET 200M programmable controller, as part of a plant or system, requires that you observe a number of specific rules and guidelines.

Note the safety and accident prevention regulations that apply to specific applications (e.g. machinery directives).

This section outlines the most important rules you must observe to integrate your ET 200M safely into an existing plant or system.

EMERGENCY STOP Devices

EMERGENCY STOP devices complying with IEC 204 (which corresponds to DIN VDE 113) must remain effective during all the operating modes of the plant or system.

Starting Up a Plant Again Following 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 • Startup of the ET 200M after an interruption of bus communication	No dangerous operating states may occur. If necessary, force an emergency stop.
• Startup follows unlocking of the EMERGENCY STOP device • The ET 200M starts up, but the DP master does not address the ET 200M	There must not be an uncontrolled or undefined startup.

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Note on Radio Interference

When several electronic components are used within a switch cabinet, the radio interference can overlap. As a result, the permissible level of radio interference intensity in the overall configuration may be exceeded.

Tip: Space these modules out as much as possible and, if necessary, use shielded cables or filters in the supply lines or switch cabinets with greater resistance to radio frequency.

Mains Voltage

The following table shows you what to remember about mains voltage.

With ...	Guidelines
Permanently installed plants or systems without all-pole supply isolating switches	There must be a supply isolating switch or a fuse in the building installation system
Load power supplies, power supply modules	The system voltage range set must correspond to the local system voltage
All ET 200M circuits	Any fluctuations in or deviations from the rated input/load voltage must be within the permissible tolerances (see the technical specifications of the S7-300 modules)

24V DC Power Supply

The following table shows you what to remember about the 24 V supply.

<table>
<tr><th>With ...</th><th colspan="2">Pay Attention to ...</th></tr>
<tr><td>Buildings</td><td>Outdoor lightning protection</td><td rowspan="2">Install lightning protection (e.g. lightning conductors).</td></tr>
<tr><td>24 V DC power supply cables, signal cables</td><td>Indoor lightning protection</td></tr>
<tr><td>24 V power supply</td><td colspan="2">Safe electrical isolation of safety extra-low voltage</td></tr>
</table>

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Protection From External Electrical Exposure

The following table shows you what to remember about protection from electrical exposure and faults.

With ...	Make Sure That ...
All plants or systems in which the ET 200M is integrated	... the plant or system is connected to the protective conductor for diverting electromagnetic interference.
Connection, signal and bus lines	... the wiring routing 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.

Rules on the Power Consumption and Power Loss of an ET 200M

The S7-300 modules get the power they need for operation from the backplane bus and, if necessary, from an external load power supply.

- The power consumption of all the signal modules from the backplane bus must **not** exceed the power the IM 153-x can deliver to the backplane bus.
- The PS 307 power supply is dependent on the power consumption from the 24V load power supply; this is made up of the total power consumption of the signal modules and all other connected loads.
- The power loss of **all** the components in a cabinet must not exceed the maximum thermal rating of the cabinet.

  Tip: When establishing the required dimensions of the cabinet, ensure that the temperature inside the cabinet does not exceed the permissible 60 °C even where external temperatures are high.

You will find the values for the power consumption and power loss of a module under the technical specifications of the relevant modules.

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5.1.2 Operating the ET 200M with Process I/O Modules on a Grounded Supply

This section contains information concerning the overall configuration of an ET 200M system with a grounded incoming supply (TN-S system). The specific subjects discussed are:

- Circuit-breaking devices, short-circuit and overload protection in accordance with DIN VDE 0100 and DIN VDE 0113
- Load power supplies and load circuits.

Definition: Grounded Supply

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

Components and Protective Measures

Various different 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 Figure 5-1.

Table 5-1 DIN VDE specifications for configuring a PLC system

Compare ...	Reference in Figure 5-1 (Page 5-7)	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	... Part 725: Single-pole protection of circuits	... Part 1: • In the case of a grounded secondary circuit: provide **single-pole** protection • Otherwise: provide **all-pole** protection
Load power supply for AC load circuits with more than five electromagnetic devices	3	Galvanic isolation by transformer **recommended**	Galvanic isolation by transformer **mandatory**

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Features of Load Power Supplies

The load power supply feeds input and output circuits (load circuits), as well as sensors and actuators. The characteristic features of load power supplies required in specific applications are listed in the following table.

Characteristics of the Load Power Supply	Mandatory for ...	Remarks
Safe (electrical) isolation	Modules that have to be supplied with ≤60V DC or ≤25V AC	The PS 307 power supplies and the Siemens load power supplies of the 6EP1 series have this feature.
	24V DC load circuits	
Output voltage tolerances: 20.4 V to 28.8 V 40.8 V to 57.6 V 51 V to 72 V	 24V DC load circuits 48V DC load circuits 60V DC load circuits	With high output voltage ripple we recommend that you provide a supporting capacitor. Rating: 200 μF per 1A load current (in the case of full-wave rectification).

Rule: Ground Load Circuits

Load circuits should be grounded.

The common reference potential (ground) guarantees full functionality. Provide a detachable connection to the protective conductor on the load power supply (terminal L- or M) or on the isolating transformer (Figure 5-1, 4). In the event of power distribution faults, this makes it easier to localize ground faults.

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ET 200M in the Overall Configuration

Figure 5-1 shows you the position of the ET 200M in the overall configuration (load power supply and grounding concept) with power infeed from a TN-S system.

Note: The illustration of the power supply connections does not reflect the actual physical arrangement; this has been done to improve clarity.

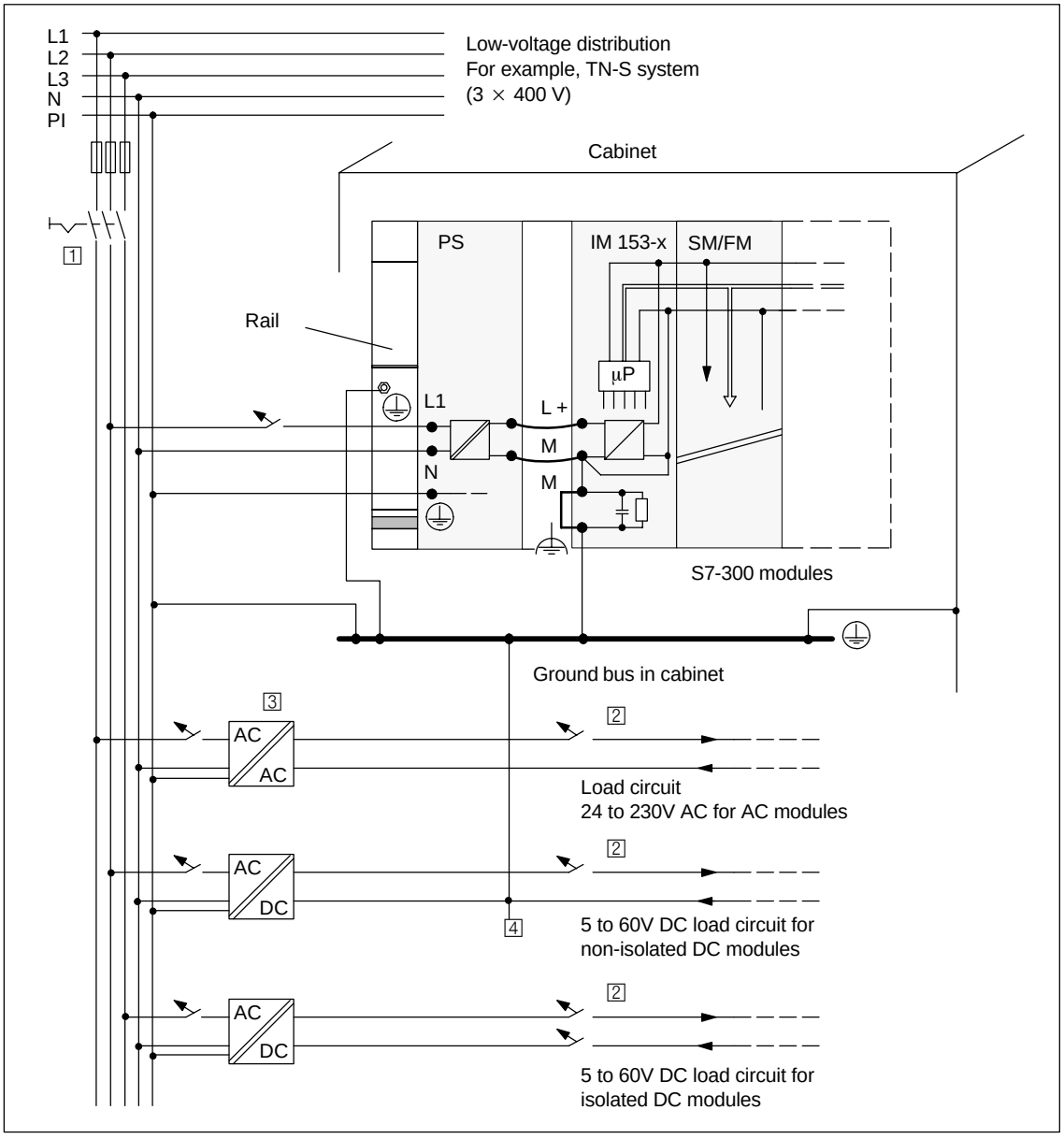


Figure 5-1 S7-300 modules operated on a grounded incoming supply

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ET 200M with Load Power Supply from the PS 307

Figure 5-2 shows the ET 200M in the overall configuration (load power supply and grounding concept) in a TN-S system.

In addition to supplying the IM 153-x, the PS 307 also supplies the load circuit for the 24V DC modules.

Note: The illustration of the power supply connections does not reflect the actual physical arrangement; this has been done to improve clarity.

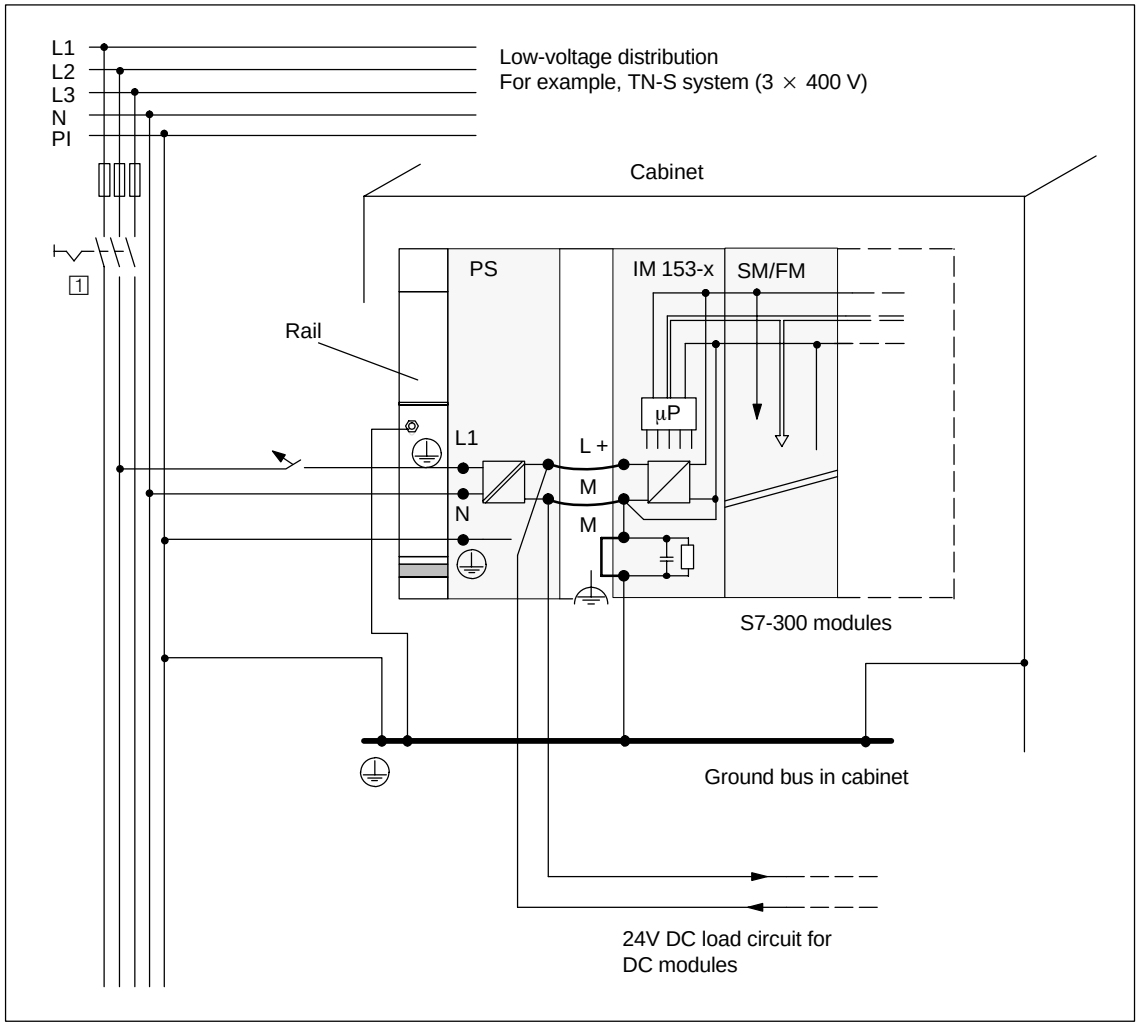


Figure 5-2 S7-300 modules operated from the PS 307

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5.1.3 Configuring the ET 200M with Ungrounded Reference Potential

When the ET 200M is configured with ungrounded reference potential, any interference current is diverted to the protective conductor via an RC network integrated in the IM 153-x (see Figure 5-3).
See also Section 9.3 for older IM 153-x versions.

Application

In plants covering large areas, it may be necessary to configure the ET 200M with ungrounded reference potential for ground fault monitoring purposes, for example. This is the case, for instance, in the chemical engineering industry and in power stations.

Terminal Connection Model

Figure 5-3 shows the configuration of an ET 200M with the IM 153-x with ungrounded reference potential. If you do not want to ground the reference potential, you must remove the jumper **on the IM 153-x between the M terminals and functional ground**. If the jumper is not in place, the reference potential of the ET 200M is connected internally to the protective conductor via an RC combination and via the rail. This discharges radio-frequency interference current and precludes static charges.

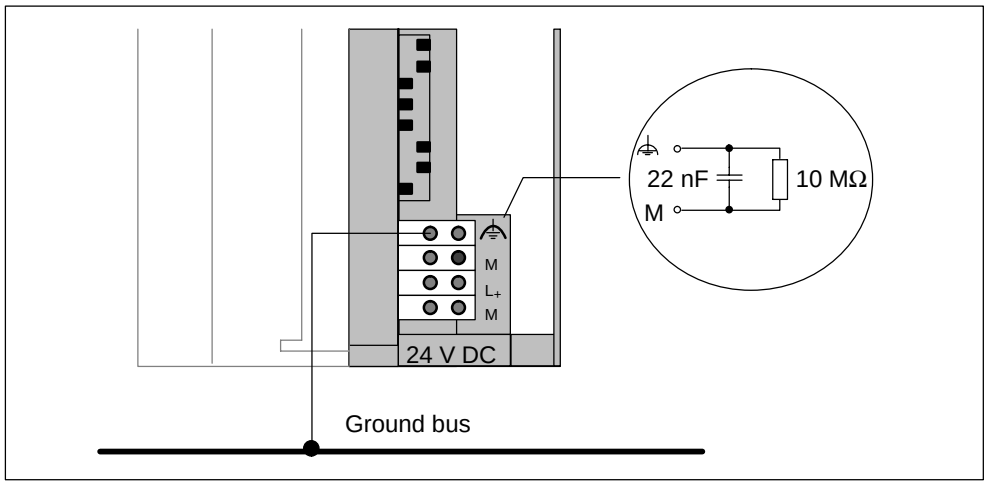


Figure 5-3 Configuring the ET 200M with ungrounded reference potential

Power Supply Units

In the case of power supply units, make sure that the secondary winding has no connection to the protective conductor. We recommend the use of the PS 307 power supply module.

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Filtering the 24V DC Supply

If you supply the IM 153-x from a battery without grounding the reference potential, you must suppress interference on the 24 V DC supply. Use an interference suppression device from Siemens such as B84102-K40.

Insulation Monitoring

If dangerous plant conditions can arise as a result of double faults, you must provide some form of insulation monitoring.

5.1.4 Configuring the ET 200M with Galvanically Isolated Modules

Definition

In configurations with isolated modules, the reference potentials of the control circuit ($M_{internal}$) and load circuit ($M_{external}$) are electrically isolated (see also Figure 5-4).

Application

You use isolated modules for the following:

- All AC load circuits
- DC load circuits with separate reference potential, e.g.:
  - DC load circuits whose sensors have different reference potentials (for example, if grounded sensors are located at some considerable distance from the control system and no equipotential bonding is possible)
  - DC load circuits whose positive pole (L+) is grounded (battery circuits).

Isolated Modules and Grounding Concept

You can use isolated modules irrespective of whether the reference potential of the ET 200M is grounded or not.

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Configuration with Isolated Modules

Figure 5-4 shows the potentials of an ET 200M configuration with isolated input/output modules.

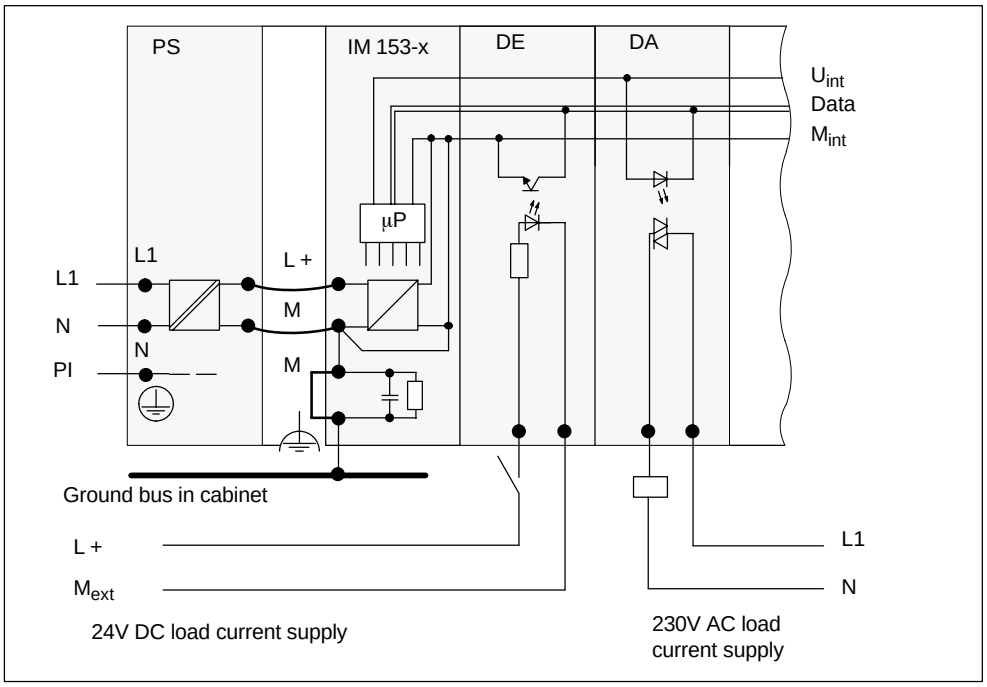


Figure 5-4 Simplified illustration of the configuration with isolated modules

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5.1.5 Configuring the ET 200M with Non-Isolated Modules

Potentials in a Configuration with Non-Isolated Modules

Figure 5-5 shows the potentials of an ET 200M configuration with grounded reference potential with the non-isolated analog input/output module SM 334; AI 4/AO 2 × 8/8Bit.

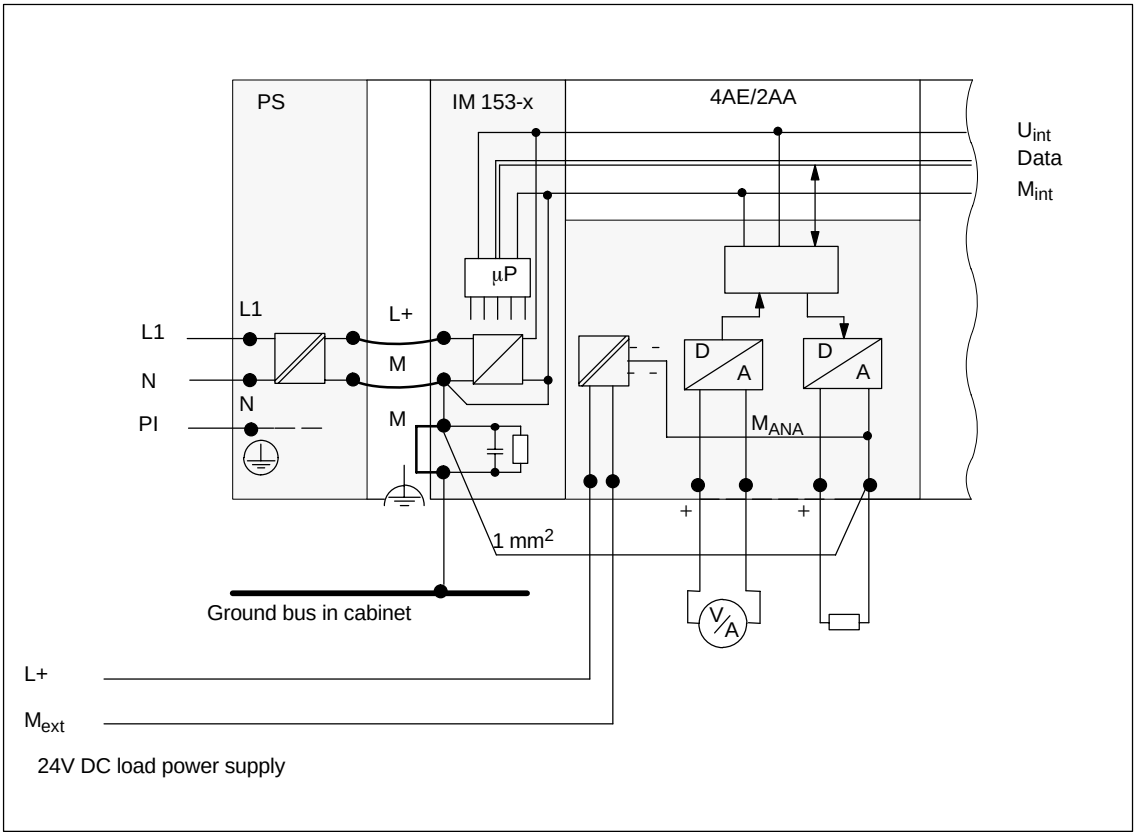


Figure 5-5 Potentials in a configuration with the non-isolated analog input/output module SM 334; AI 4/AO 2 × 8/8Bit

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5.2 Wiring

In This Chapter

Section	Subject	Page
5.2.1	Wiring Rules	5-13
5.2.2	Wiring the Power Supply Module and IM 153-x	5-15
5.2.3	Wiring the Front Connectors of the Signal Modules	5-17
5.2.4	Connecting Shielded Cables via a Shield Contact Element	5-21

5.2.1 Wiring Rules

Note: The cables for the front connectors should be longer in a configuration for ”module change during operation” (see Section 5.2.3).

Table 5-2 Wiring rules for the power supply and the IM 153-x

Wiring Rules for ...		Power Supply and IM 153-x
Connectable wire cross-sections for rigid lines		No
Connectable wire cross-sections for flexible lines	Without wire end ferrule	0.25 to 2.5 mm ^{2}
	With wire end ferrule	0.25 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
Maximum external diameter of the wire’s insulation		∅ 3.8 mm
Stripping length of the wires	Without insulating collar	11 mm
	With insulating collar	11 mm
Wire end ferrules to DIN 46228	Without insulating collar	Form A 10 to 12 mm long
	With insulating collar	Form E, up to 12 mm long

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Table 5-3 Wiring rules for module front connectors

Wiring Rules for ...		Module Front Connectors (Screw-Type Terminal and Spring Terminal)	
		20-pin	40-pin
Connectable wire cross-sections for rigid lines		No	No
Connectable wire cross-sections for flexible lines	Without wire end ferrule	0.25 to 1.5 mm ^{2}	0.14 to 0.75 mm^2
	With wire end ferrule	0.25 to 1.5 mm ^{2}	0.14 to 0.75 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 or combination of 2 conductors up to 0.75 mm^2 (total) in a common wire end ferrule
Maximum external diameter of the wire's insulation		∅ 3.1 mm max. 20 cables	∅ 2.0 mm max. 40 cables
Stripping length of the wires	Without insulating collar	6 mm	6 mm
	With insulating collar	6 mm	6 mm
Wire end ferrules to DIN 46228	Without insulating collar	Version A, 5 to 7 mm long	Version A, 5 to 7 mm long
	With insulating collar	Version E, up to 6 mm long	Version E, up to 6 mm long

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5.2.2 Wiring the Power Supply and IM 153-x

Power Cables

To wire the power supply, use flexible cables (see Table 5-2 on page5-13).

If you use only one cable per connection, you don't need an end ferrule.

Jumper

Use the jumper when wiring the PS 307 power supply module to the IM 153-x. The jumper comes with the power supply module.

Other 24 V Connections

Above the jumper on the power supply PS 307 there are still a number of free 24 V connections for the supply to the S7-300 I/O modules.

Wiring the 24 V Connections with a Redundant Configuration with 2 × IM 153-2

Note

If you reverse the polarity of L+ power supply when wiring the IM 153-2 in a redundant configuration, short-circuiting will occur via the frame connection. The reason for this: Both IM 153-2 have a common ground cable via the bus module BM IM/IM.

With IM 153-2AA02/-2AB01:
In a redundant configuration we recommend that you fuse the L+ supply before the IM 153-2 with 2.5 A.

With IM 153-2Bx00:

- In configurations with ungrounded reference potential (jumper between M and functional ground removed, see Figure 5-3), an internal electronic fuse which regenerates after approx. 30 seconds is triggered in the event of polarity reversal.
- In configurations with grounded reference potential (jumper inserted between M and functional ground), the short-circuit current flows through these jumpers and the functional grounds in the event of polarity reversal.
  The IM 153-2 is not damaged if fuse protection configured for the cross-section of the connecting cable is provided upstream of the module.

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Wiring with the Jumper

To wire the power supply module and IM 153-x, proceed as follows (see Figure 5-6).

Warning

Make sure the ET 200M is de-energized before doing any wiring!

1. Open the front doors of the PS 307 and IM 153-x.
2. Undo the strain-relief assembly on the PS 307.
3. Strip the insulation from the power cable (230V/120V), and connect it to the PS 307.
4. Screw the strain-relief assembly tight.
5. Insert the jumper and screw tight.
6. Close the front doors.

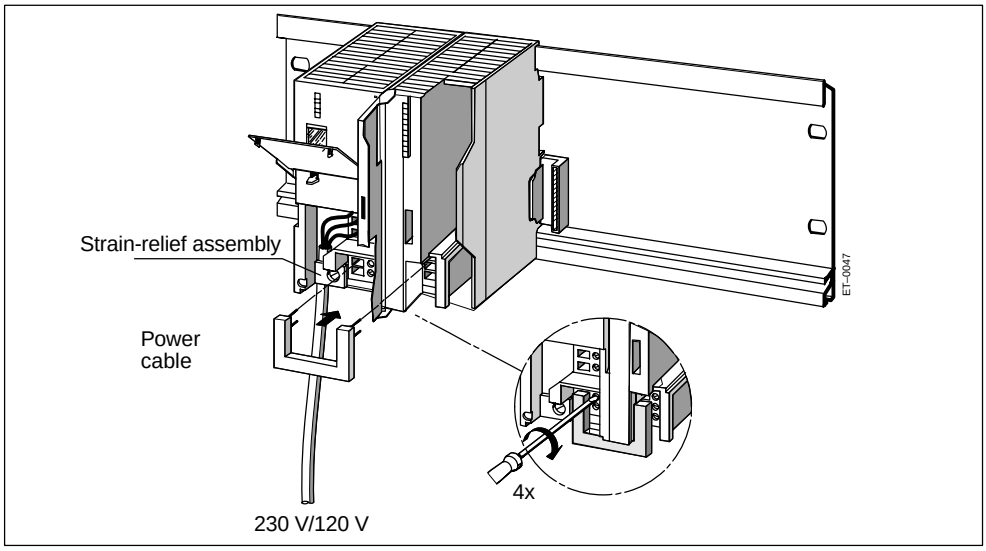


Figure 5-6 Wiring the PS 307 power supply module and the IM 153-x with the jumper

Setting the Switch for the Mains Voltage

Check that the switch for selecting the mains voltage is set correctly to your mains voltage. This switch is always factory-set to 230 V on the PS 307. To select another mains voltage, do the following:

1. Prize the cover off with a screwdriver.
2. Set the selector to your mains voltage.
3. Replace the cover.

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5.2.3 Wiring the Front Connectors of the Signal Modules

S7 Explosion-Proof Modules

You can find out how to wire the S7 explosion-proof modules and what to look out for when wiring modules in an intrinsically safe area in the *Intrinsically Safe I/O Modules* Reference Manual.

Cables

You can use flexible cables with cross-sections as in Table 5-3 on page 5-14.

You do not need wire end ferrules. If you use wire end ferrules, only use those listed in Table 5-3 on page 5-14.

Types of Front Connector

There are two types of 20-pin and 40-pin front connectors: spring terminals and screw-type terminals.
You can find the order numbers in Appendix A.

Spring Terminals

To wire the front connector using spring terminals, simply insert the screwdriver vertically into the opening with the red opening mechanism, put the cable into the correct terminal, and remove the screwdriver.

Tip: There is a separate opening for test probes up to 2 mm in diameter to the left of the opening for the screwdriver.

Wiring for Module Change During Operation

If you wire modules for an ET 200M with the ”module change during operation” function, you will require longer cables to the front connectors in order to easily insert and remove the modules during ET 200M operation. We recommend you make the wiring to the front connector approx. 20 cm longer.

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Preparing the Connector for Wiring

To prepare for wiring, proceed as follows:

Warning

Accidental contact with live conductors is possible, if the power supply module and any additional load power supplies are switched on.

Make sure the ET 200M is de-energized before doing any wiring!

1. Open the front door.
2. Put the front connector in the wiring position.

   To do this, push the front connector into the signal module until it snaps into place. The front connector still protrudes from the module in this position.

   An advantage of the wiring position is that it makes wiring easier; in the wiring position a wired front connector has no contact with the module.

   Figure 5-7 shows you how to get the front connector into wiring position.

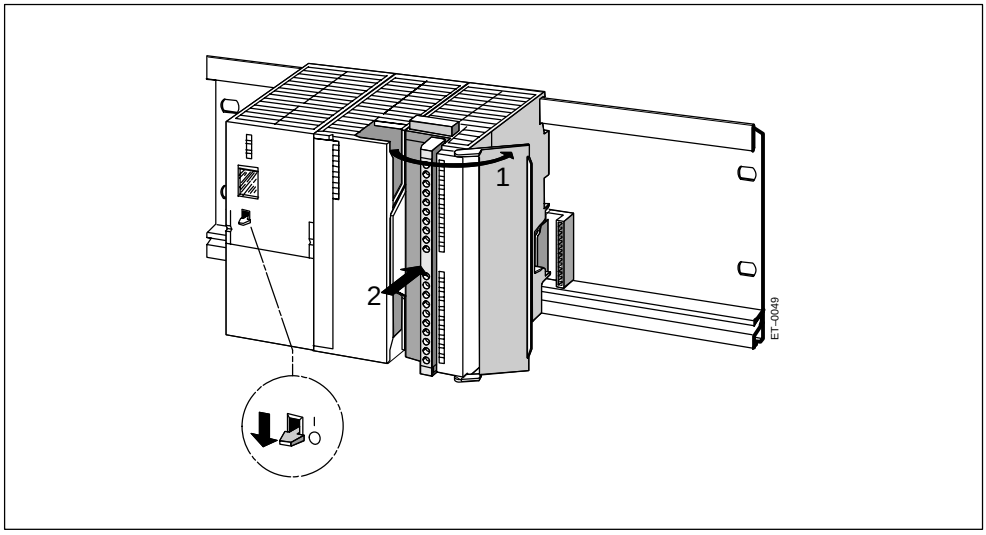


Figure 5-7 Bringing the front connector into the wiring position

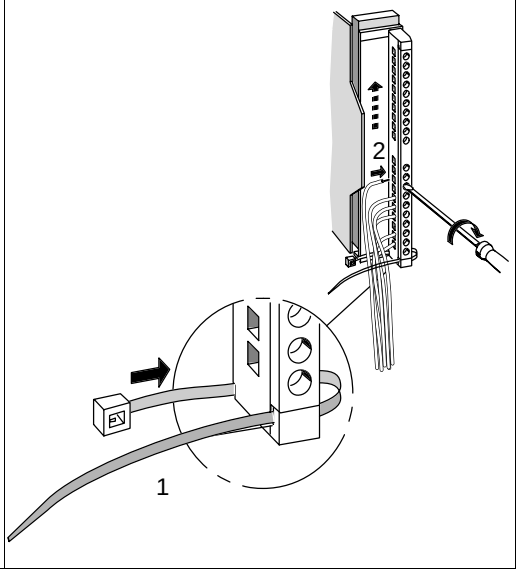
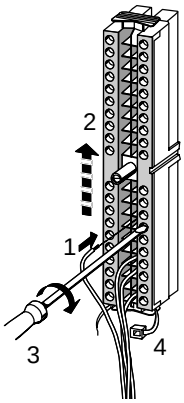
3. Strip the insulation off the cables (see Table 5-3 on page 5-14)
4. Do you want to use end ferrules?

   If so: Press the end ferrules and the cables together

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Wiring the Front Connector

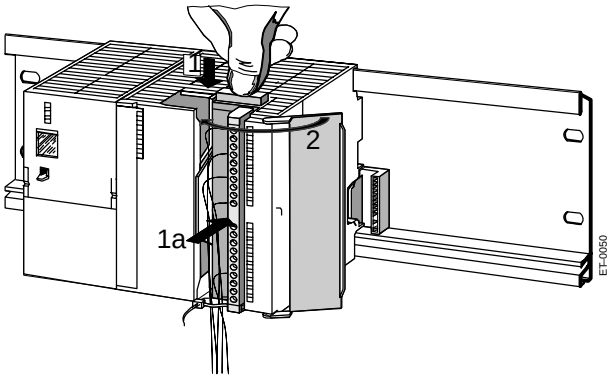
Table 5-4 Wiring the front connector

Step	20-Pin Front Connector	40-Pin Front Connector
1.	Thread the cable strain-relief assembly into the front connector.	–
2.	Do you want to bring the cables out at the bottom of the module?	
	If so:	
	Start with terminal 20, and wire the terminals in the following order: terminal 20, 19, ... 1.	Starting at terminal 40 or 20, wire the terminals alternately (i.e. terminals 39, 19, 38, 18 etc. down to terminals 21 and 1).
	If not:	
	Start with terminal 1, and wire the terminals in the following order: terminal 1, 2, ... 20.	Starting at terminal 1 or 21, wire the terminals alternately (i.e. terminals 2, 22, 3, 23 etc. up to terminals 20 and 40).
3.	Also tighten the screws of any terminals that are not wired.	
4.	–	Thread the cable strain-relief assembly into the front connector.
5.	Pull the cable strain-relief assembly tight. Push the retainer on the strain-relief assembly in to the left; this will improve utilization of the available space.	
–		

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Preparing the Signal Module for Operation

Table 5-5 Preparing the signal module for operation

Step	20-Pin Front Connector	40-Pin Front Connector
1.	Press down the unlocking button on the top of the module and, at the same time, push the front connector into its operating position on the module. When the front connector reaches its operating position, the unlocking button will snap back into the locking position.	Tighten screws to bring front connector to its operating position.
	Note: When the front connector is put in its operating position, a front connector encoding device engages. The front connector then only fits this type of module.	
2.	Close the front door.	
3.	Enter the addresses for identifying the individual channels on the labeling strip.	
4.	Slide the labeling strip into the guides on the front door.	
–		

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5.2.4 Connecting Shielded Cables via a Shield Contact Element

Introduction

This section tells you how to connect the shield of shielded signal lines to ground via a shield contact element. The connection to ground is achieved by direct contact between the shield contact element and the rail.

Application

You can do the following easily with the shield contact element:

- Connect all S7-300 module shielded cables to ground
- Connect the interconnecting cable to ground.

Design of the Shield Contact Element

The shield contact element consists of the following parts:

- A mounting bracket with two bolts for attaching the element to the rail (Order No.: 6ES7 390-5AA00-0AA0)
- The shield terminals

Depending on the cable cross-sections used, you must use the following shield terminal:

Table 5-6 Assignment of cable cross-sections and terminal elements

Cable and shield diameter	Shield terminal Order no.:
2 cables with a shield diameter of 2 to 6 mm each	6ES7 390-5AB00-0AA0
1 cable with a shield diameter of 3 to	6ES7 390-5BA00-0AA0
1 cable with a shield diameter of 4 to 13 mm interconnecting cable	6ES7 390-5CA00-0AA0

The shield contact element is 80 mm wide with space for two rows each with 4 shield terminals.

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Installing the Shield Contact Element

Install the shield contact element as follows:

1. Push the two bolts of the fixing bracket into the guide on the underside of the rail. Position the fixing bracket under the modules to be wired.
2. Bolt the fixing bracket tight to the rail.
3. A slotted web is arranged at the bottom side of the terminal element. Place the shield terminal at this position onto the edge of the fixing bracket (see Figure 5-8). Press the shield terminals down and swing them into the desired position.

   You can attach up to four terminal elements on each of the two rows of the shield contact element.

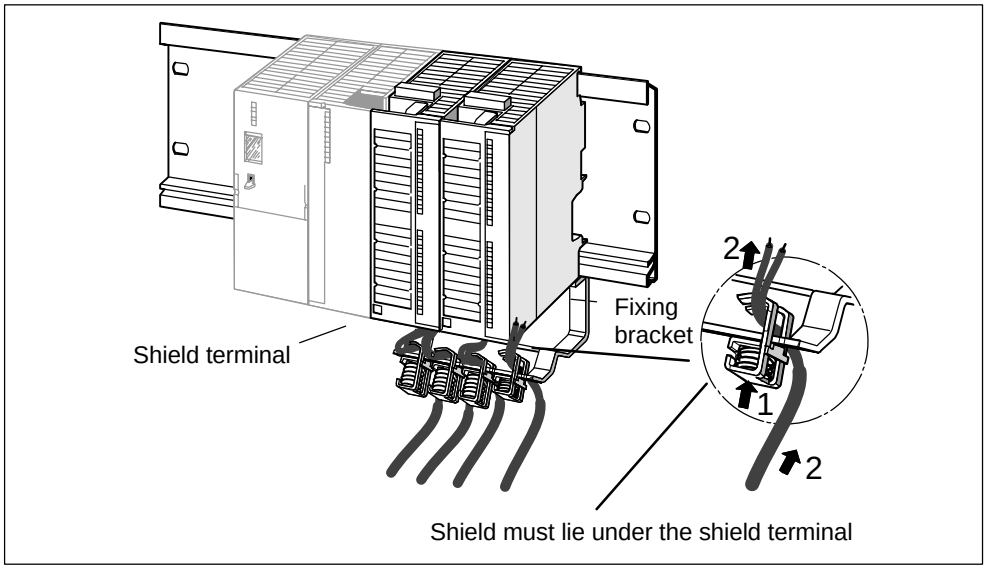


Figure 5-8 Attaching shielded 2-wire cables to a shield contact element

Attaching Cables

You can only attach one or two shielded cables per shield terminal (see Figure 5-8 and Table 5-6). The cable is connected by its bare cable shield. There must be at least 20 mm of bare cable shield. If you need more than 4 shield terminals, start wiring at the rear row of the shield contact element.

Note

Use a sufficiently long cable between the shield terminal and the front connector. This enables you to remove the front connector without removing the shield terminal.

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Commissioning and Diagnostics

6

Chapter Overview

Section	Subject	Page
6.1	Commissioning and Startup of the DP Slave	6-1
6.2	Diagnostics Using LEDs	6-10
6.3	Diagnostics Using *STEP 7* and *STEP 5*	6-13
6.4	Structure of the Diagnosis	6-16

6.1 Commissioning and Startup of the DP Slave

This section describes the prerequisites for commissioning and the few steps that need to be taken to commission the ET 200M.

The startup of the ET 200M depends on which IM 153-x with which functionality you use.

Section	Subject	Page
6.1.1	Prerequisites for Commissioning	6-2
6.1.2	Startup of the IM 153-1	6-4
6.1.3	Startup of the IM 153-2/153-2 FO	6-5
6.1.4	PROFIBUS-DPV1 Mode	6-8

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6.1.1 Prerequisites for Commissioning

Software Prerequisites

Table 6-1 Software prerequisites for commissioning

Configuration Software Used	Version	Notes
STEP 7	–	If you configure the IM 153-x from the *STEP 7* hardware catalog, unlimited S7 functionality is available to you (for example, removal/insertion interrupts on the DP master for module change during operation or forwarding of the parameterization data to the FM or HART modules) If you can't find your IM 153-x version in the hardware catalog, integrate the device master file in *STEP 7*.
COM PROFIBUS	≥ Version 3.0	You have integrated the IM 153-x together with the device master file in the *COM PROFIBUS*. *COM PROFIBUS* supports the device master file up to revision 2. You can use the device master file revision ≥ 3 for configuration, but the new functions of the IM 153-2Bx00 are then not supported.[1]
Configuration software for DP master used	–	You integrate the device master file of the DP slave.

1 The functions which can be operated with the individual device master file revisions are listed in Table 6-4.

You can find the current device master file on the Internet at
`http://www.ad.siemens.de/csi_e/gsd`.

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Prerequisites for Commissioning

Table 6-2 Commissioning prerequisites for the DP slave

Required Activity	DP Interface		See ...
	RS 485	FO	
1. DP slave installed	×	×	Section 4.2
2. PROFIBUS address set on the DP slave	×	×	Section 4.5
3. Bus connector and fiber-optic cable connected	×	×	Section 4.3 and 4.4
4. If the DP slave is at the segment end, the terminating resistor on the DP slave is connected	×	–	Section 4.3
5. If the DP slave is at the end of a fiber-optic line, close the unused fiber-optic interface with filler plugs	–	×	Section 4.4
6. The DP slave configured	×	×	Online help system/manual for configuration software
7. Configuration loaded in the DP master	×	×	Online help system/manual for configuration software
8. Supply voltage switched on for DP master	×	×	DP master manual
9. DP master set to RUN mode	×	×	DP master manual

Commissioning the DP Slave

Table 6-3 Procedure for commissioning the DP slave

Step	Procedure
1.	Switch on the supply voltage for the DP slave.
2.	Switch on the supply voltage for the load as necessary.

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6.1.2 Startup of the IM 153-1

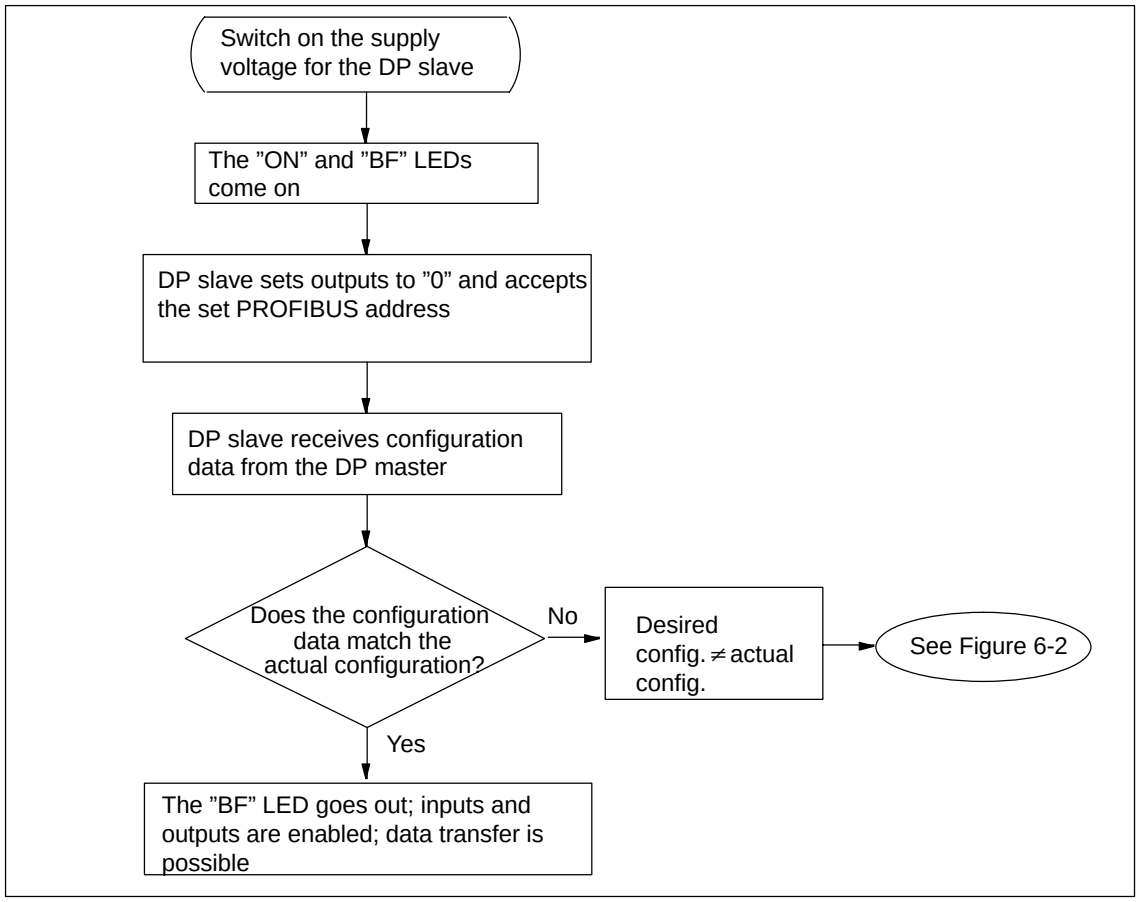


Figure 6-1 Startup of the IM 153-1

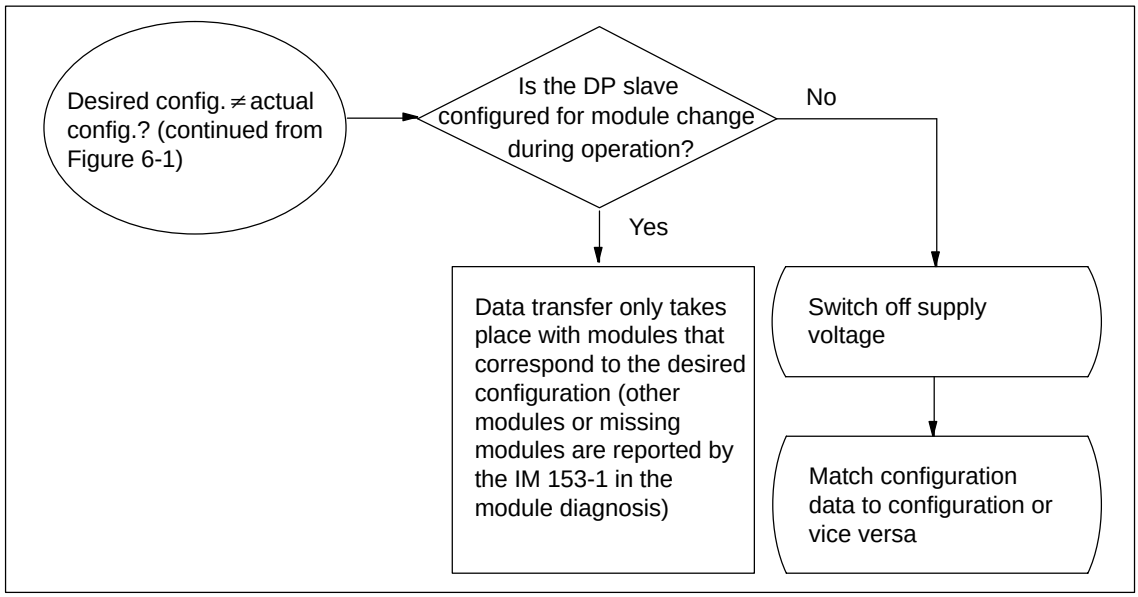


Figure 6-2 Startup behavior in the case of module change during operation

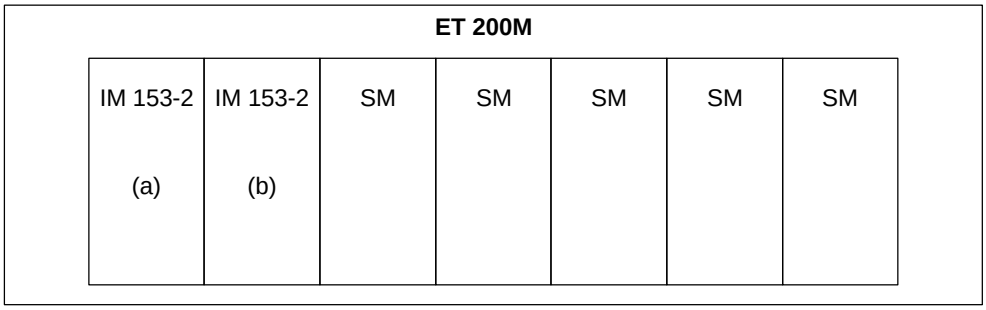
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6.1.3 Startup of the IM 153-2/153-2 FO

The designation IM 153-2 in this section applies to both the IM 153-2 **and** the IM 153-2 FO.

Agreement in the case of Redundancy:

In the case of redundancy, the two inserted IM 153-2 modules operate independently of one another.
Figure 6-3 shows the startup of the IM 153-2 (a). If you look at the IM 153-2 (b), the following flow diagram applies with the labels reversed.



Note

If the IM 153-2Bx00 is operated on the bus module BM IM/IM 6ES7 195-7HD00-0XA0, power-up takes approx. 70 seconds (the time taken for the appropriate operating mode for the bus module to be set up).

If the IM 153-2AA02/-2AB01 has inadvertently been inserted on the bus module BM IM/IM 6ES7 195-7HD10-0XA0, this IM cannot access the I/O modules. As a result, the IM cannot be operated in this redundancy system.

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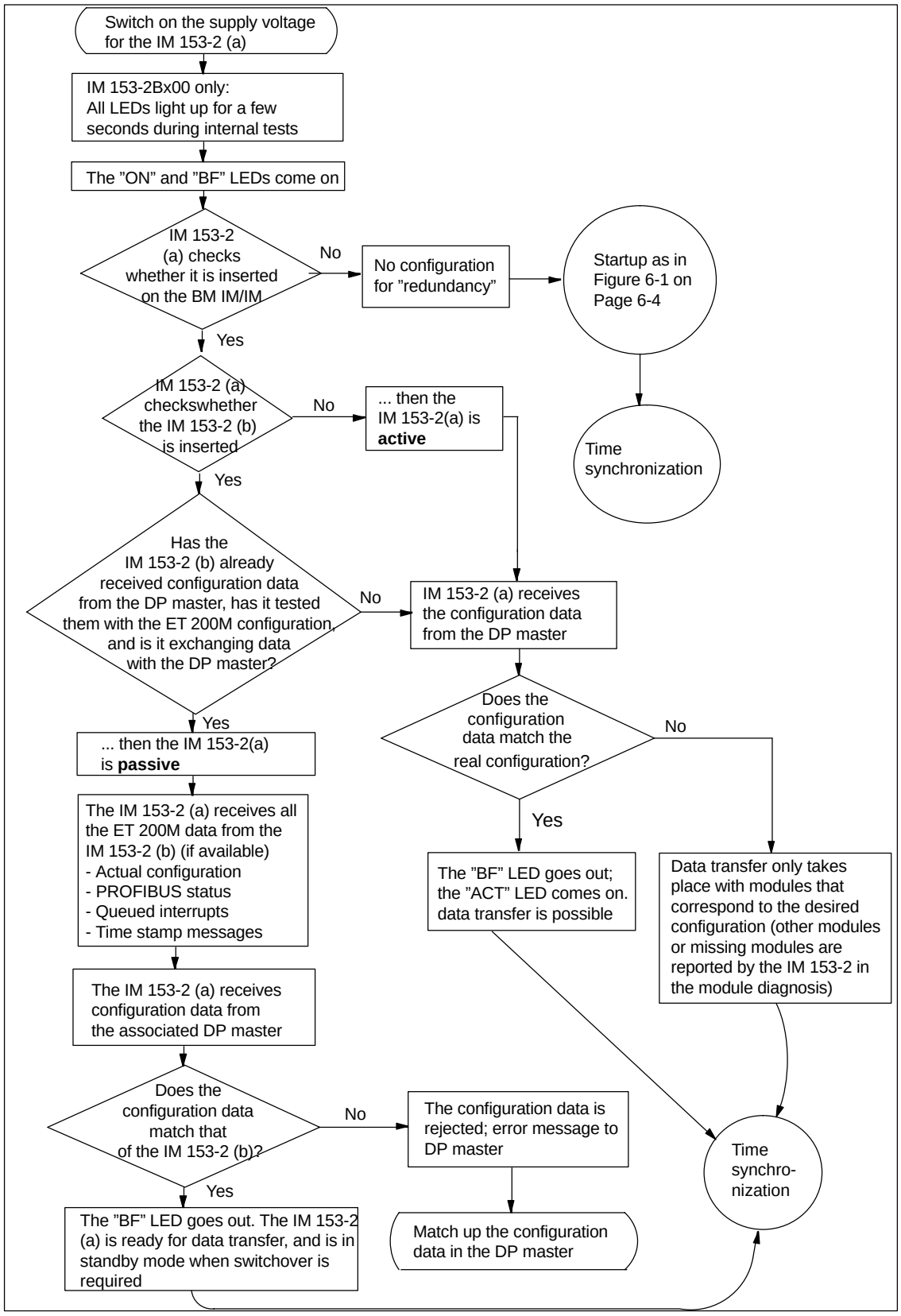


Figure 6-3 Startup of the IM 153-2

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Startup for Time Synchronization/Time Stamping of Signal Changes

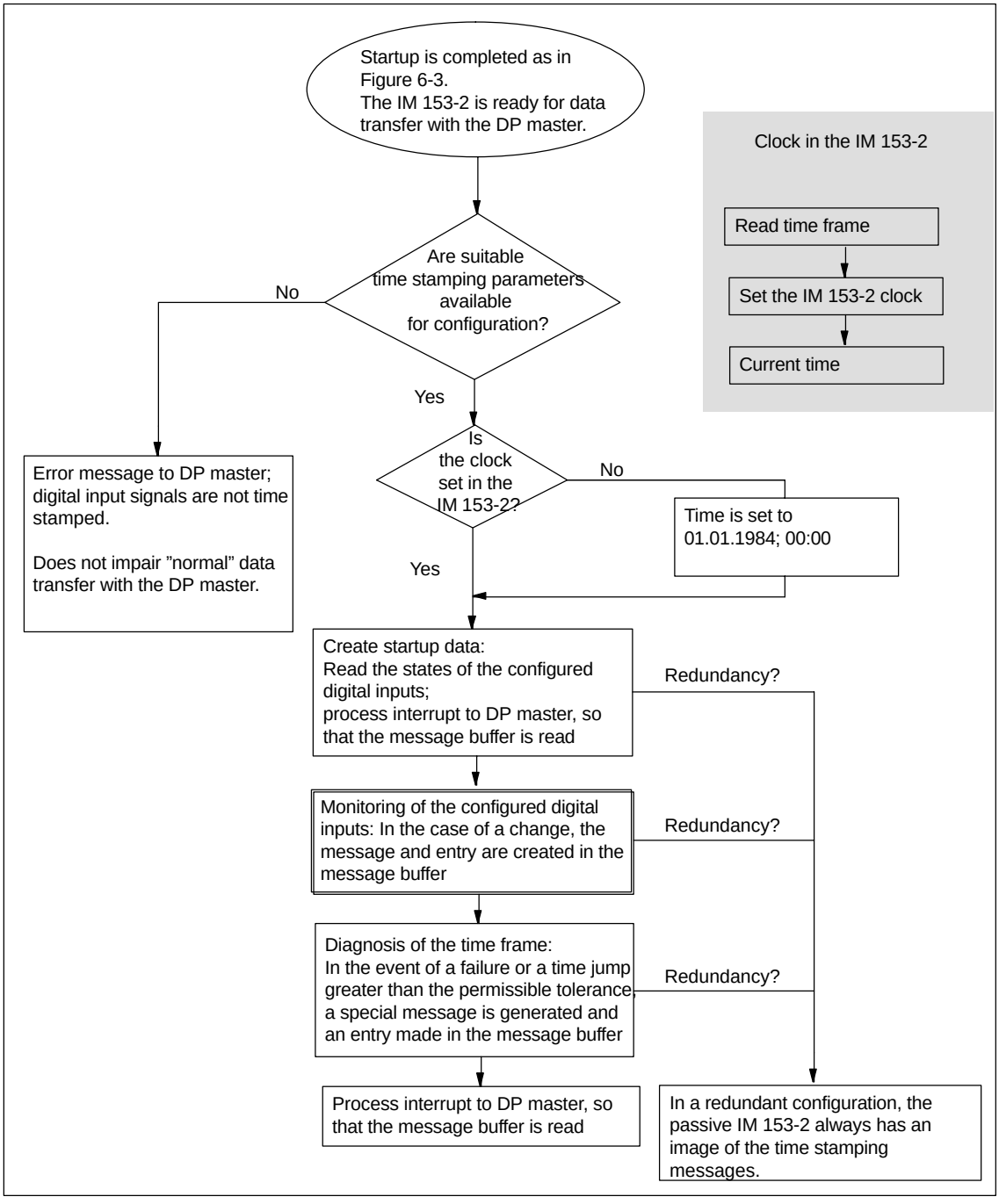


Figure 6-4 Startup for time synchronization/time stamping

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6.1.4 PROFIBUS-DPV1 Mode

The ET 200M fulfills the requirements of DPV1. If you want to use the DPV1 functions, the DP master must of course also fulfill the requirements of DPV1 (see the documentation for the DP master).

The table below shows you the new functions of the PROFIBUS-DPV1 slave compared to a PROFIBUS-DPV0 slave:

Table 6-4 Comparison between DPV1 and DPV0 slave

Function[1]		**DPV0 slave**	**DPV1 slave**
Parameterization and configuration with device master file[2]		X[4]	X[6]
Cyclic data exchange		X	X
Acyclic data exchange (read/write data record): • Free access to parameters in field device	Class 1 services (parameter assignment master, e.g. PLC)	–	X
• Reparameterization of application process	Class 2 services (e.g. PG/OP)	X	X
Diagnostics[3]			
• Module diagnosis		X	X
• Module status		X[5]	X[7]
• Channel-specific diagnosis		X[5]	X[7]
Interrupts			
• Diagnostic interrupt		–	X[8]
• Process interrupt		–	X[8]
• Module removal/insertion interrupt		–	X
Other functions			
• Time synchronization		–	X[9]
• Time stamping		–	–[10]
• Clock synchronism		–	X[9]

1 The assignment of the functions to the interface module versions is given in Sections 9.1 and 9.2.
2 If parameterization is performed using HW Config, S7-specific features are set for some functions.
3 One interrupt can be used per diagnostic frame. With DPV1 (and S7-DP) an interrupt consists of a slave diagnosis which is accompanied by an acknowledgment mechanism which does not exist in DPV0.
4 Without device master file or with device master file revision 2
5 With device master file revision 2
6 As of device master file revision 3
7 Only if the device master file has been imported and if the DPV1 mode is selected in HW-Config.
8 With S7-DP the interrupts are not reported when the CPU is in the STOP mode.
9 As of device master file revision 4
10 Time stamping is currently only available in the S7 system environment.

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Actions Following Diagnostic Message in S7 or DPV1 Mode

Every diagnostic message triggers the following actions:

- In S7 or DPV1 mode, diagnoses are reported as diagnostic interrupts.
- In DPV1 mode, diagnoses are also reported when the master CPU is in STOP mode. The diagnostic frame also contains the module status and the channel-specific diagnosis.
- Following a diagnostic message, it is
  - entered in the diagnostic frame as a diagnostic interrupt block (only one interrupt at any one time)
  - stored in the diagnostics buffer of the master CPU
- The SF LED on the IM 153-x lights up.
- OB 82 is called in the master CPU. If OB 82 is not available, the master CPU enters the STOP mode.
- Acknowledgment of the diagnostic interrupt by the master CPU (a new diagnostic interrupt is then possible).

Actions Following Diagnostic Message in DPV0 Mode

The error is entered in the channel-specific diagnosis in the diagnostic frame:

- The SF LED on the IM 153-x lights up.
- Several diagnostic messages can be issued at the same time.

Error Causes and Corrective Measures

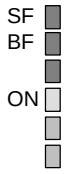
The error causes for diagnostic messages and possible corrective measures are described in Section 6.4.7.

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6.2 Diagnostics Using LEDs

IM 153-1

Table 6-5 Status and error LEDs on the IM 153-1



SF (group fault): red
BF (fault at PROFIBUS): red
ON (supply voltage available): green

LEDs			Meaning	What to Do
SF	BF	ON		
Off	Off	Off	There is no voltage applied to the IM 153-1, or the IM 153-1 has a hardware defect.	Switch on the power supply module or change the IM 153-1.
*	*	On	There is voltage applied to the IM 153-1.	–
*	Flashes	On	The IM 153-1 is incorrectly parameterized – there is no data transfer between the DP master and the IM 153-1. Causes: • Configured and set PROFIBUS address is incorrect • Faults on the bus	• Check the IM 153-1. • Check the configuration and parameter assignment. • Check the PROFIBUS address on the IM 153-1 and in the STEP 7 project. • Check the cable length with respect to the baud rate. • Check the terminating resistor settings.
*	On	On	No connection to the DP master (baud rate detection) Causes: • The bus communication via PROFIBUS-DP to the IM 153-1 has been interrupted.	Check the bus setup. • Check that the bus connector is correctly inserted. • Check if the interconnecting cable to the DP master has been interrupted. • Switch the 24 V DC switch on the power supply module off and then on again.
On	Flashes	On	The configured setup of the ET 200M does not match the actual setup of the ET 200M.	Check the PROFIBUS address and the ET 200M configuration, to find out if a module is missing or defective or whether an unconfigured module is inserted. Check the configuration (for example with *COM PROFIBUS* or *STEP 7*).
On	Off	On	Invalid PROFIBUS address Is the SF LED of an SM/FM also on? If so: There is an error or diagnosis in an S7-300 module If not: The IM 153-1 is defective.	Set a valid PROFIBUS address (1 to 125) on the IM 153-1. Check the SM/FM with the diagnosis. Change the S7-300 module or the IM 153-1 or contact your Siemens partner.
Off	Off	On	Data transfer is taking place between the DP master and the ET 200M. The desired configuration and actual configuration of the ET 200M match.	–

* Not applicable

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IM 153-2

Table 6-6 Status and error messages of the IM 153-2

IM 153-2AA02/-2AB01	IM 153-2Bx00		
SF BF ACT ON	SF BF ACT ON	SF (group fault): BF (fault at PROFIBUS): ACT (active module in redundancy mode): ON (supply voltage available):	red red yellow green

LEDs				Meaning	What to Do
SF	**BF**	**ACT**	**ON**		
Off	Off	Off	Off	There is no voltage applied to the IM 153-2, or the IM 153-2 has a hardware defect.	Switch on the power supply module or change the IM 153-2.
*	*	*	On	There is voltage applied to the IM 153-2. IM 153-2 is in operation.	–
On	Off	Off	Off	IM 153-2 is in hardware reset following power on	–
On	On	On	On	Hardware test following power on	–
On	On	Off	Off	Operating system update is running	–
Off	Flashes 0.5Hz	Off	Off	Operating system update has been completed successfully (remove MMC and switch on IM 153-2)	–
On	Flashes 0.5Hz	Off	Off	External fault; e.g. unsuitable operating system or MMC has been removed	Use a suitable operating system for the update. Do not remove the MMC during the update.
On	Flashes 2Hz	Off	Off	Internal fault; e.g. during writing of the update files	Repeat the update procedure. If the LEDs indicate the fault again, the internal memory is faulty.
*	Flashes	Off	On	The IM 153-2 is incorrectly parameterized – there is no data transfer between the DP master and the IM 153-2. Causes: • The PROFIBUS address is incorrect • Faults on the bus.	• Check the IM 153-2. • Check the configuration and parameter assignment. • Check the PROFIBUS address on the IM 153-2 and in the STEP 7 project. • Check the cable length with respect to the baud rate. • Check the terminating resistor settings.

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Table 6-6 Status and error messages of the IM 153-2

IM 153-2AA02/-2AB01	IM 153-2Bx00		
SF BF ACT ON	SF BF ACT ON	SF (group fault): BF (fault at PROFIBUS): ACT (active module in redundancy mode): ON (supply voltage available):	red red yellow green

LEDs				Meaning	What to Do
SF	**BF**	**ACT**	**ON**		
*	On	Off	On	No connection to the DP master (baud rate detection) Causes: • The bus communication via PROFIBUS-DP to the IM 153-2 has been interrupted.	Check the bus setup. • Check that the bus connector/fiber-optic cable is correctly inserted. • Check if the interconnecting cable/fiber-optic cable to the DP master has been interrupted. • Switch the 24 V DC switch on the power supply module off and then on again.
On	Flashes	Off	On	The configured setup of the ET 200M does not match the actual setup of the ET 200M.	Check the ET 200M configuration, to find out if a module is missing or defective or whether an unconfigured module is inserted. Check the configuration (for example with *COM PROFIBUS* or *STEP 7*).
On	Off	Off	On	Invalid PROFIBUS address Is the SF LED of an SM/FM also on? If so: There is an error or a diagnosis in an S7-300 module If not: The IM 153-2 is defective.	Set a valid PROFIBUS address (1 to 125) on the IM 153-2. Check the SM/FM with the diagnosis. Change the S7-300 module or the IM 153-2 or contact your Siemens partner.
*	Off	On	On	The IM 153-2 is involved in data exchange with the DP master and the I/O modules of the ET 200M. In the case of redundancy, this IM 153-2 is the **active** one of the ET 200M.	–
*	Off	Off	On	There is voltage applied to the IM 153-2. In the case of redundancy this IM 153-2 is the **passive** one, i.e. it does not exchange data with the I/O modules.	–
Flashes 0.5Hz	Off	Off	On	In redundancy mode, this IM 153-2 is **passive** and not ready for a bumpless switchover (for example, switching the associated CPU to STOP).	Put the fault-tolerant system into the redundant state.

* Not applicable

** After transition to redundant mode, the SF LED flashes for a further 20 s.

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6.3 Diagnostics Using STEP *7* and STEP *5*

Slave Diagnostics

The slave diagnostics performs to the standard IEC 61784-1:2002 Ed1 CP 3/1. Depending on the DP master, the diagnostics can be displayed for all DP slaves which perform to standard, using *STEP 7* or *STEP 5*.

Displaying and structuring the slave diagnostics is described in the following sections.

Options for Displaying the Diagnosis

Table 6-7 Displaying the diagnosis using STEP *STEP 7* and *STEP 5*

Programmable Logic Controller with DP Master	Block or Register in STEP *7*	Application	See ...
SIMATICS7/M7	DP slave diagnostics register	Display slave diagnostics as plain text on the *STEP 7* user interface	The section on hardware diagnostics in the *STEP 7* online help system
	SFC 13 ”DPNRM_DG”	Display slave diagnosis (store in data area of the user program)	For the structure see section 6.4; for the SFC see *System and Standard Functions* Reference Manual
	SFC59 ”RD_REC”	Display data records of the S7 diagnosis (store in the data area of the user program)	
	FB 125/FC 125	Evaluate slave diagnostics	On the Internet at `http://www.ad.siemens.de/simatic-cs` under the `ID` 387 257
SIMATIC S5 with the IM 308C as DP master	FB192 ”IM308C”	Display slave diagnosis (store in data area of the user program) **Note:** not for enhanced diagnosis	For the structure see section 6.4; for the FB see the *ET200 Distributed I/O Device* manual
SIMATIC S5 with S5-95U as DP master	FB230 ”S_DIAG”		

Note

Further possibilities for displaying diagnostic information can be found in the manual SIMATIC Software; Programming with STEP 7 V5.x.

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Example of Displaying the S7 Diagnosis Using SFC 13 ”DPNRM_DG”

Here you will find an example of how to use SFC 13 to display the slave diagnosis for a DP slave in the STEP *7* user program.

Assumptions

The following assumptions apply to this STEP *7* user program:

- The diagnostic address of the ET 200M is 1022 ($3FE_H$).
- The slave diagnosis should be stored in DB 82:
  as of address 0.0, length 64 bytes.
- The slave diagnosis consists of 64 bytes.

STEP 7 User Program

```
STL                                  Description

CALL  SFC 13

REQ     :=TRUE                       Read request
LADDR   :=W#16#3FE                   Diagnostic address of the ET 200M
RET_VAL :=MW 0                       RET_VAL of SFC 13
RECORD  :=P#DB82.DBX 0.0 BYTE 64     Data mailbox for the diagnosis in DB 82
BUSY    :=M2.0                       Read operation runs over several OB1 cycles
```


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Example of Displaying the Slave Diagnosis with FB 192 ”IM308C”

Here you will find an example of how to use the FB 192 to display the slave diagnosis for a DP slave in the *STEP 5* user program.

Assumptions

The following assumptions apply to this *STEP 5* user program:

- The IM 308-C is assigned pages 0 to 15 (number 0 of the IM 308-C) as the DP master.
- The DP slave has the PROFIBUS address 3.
- The slave diagnosis is to be stored in DB 20. However, you can also use any other data block for this.
- The slave diagnosis consists of 29 bytes.

STEP 5 User Program

```
STL                                  Description
        :A      DB 30
        :JU     FB 192
Name    :IM308C
DPAD    :       KH F800              Default address area of the IM 308-C
IMST    :       KY 0, 3              IM No. = 0, PROFIBUS address of DP slave = 3
FCT     :       KC SD                Function: Read slave diagnosis
GCGR    :       KM 0                 Not evaluated
TYPE    :       KY 0, 20             S5 data area: DB 20
STAD    :       KF +1                Diagnostic data from data word 1
LENG    :       KF -1                Diagnosis length = joker length (all permissible
                                     bytes)
ERR     :       DW 0                 Error code stored in DW 0 of DB 30
```


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6.4 Structure of the Diagnosis

Introduction

The IM 153-x makes the standard slave diagnosis available to you. Note the differences in the diagnostic frame depending on which version of IM 153-x and which release you have.

Depending on the DP master and parameter assignment, the following can provide an enhanced diagnosis:
IM 153-1 as of 153-1AA03, version 02, DDB version V1.18;
IM 153-1 as of 153-1AA83, version 01, DDB version V1.18;
IM 153-2 as of 153-2AA02, version > 06, DDB version V1.9;
IM 153-2 FO as of 153-2AB01, version > 05, DDB version V1.5.
IM 153-2 as of 153-2AA00, version > 01, DDB version V1.0;
IM 153-2 FO as of 153-2AB00, version > 01, DDB version V1.0
You can find detailed information in the diagnostic frame in the form of the module status and channel-specific diagnoses (see Figure 6-5 on Page 6-18).

Section	Subject	Page
6.4.1	Structure of the Slave Diagnosis	6-17
6.4.2	Station Statuses 1 to 3	6-19
6.4.3	Master PROFIBUS Address	6-21
6.4.4	Manufacturer ID	6-21
6.4.5	Module Diagnosis	6-22
6.4.6	Module Status	6-23
6.4.7	Channel-Specific Diagnosis	6-24
6.4.8	H Status (with S7-400H and Standard Redundancy Only)	6-28
6.4.9	Interrupts	6-29
6.4.10	Evaluating Interrupts from the Device-Specific Diagnosis	6-38

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6.4.1 Structure of the Slave Diagnosis

Notes on Enhanced Diagnosis

To use channel-specific diagnosis, you must enable the diagnostic interrupt in each I/O module using parameter assignment.

When you parameterize the IM 153-x, you can enable or disable the diagnostic, process and insert/remove module interrupts regardless of whether or not the enhanced diagnosis is enabled.

Using the DPV1 parameters (as of device master file rev. 3) you can disable and enable the individual blocks of the enhanced diagnosis. Disabled diagnoses are removed from the diagnostic frame.

Important: If you have enabled enhanced diagnosis during parameter assignment and do not enable diagnostic interrupts for a module until the ET 200M is in operation, a channel fault will not be entered in the diagnostic frame immediately. Not until the first diagnostic interrupt of the module is triggered after being enabled will a channel fault be entered in the diagnostic frame.
To delete channel faults from the diagnostic frame, you must disable enhanced diagnosis.

With IM 153-2Bx00

With the IM 153-2Bx00, the enhanced diagnosis is available by default in DPV0/DPV1 mode. It can be deselected (disabled) in blocks during parameterization.

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Structure of the Slave Diagnosis

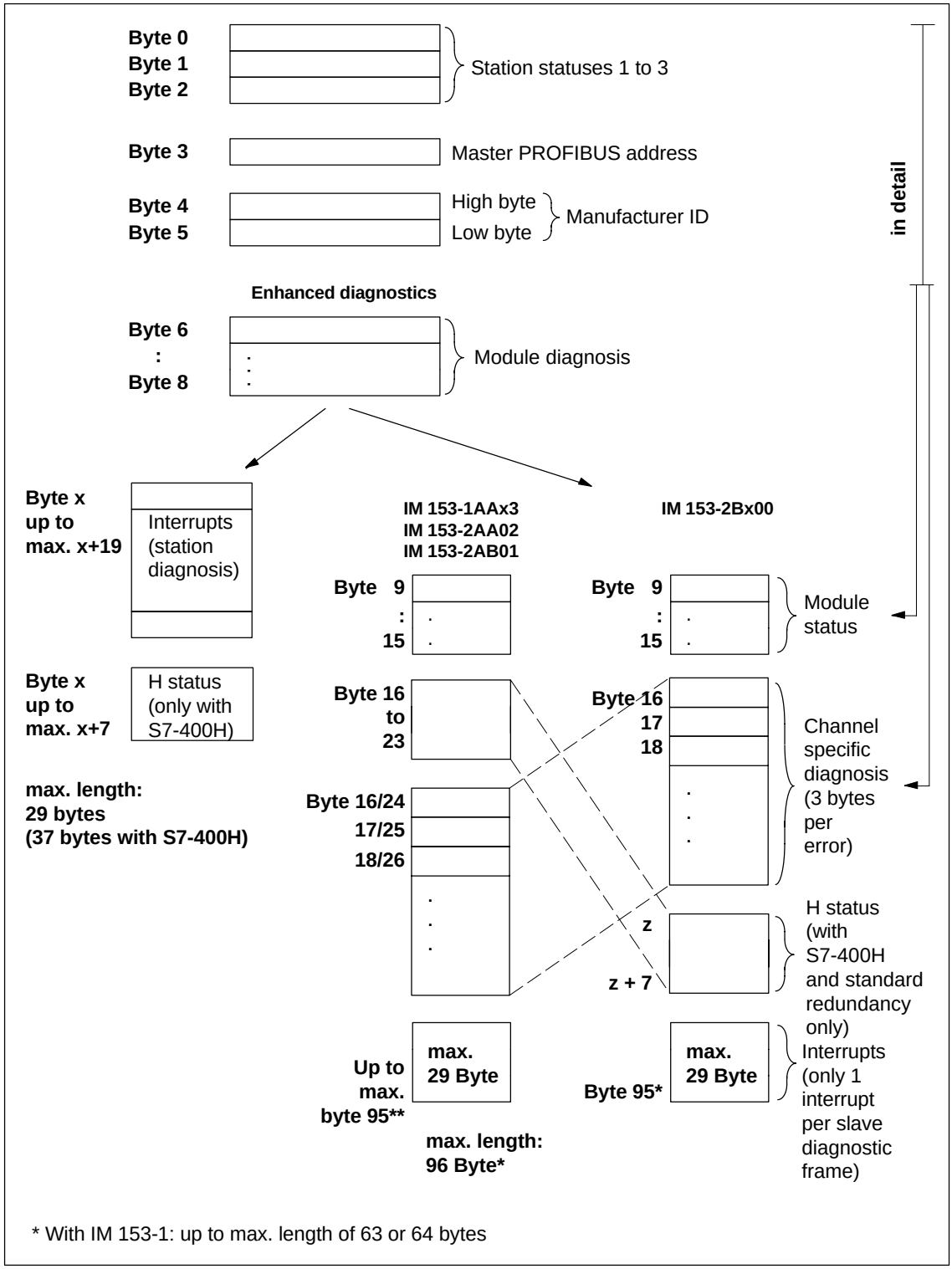


Figure 6-5 Structure of the slave diagnosis

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6.4.2 Station Statuses 1 to 3

Definition

Station statuses 1 to 3 provide an overview of the status of a DP slave.

Station Status 1

Table 6-8 Structure of station status 1 (Byte 0)

Bit	Meaning	Cause/Remedy
0	1: The DP slave cannot be addressed by the DP master. The bit is always at 0 in the DP slave.	• Correct PROFIBUS address set on the DP slave? • Bus connector and fiber-optic cable connected? • Voltage at DP slave? • RS 485 repeater set correctly? • Reset on the DP slave executed (switch on/off)?
1	1: The DP slave is not yet ready to exchange data.	• Wait while the DP slave starts up.
2	1: The configuration data sent by the DP master to the DP slave does not correspond to the actual configuration of the DP slave.	• Correct station type or correct configuration of the DP slave entered in the configuration software?
3	1: External diagnostics available.	• Evaluate the module diagnostics, the module status and/or the channel-specific diagnostics. Bit 3 is reset as soon as all the faults have been rectified. The bit is reset when there is a new diagnostic message in bytes of the above-mentioned diagnostics.
4	1: The requested function is not supported by the DP slave (e.g. SYNC/FREEZE).	• Check the configuration.
5	1: This bit is always ”0”.	Note: When reading the station status from the DP master, the bit is ”1”. The DP master cannot interpret the response of the DP slave.

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Table 6-8 Structure of station status 1 (Byte 0), continued

Bit	Meaning	Cause/Remedy
6	1: The DP slave type does not correspond to the software configuration.	• Compare the desired configuration with the actual configuration.
7	1: Parameters have been assigned to the DP slave by a different DP master (not that which currently has access to the DP slave).	• The bit is always 1 when you are accessing the DP slave using the programming device or another DP master, for example. The PROFIBUS address of the DP master that parameterized the DP slave is located in the ”master PROFIBUS address” diagnostic byte.

Station status 2

Table 6-9 Structure of station status 2 (Byte 1)

Bit	Meaning
0	1: New parameters have to be assigned to the DP slave.
1	1: The slave is in start-up phase.
2	1: The bit is always at 1 in the DP slave.
3	1: Response monitoring has been enabled for this DP slave.
4	1: The DP slave has received the ”FREEZE” control command.
5	1: The DP slave has received the ”SYNC” control command.
6	0: The bit is always at 0.
7	1: The bit is always at 0. Note: When the station status is read by the DP master, the bit is ”1” if the DP slave in the DP master has been deactivated. The DP slave is deactivated – that is, it has been removed from current processing.

Station status 3

Table 6-10 Structure of station status 3 (Byte 2)

Bit	Meaning
0 to 6	0: The bits are always at ”0”.
7	1: There are more channel-specific diagnostic messages than can be represented in the diagnostic frame.

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6.4.3 Master PROFIBUS Address

Definition

The master PROFIBUS address diagnostic byte contains the PROFIBUS address of the DP master that:

- Assigned parameters to the DP slave and
- Has read and write access to the DP slave

The master PROFIBUS address is in byte 3 of the slave diagnostics.

FF_H in Byte 3

If the value FF_H is defined as the master PROFIBUS address in byte 3, the DP slave has not been parameterized by the DP master.

6.4.4 Manufacturer ID

Definition

The manufacturer ID contains a code that describes the type of the DP slave.

Manufacturer ID

Table 6-11 Structure of the manufacturer ID (Bytes 4, 5)

Byte 4	Byte 5	Manufacturer ID for
80_H	$1D_H$	IM 153/IM 153-1
80_H	$1E_H$	IM 153-2
80_H	71_H	IM 153-2 FO

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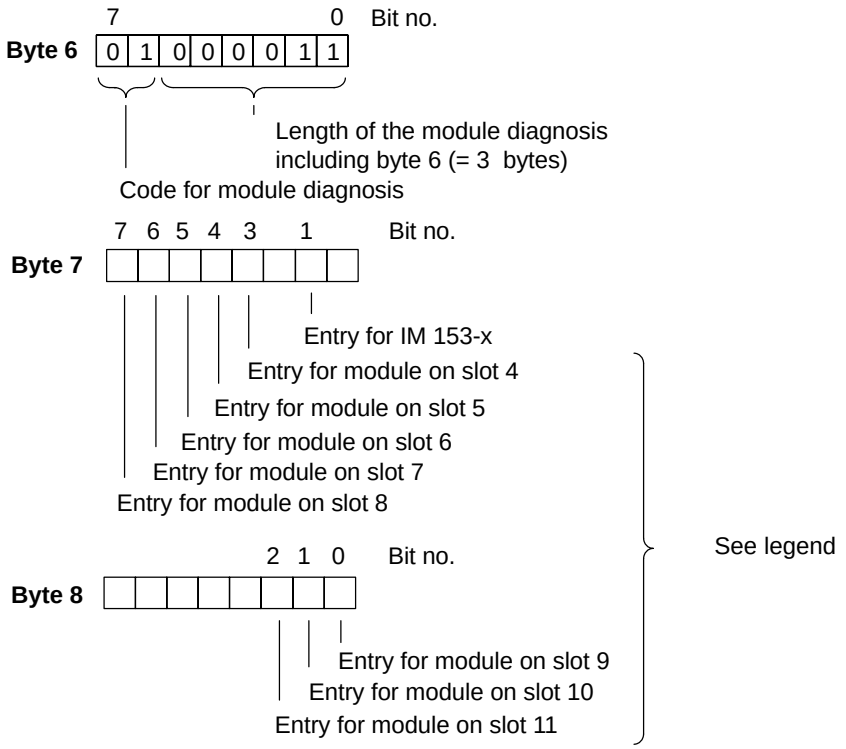
6.4.5 Module Diagnosis

Definition

The module diagnosis indicates whether or not modules of the ET 200M have errors/faults. The module diagnosis begins as of byte 6 and comprises 3 bytes.

Module Diagnosis

The module diagnosis for the ET 200M is structured as follows:



Legend for the entry for a module on slot x:

The bit is set if one of the following occurs:

- a module is removed;
- an unconfigured module is inserted;
- an inserted module cannot be accessed;
- a module reports a diagnostic interrupt;
- the ET 200M **is not** configured with active bus modules, and ”module change during operation” was selected during configuration. In this case, the IM 153 sets the bit for all configured modules.

Figure 6-6 Structure of the module diagnosis

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6.4.6 Module Status

Definition

The module status indicates the status of the configured modules and expands on the module diagnosis as regards the configuration. The module status begins after the module diagnosis and comprises 7 bytes.
The module status is only contained in the diagnostic frame if you have enabled enhanced diagnosis during parameter assignment.

Module Status

The module status for the ET 200M is structured as follows:

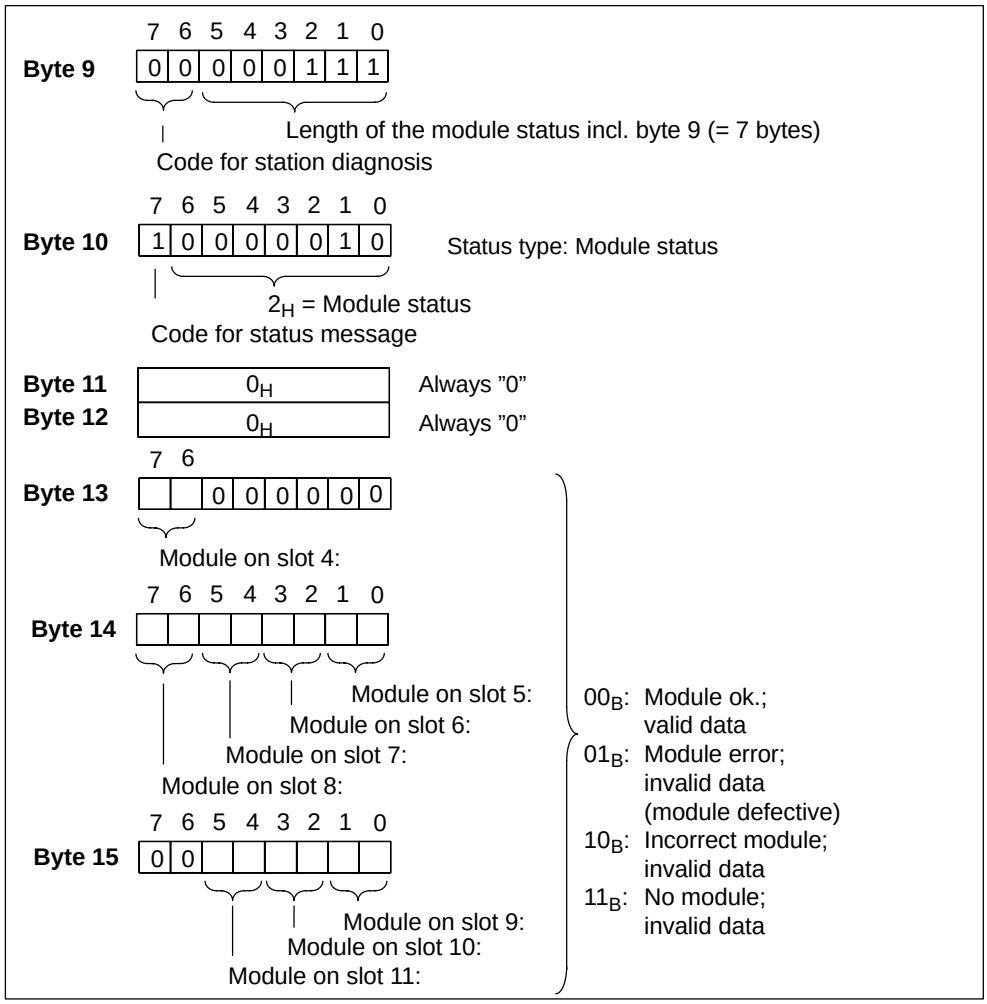


Figure 6-7 Structure of the module status for the ET 200M

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6.4.7 Channel-Specific Diagnosis

Definition

The channel-specific diagnosis gives information on channel errors of modules and expands on the module diagnosis.
The channel-specific diagnosis begins after the module status or after the H status. (see Section 6.4.8)
The channel-specific diagnosis does not affect the module status.
Important: The diagnostic interrupt must be switched on for each module!

Channel-Specific Diagnosis

The channel-specific diagnosis is only contained in the diagnostic frame if you have enabled enhanced diagnosis during parameter assignment.
The maximum number of channel-specific diagnoses is limited by the maximum overall length of the slave diagnosis of 64 bytes in the IM 153-1 and 96 bytes in the IM 153-2. The length of the slave diagnosis depends on the number of currently pending, channel-specific diagnoses. If there are more channel-specific diagnoses than can be represented in the slave diagnosis, bit 7 (diagnostic overflow) is set in station status 3.
Tip: If you disable the interrupts for the ET 200M during parameter assignment, there are still up to 29 additional bytes available in the interrupt section for the channel-specific diagnosis (see also Figure 6-5 on Page 6-18).

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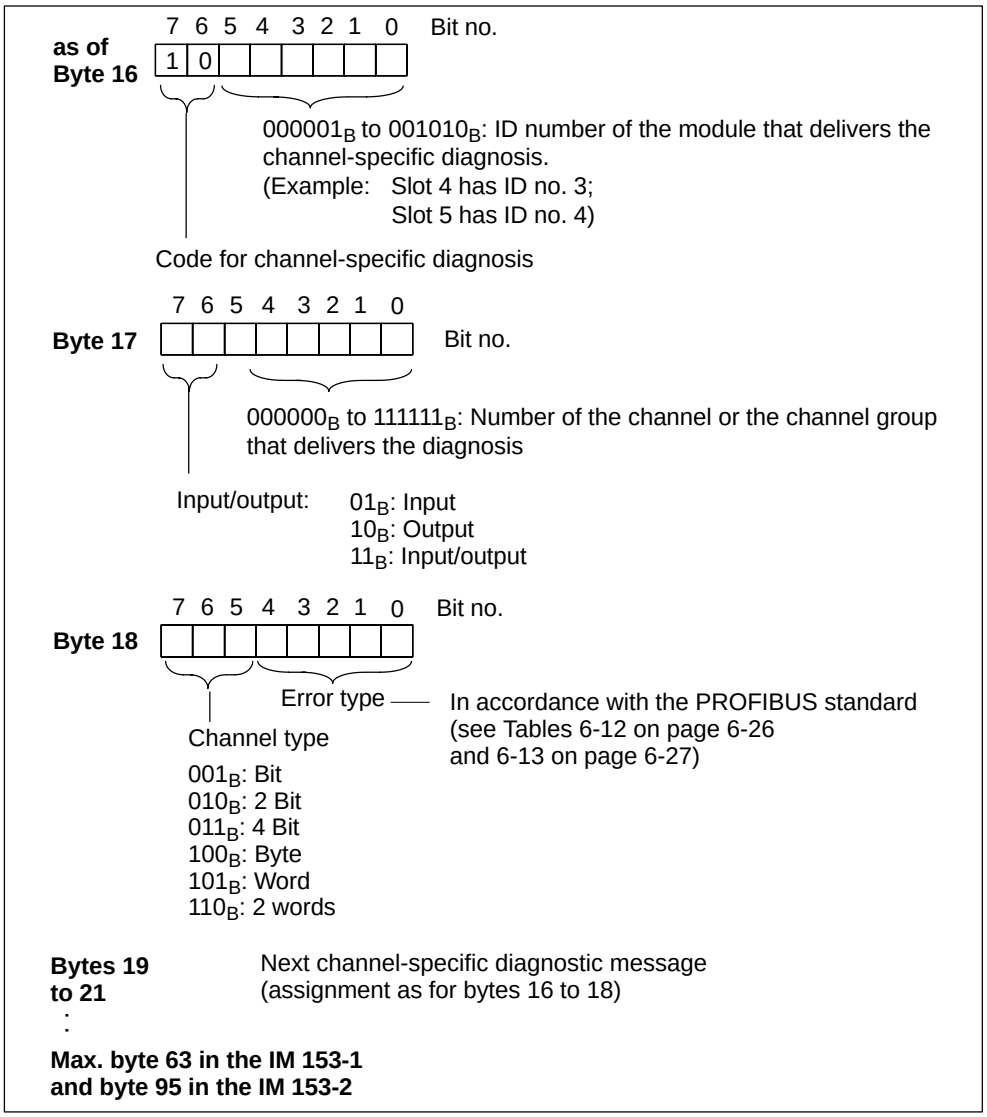


Figure 6-8 Structure of the channel-specific diagnosis

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Channel-Specific Error Messages

Table 6-12 Channel-specific error messages to PROFIBUS standard

Error Type		Error Text	Meaning	What to Do
00001_B	1_D	Short circuit	Short circuit because, for example: • Sensor wiring to P potential short-circuited • Sensor wiring to M potential short-circuited • Output wiring to P potential short-circuited • Output wiring to ground short-circuited	Correct the process wiring
00010_B	2_D	Undervoltage	Supply voltage is below the tolerance range	Correct the power supply
00011_B	3_D	Overvoltage	Supply voltage is above the tolerance range	Correct the power supply
00100_B	4_D	Overload	The output level is overloaded	Correct the module/actuator match
00101_B	5_D	Temperature rise	The output level is overloaded and is too hot	Correct the module/actuator match
00110_B	6_D	Open circuit	Wire break because, for example: • The signal line to a sensor is interrupted • The signal line from an actuator is interrupted • Power cable of the sensor interrupted	Correct the process wiring.
00111_B	7_D	Upper limit violation	Value is above the overrange	Correct the module/actuator match
01000_B	8_D	Lower limit violation	Value is below the underrange	Correct the module/actuator match
01001_B	9_D	Error	Error, for example, because: • Load voltage at the output • Sensor supply • Hardware error in the module • Contactor is welded or jammed • The switching element has reached the end of its life	Replace the module.

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Table 6-13 Channel-specific error messages – manufacturer-specific

Error Type		Error Text	Meaning	What to Do
10000_B	16_D	Parameter assignment error	Parameter assignment error, for example, because: • The module cannot use the parameter (unknown, impermissible combination...) • Module is not parameterized	Correct the parameter assignment
10001_B	17_D	Sensor or load voltage missing	The following voltage may be missing: • External supply voltage • Voltage to operate the module	Correct the process wiring.
10010_B	18_D	Fuse defect	Failure of fuse that can be replaced by the user	Replace the fuse.
10100_B	20_D	Ground fault	Ground fault, for example: • Permissible common-mode voltage in the case of non-isolated channels exceeded • M cable in the case of isolated channels ripped	Correct the process wiring.
10101_B	21_D	Reference channel error	Error on the reference channel	Replace reference channel module
10110_B	22_D	Process interrupt lost	Process interrupt is lost	Correct the program/process/ module match
11001_B	25_D	Safety-relate d shutdown	Trigger/cause for safety-related shutdown exists	Eliminate the cause
11010_B	26_D	External fault	External (process-related) error, for example: • Sensor error • Actuator error • Sensor data is not correct	Replace the sensor/actuator; correct the process wiring
11011_B	27_D	Indefinable error	Indefinable errors are errors that cannot be further specified	Depends on cause

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6.4.8 H Status (with S7-400H and Standard Redundancy Only)

The IM 153-2 only delivers the H status if it is running on an S7-400H-DP master or is operating with redundancy to standard.

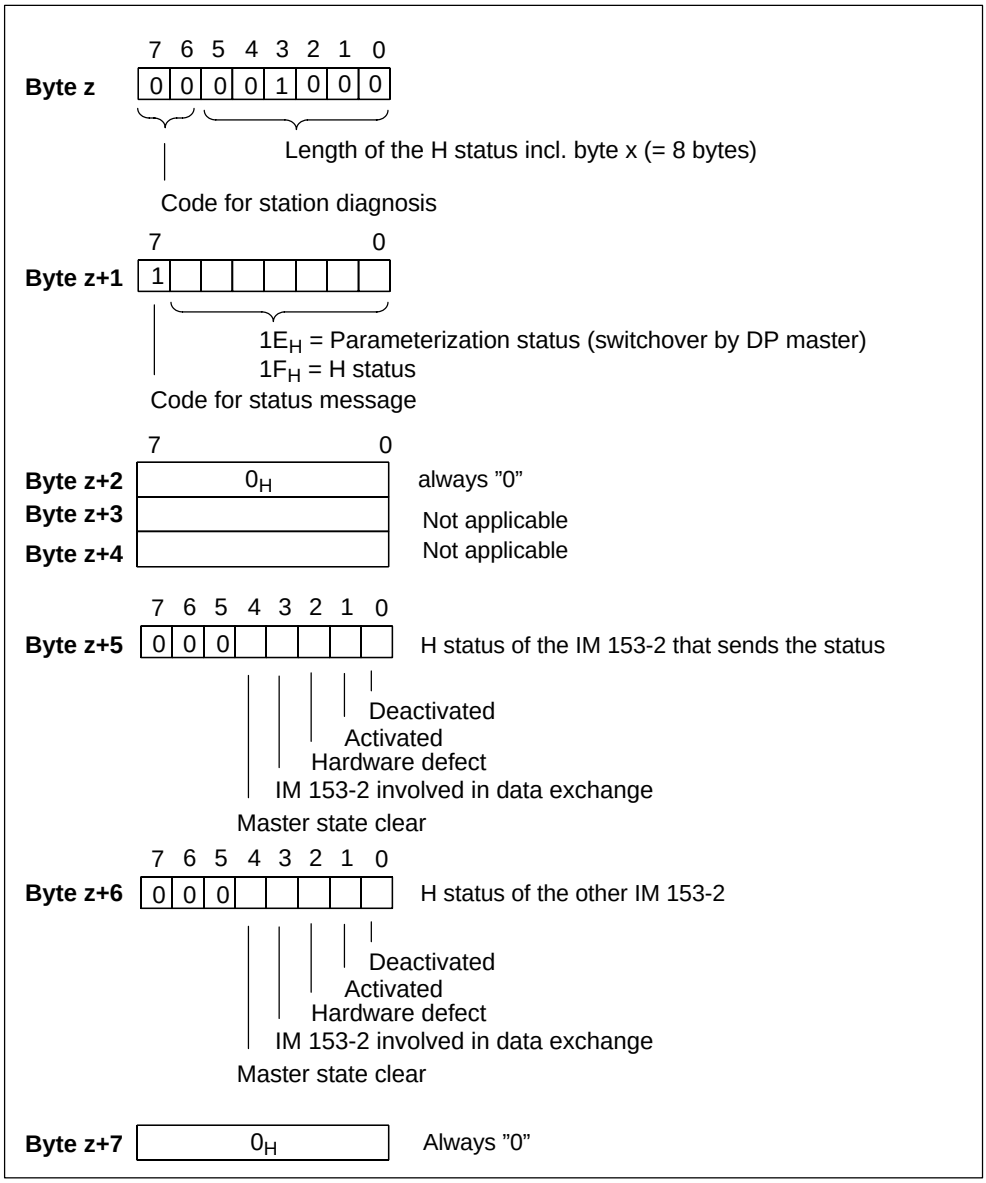


Figure 6-9 Structure of the H status of the IM 153-2 (only for S7-400H)

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6.4.9 Interrupts

Definition

The interrupts section of the slave diagnosis provides information on the type of interrupt and the cause that triggered the interrupt.
The interrupt section has a maximum of 29 bytes.
A maximum of one interrupt can be used per slave diagnosis.

Position in the Diagnostic Frame

The position of the interrupt section in the slave diagnosis depends on the structure of the diagnostic frame and on the number of channel-specific diagnoses (see also Figure 6-5 on page 6-18): The interrupt component is always the last part of the diagnostic frame.

Contents

The contents of the interrupt information depend on the type of interrupt:

In the case of **diagnostic interrupts**, the diagnostic data record 1 for SIMATIC S7 (e.g. 16 bytes) is sent as interrupt information (as of byte x+4). You can find out what these bytes mean for digital and analog modules in Figures 6-12 to 6-15 (pages 6-33 to 6-36).
In the case of **process interrupts**, the additional interrupt information is 4 bytes long. You can find out what these bytes mean in Figures 6-16 and 6-17 (pages 6-37 and 6-37).
In the case of cycle-end interrupts, these bytes are always FF_H.
In the case of **insertion/removal interrupts** the additional interrupt information is 5 bytes long. You can find out what these bytes mean in Figure 6-18 (on page 6-38).

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Removal and Insertion Interrupts

To remove and insert modules during operation, you must configure the ET 200M with active bus modules (see Section 4.1.4 in the manual). Use the switch for the removal/insertion interrupt to parameterize whether removal/insertion events are to be reported as interrupts in the diagnostic frame. If you disable removal/insertion interrupts, you can still remove and insert modules in the configuration with active bus modules. These events then appear in the module diagnosis and the module status exclusively. See also Section 9.1 and 9.2 to find out how the older IM 153-x versions respond.
In a configuration without active bus modules, removing and inserting modules will result in station failure.

Note: Inserting or removing a DM 370 dummy module does not trigger an insertion or removal interrupt.

Diagnostic Interrupt

If there is a diagnostic event for channel/channel group 0 of a module, there may be a module error **as well as** a channel error (see record 0 in Figure 6-11 on page 6-32). The entry is made in this case even if you have not enabled the diagnosis for channel/channel group 0 of the module.

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Interrupts

The interrupt section for the ET 200M is structured as follows (in the IM 153-x without module status and channel-specific diagnosis, byte x = byte 9):

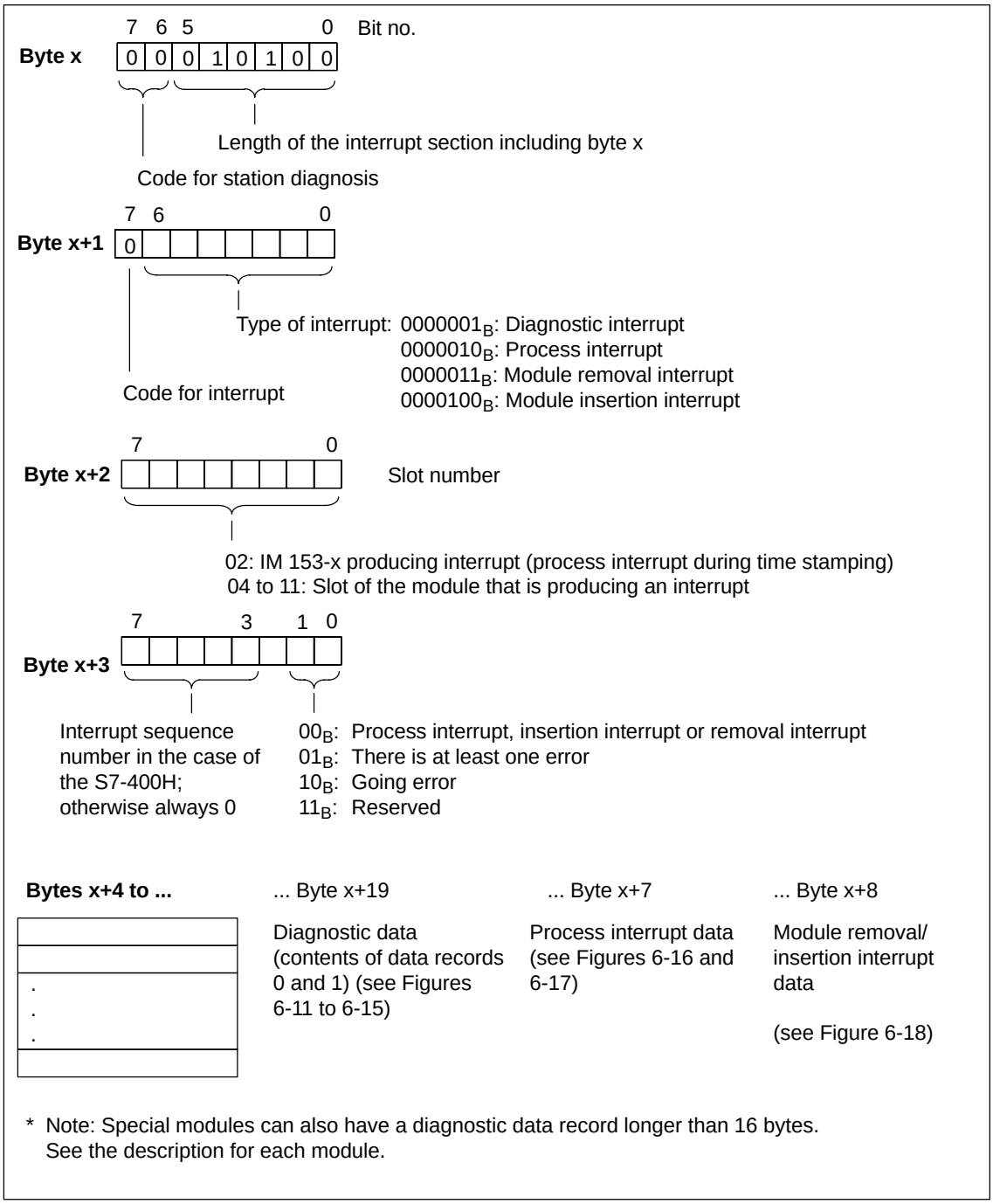


Figure 6-10 Structure of the interrupt status of the interrupt section

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Diagnostic Interrupt, Bytes x+4 to x+7

Bytes x+4 to x+7 correspond to the diagnostic data record 0 in *STEP 7*.The bytes as of byte x+8 to byte x+19 correspond to diagnostic data record 1 in *STEP 7*.

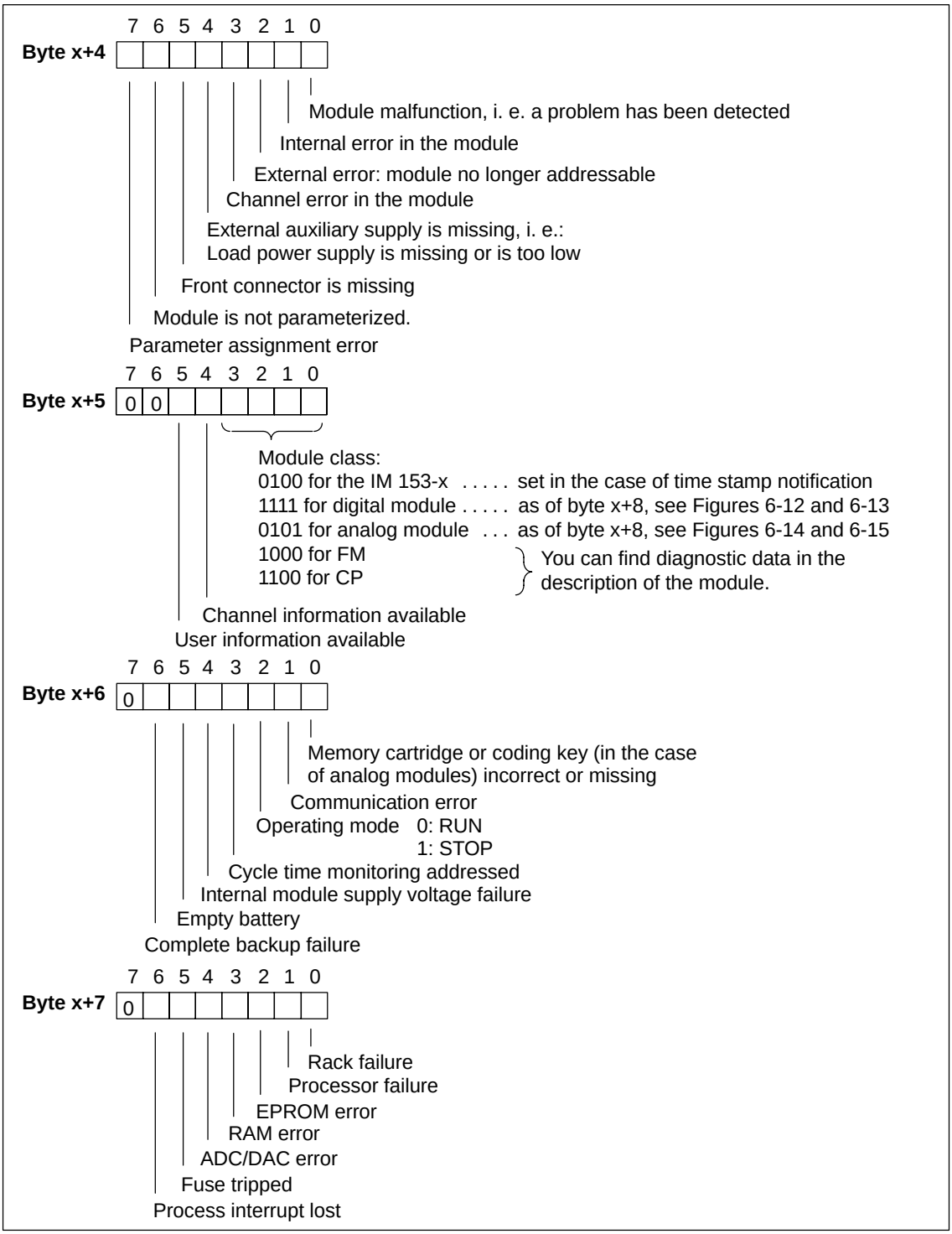


Figure 6-11 Structure of bytes x+4 to x+7 for diagnostic interrupt (digital and analog modules)

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Diagnostic Interrupt of Modules with Digital Inputs

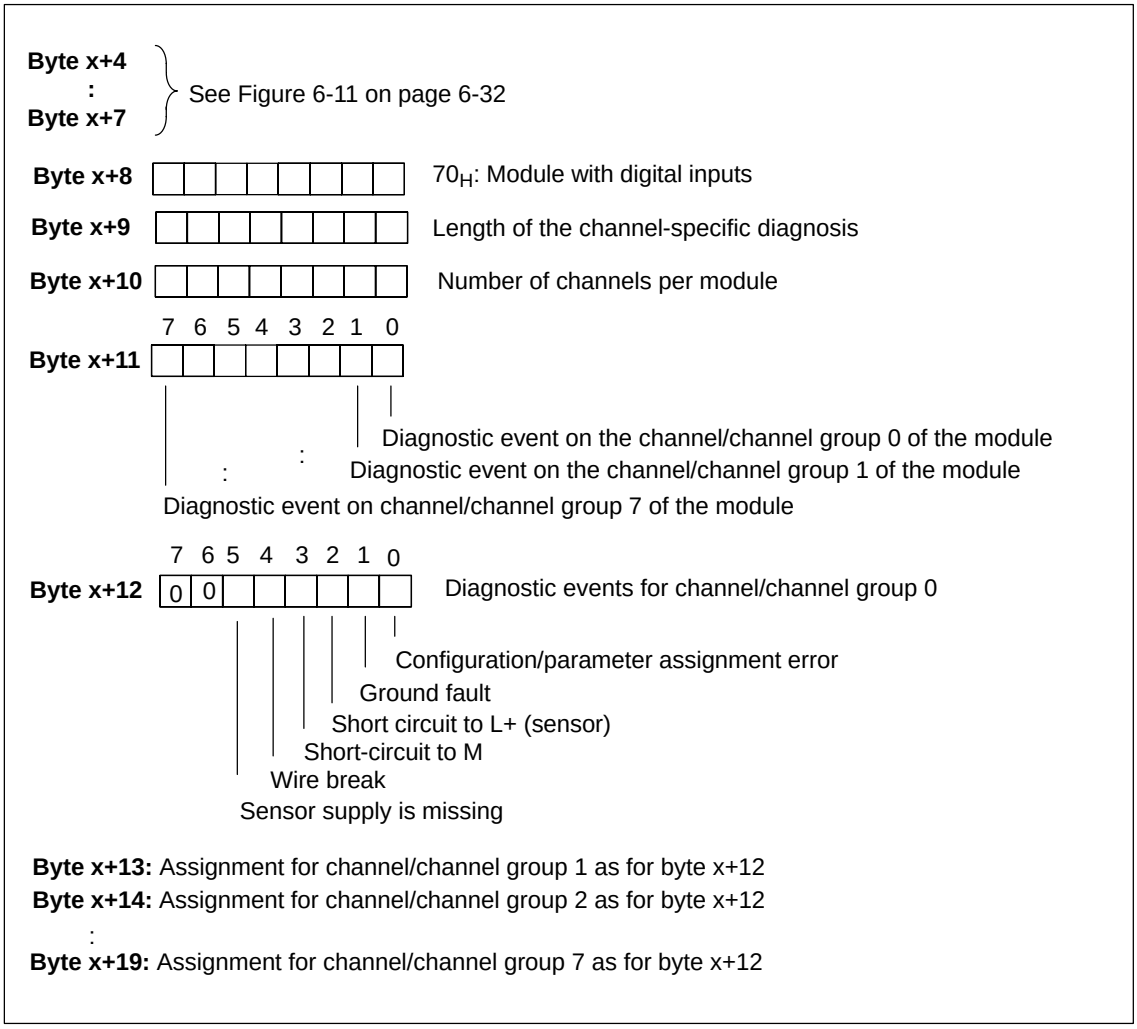
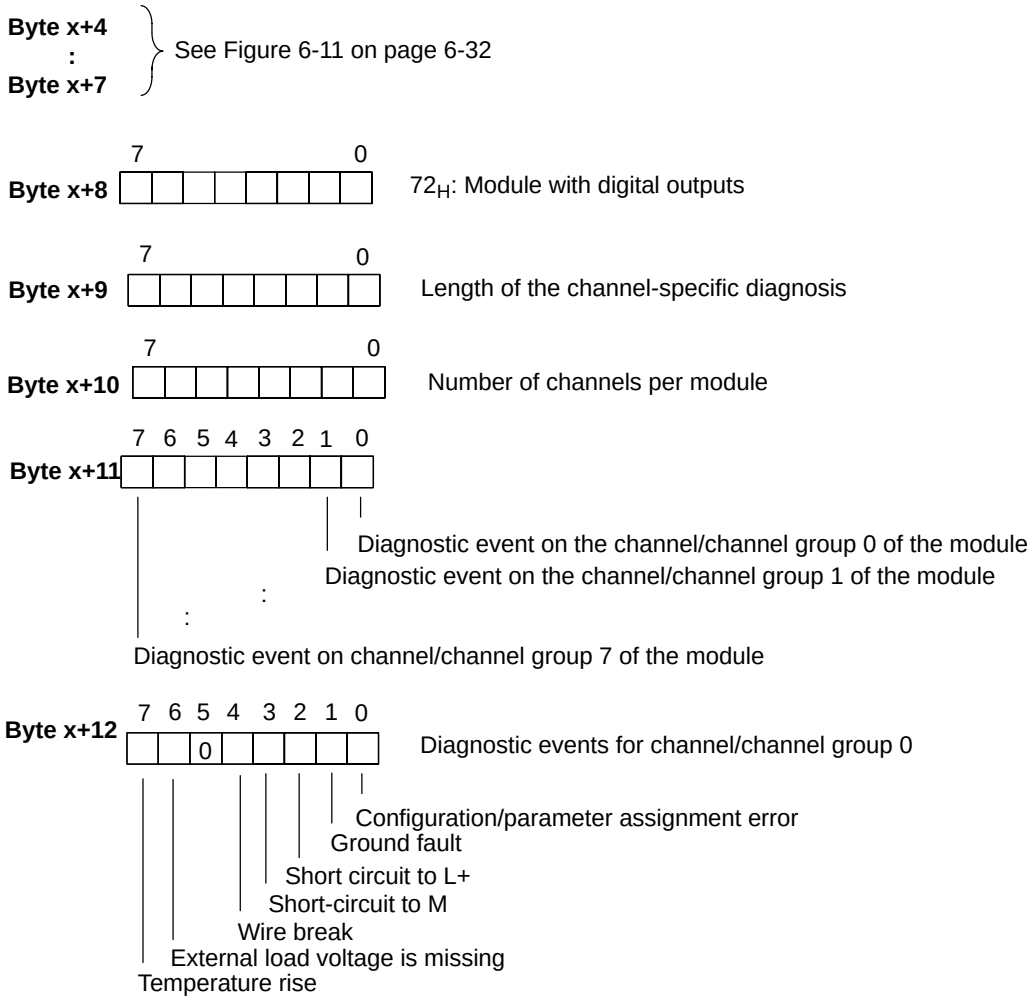


Figure 6-12 Structure as of byte x+8 for diagnostic interrupt (digital inputs)

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Diagnostic Interrupt of Modules with Digital Outputs



Byte x+13: Assignment for channel/channel group 1 as for byte x+12

Byte x+14: Assignment for channel/channel group 2 as for byte x+12

:

Byte x+19: Assignment for channel/channel group 7 as for byte x+12

Figure 6-13 Structure as of byte x+8 for diagnostic interrupt (digital outputs)

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Diagnostic Interrupt of Modules with Analog Inputs

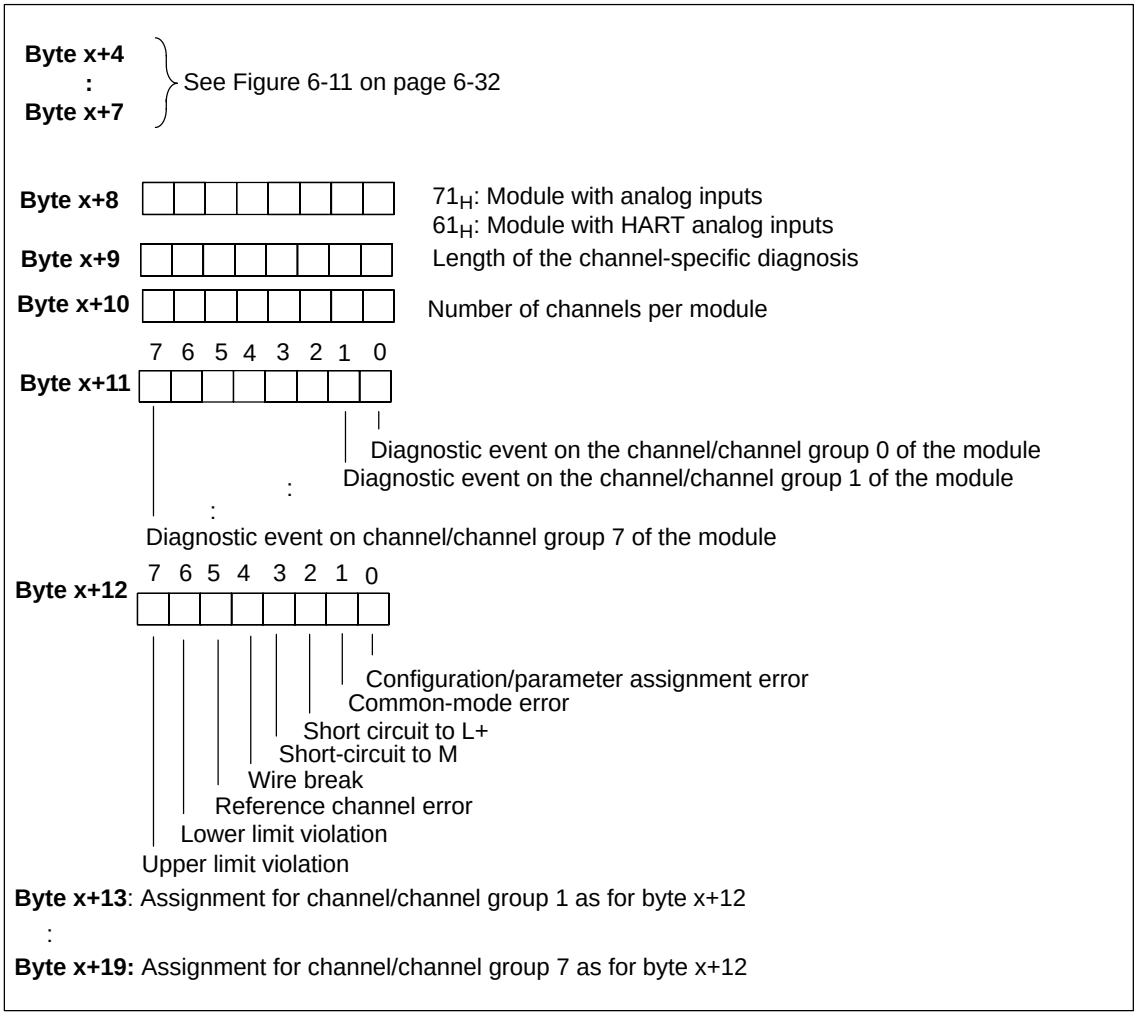
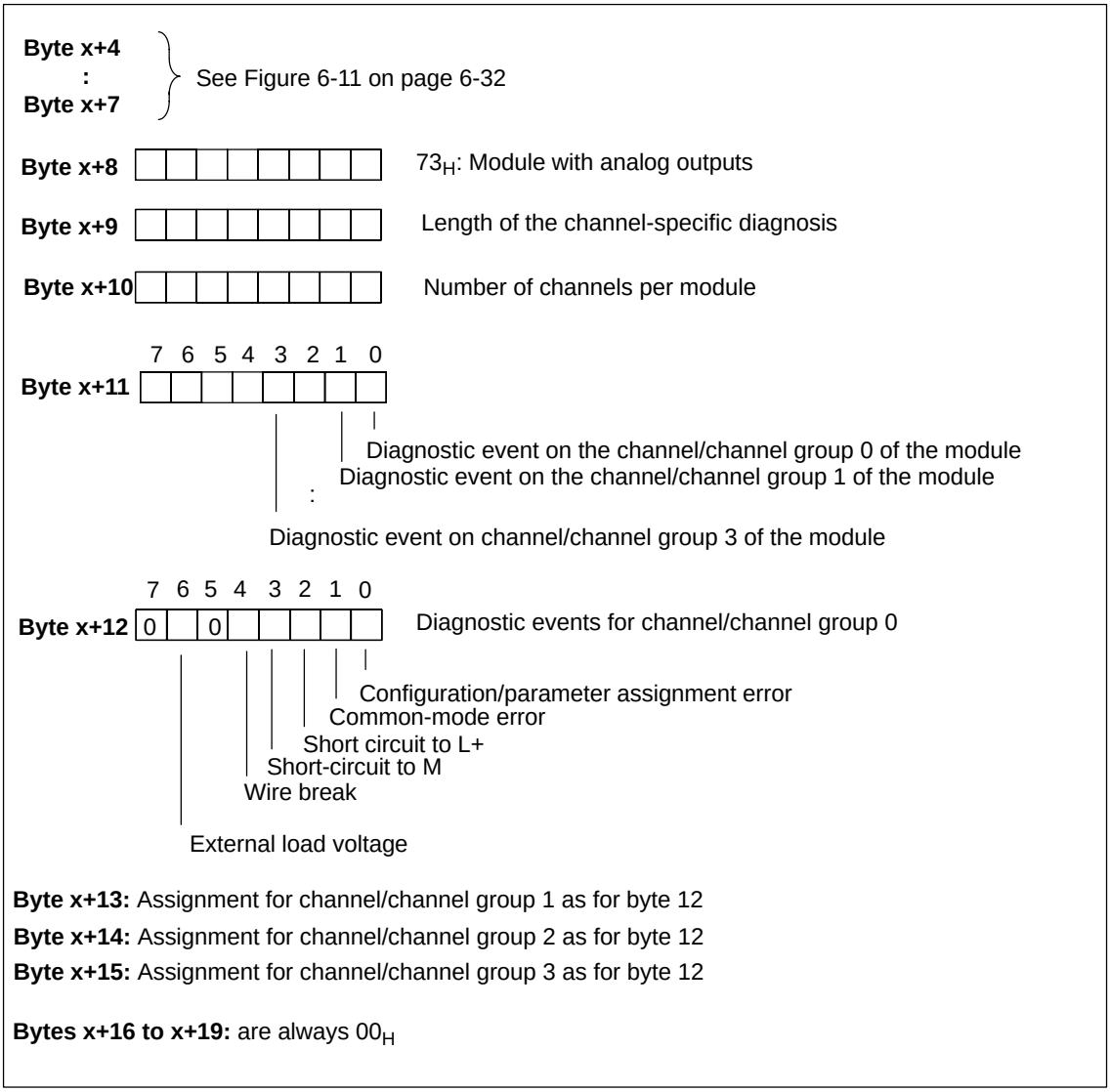


Figure 6-14 Structure as of byte x+8 for diagnostic interrupt (analog inputs)

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Diagnostic Interrupt of Modules with Analog Outputs



Byte x+13: Assignment for channel/channel group 1 as for byte 12

Byte x+14: Assignment for channel/channel group 2 as for byte 12

Byte x+15: Assignment for channel/channel group 3 as for byte 12

Bytes x+16 to x+19: are always 00_H

Figure 6-15 Structure as of byte x+8 for diagnostic interrupt (analog outputs)

Process Interrupt of the IM 153-2

If the IM 153-2 reports a process interrupt, there is at least one data record containing messages concerning time-stamped signal changes or special messages.

The DP master CPU can read the data record(s) and evaluate them with the 90 ”IM_DRV” FB (see the *PCS 7* documentation).

Evaluation with FB 62 ”FB TIMESTMP” is also possible.

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Process Interrupt of Analog Input Modules

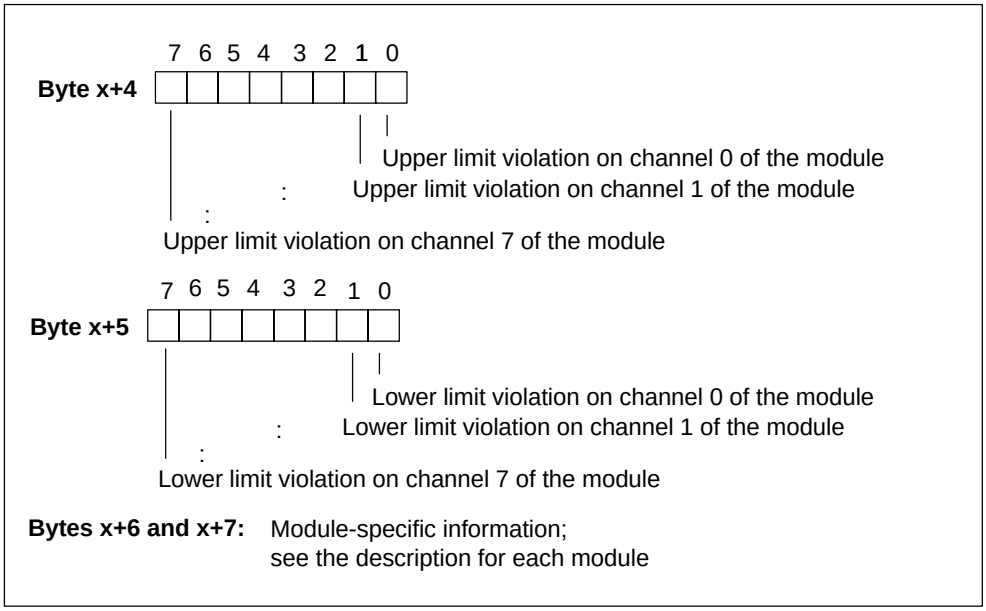


Figure 6-16 Structure as of byte x+4 for process interrupt (analog inputs)

Process Interrupt of Digital Input Modules

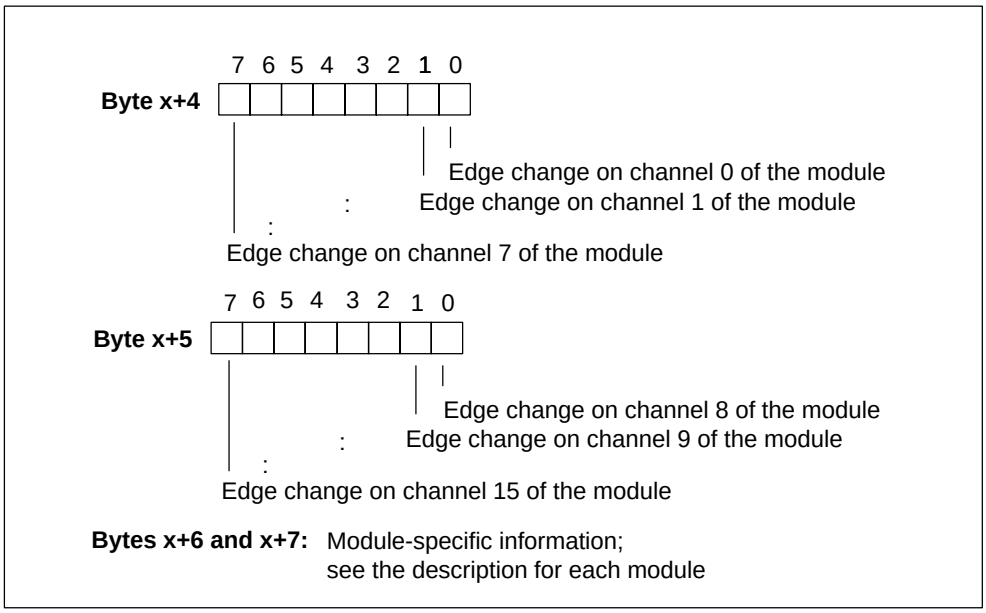


Figure 6-17 Structure as of byte x+4 for process interrupt (analog inputs)

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Module Removal/Insertion Interrupt

The module ID that was removed or inserted is in byte x+4 to x+8. You can find the IDs for the individual modules in the device master file. You can tell whether the module was removed or inserted by the type of interrupt in byte x+1 (see Figure 6-11, on page 6-32).

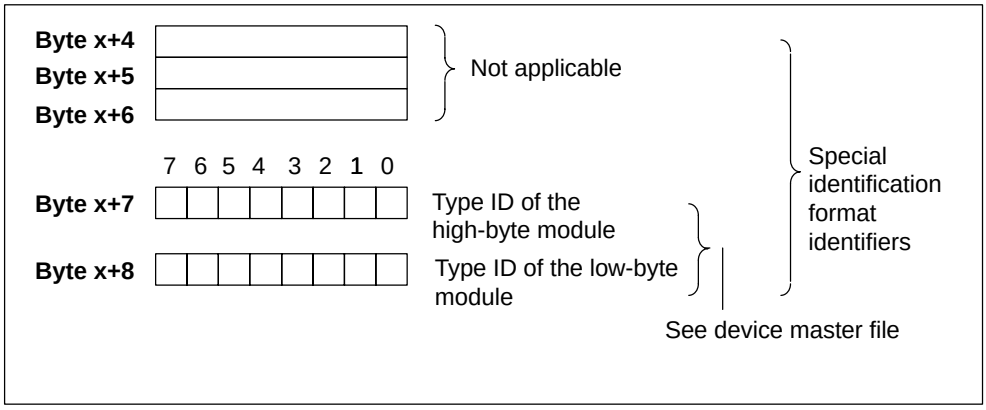


Figure 6-18 Structure as of byte x+4 for module removal/insertion interrupt

6.4.10 Evaluating Interrupts from the Station Diagnosis

The structure of the station diagnosis is the same as the structure of the interrupt section, as described in Section 6.4.9.

Interrupts with S7/M7-DP Master or DPV1 Master

The ET 200M supports the following interrupts:

- Diagnostic interrupt
- Process interrupt
- Module insertion/removal interrupt.

You can evaluate these interrupts with an S7/M7-DP master or DPV1 master. In the case of an interrupt, interrupt OBs run automatically in the master CPU (see the *System Software for S7-300/S7-400, Program Design* Program Manual).

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Removal/Insertion Interrupt with S7/M7-DP Master or DPV1 Master

If you use the ET 200M with ”module change during operation” on an S7/M7-DP master or a DPV1 master, the system behaves as follows:

- When a module is removed, the IM 153-x reports a module removal interrupt on the DP master that executes OB 83. You program the desired response to the module removal event in OB 83.
  In the case of I/O access, OB 122 (I/O access error) is called in the DP master.
- If you insert a module that corresponds to the configuration, the IM 153-x reports a module insertion interrupt to the DP master (OB 83 call with diagnostics buffer entry) and assigns parameters to the module in keeping with the stored configuration.
- If you insert a module in an unconfigured slot, the IM 153-x doesn’t report a module insertion interrupt.
- If you insert a different module than configured:
  - the IM 153-x reports a module insertion interrupt to the DP master (OB 83 call with diagnostics buffer entry); but it ignores this unconfigured module.
  - The module diagnosis is stopped, and you can read out the slot in which the wrong module is inserted (see Section 6.4.5).
  - The SF LED shows the error.

Note: Inserting or removing a DM 370 dummy module does not trigger an insertion or removal interrupt.



Warning

Problems during removal and insertion are tolerated for up to 1 second.
This means that the output values will not change within the tolerance time in the event of such a problem occurring.

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Interrupts with Another DP Master

If you operate the ET 200M with another DP master, these interrupts are simulated as a device-specific diagnosis of the ET 200M. You must postprocess the relevant diagnostic events in the DP master's user program.

Saving the Diagnosis

Depending on byte x+1, transfer the contents of the station diagnosis to a data block because:

- The interrupts are updated cyclically.
- The contents of the diagnosis as of byte x+3 depend on whether the S7 diagnosis or S7 process interrupt or module insertion/removal module interrupt is reported.

Note

The following points are important in evaluating diagnostic interrupts and process interrupts with a different DP master by means of the station diagnosis:

- The DP master should be able to store the diagnostic messages, that is, the DP master should have a ring buffer in which to place these messages. If the DP master can not store diagnostic messages, only the last diagnostic message will be available for evaluation.
- You must scan the relevant bits in the device-related diagnostic data in your user program at regular intervals.
- You cannot use process interrupts in the station diagnosis in an IM 308-C as DP master, because only coming – and not going – interrupts are reported. For example, the "upper limit violation" bit is only reset when the "lower limit violation" bit is set. The cycle end interrupt is not supported by the IM 308-C, because the cycle end interrupt updates to "1" at the end of each cycle (i.e. there is no change in the signal level).

Module Removal/Insertion Interrupts with Other DP Masters

If you use the ET 200M with module change during operation on another DP master, you must make sure that it **cannot** evaluate the module removal and insertion interrupts. You can evaluate the module removal and insertion events in the module and station diagnosis of the IM 153-x.
Tip: Evaluate the module status in the enhanced diagnosis.

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Maintenance 7

Maintenance

The ET 200M is a maintenance-free DP slave.

Chapter Overview

In this chapter you will find out how to replace modules or components.

Section	Subject	Page
7.1	Replacing the Power Supply Module	7-1
7.2	Replacing the IM 153-1	7-3
7.3	Replacing the IM 153-2 or IM 153-2 FO	7-4
7.4	Replacing Modules without the ”Module Change During Operation” Function	7-8
7.5	Replacing Modules with the ”Module Change During Operation” Function	7-11
7.6	Replacing the Bus Module	7-13
7.7	Changing Fuses in the Case of Digital Output Modules	7-14
7.8	Update of the IM 153-x	7-16

7.1 Replacing the Power Supply Module

Initial Situation

The power supply module you want to replace is installed and wired. You want to install a new power supply module of the same type.

Slot Numbering

If you have given slot numbers to the power supply modules in your system, you must remove the numbering from the old power supply module when you replace the module and then use them for the new power supply module.

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Removing the Power Supply Module

To remove the power supply module, proceed as follows:

1. Operate the supply isolating switch in order to de-energize the power supply module.
2. Remove the cover.
3. Disconnect all the wiring.
4. Undo the fixing screws of the power supply module.
5. Swing the power supply module out.

Installing the New Power Supply Module

To install the new power supply module, proceed as follows:

1. Check the setting of the voltage selector switch.
2. Hook the new power supply module of the same type onto the rail and swing it down into place.
3. Screw the power supply module on securely.
4. Wire the power supply module.
5. Connect the power supply module to the line voltage.
6. Close the cover.

Response of the ET 200M After Module Replacement

If there is an error after the power supply modules have been replaced, you can have the cause displayed in the diagnostic buffer with *STEP 5* or with *STEP 7*.

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7.2 Replacing the IM 153-1

Initial Situation

The IM 153-1 is installed. You want to install a new IM 153-1 of the same type.

Slot Numbering

If you have given slot numbers to the modules in your system, you must remove the numbering from the old module when you replace the module and use it on the new module.

Unplugging the Bus Connector

With a **looped-through interconnecting cable** you can unplug the bus connector from the PROFIBUS-DP interface without interrupting data traffic on the network.

Note

A data communication error may occur on the network.

A network segment must always be terminated at both ends with the terminating resistor. This is not the case, for example, if the power supply is not activated on the last slave with a bus connector. The efficacy of the terminating resistor is impaired because the terminating resistor in the bus connector gets its voltage from the node.

Please make sure that power is always supplied to nodes
on which the terminating resistor is active.
Tip: You can use the PROFIBUS terminator as an active bus terminating element.

Removing a Module

To remove the module, proceed as follows:

1. Put the on/off switch of the power supply module in the 0 position (⏻:output voltage 0 V).
2. Remove the bus connector.
3. Disconnect the wiring.
4. Remove the fixing screws of the IM 153-1.
5. Swing the IM 153-1 out.

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Installing a New Module

Install the new module as follows:

1. Set the same DP address on this IM 153-1 as for the old IM 153-1.
2. Hook the new IM 153-1 onto the rail and swing it down into place.
3. Screw the module on securely.
4. Wire the IM 153-1.
5. Screw the bus connector tight.
6. Put the standby switch of the power supply module into the 1 position (output voltages to rated value).

Response of the ET 200M After Module Replacement

If there is an error after the modules have been replaced, you can have the cause displayed in the diagnostic buffer with *STEP 5* or *STEP 7*.

7.3 Replacing the IM 153-2 or IM 153-2 FO

Initial Situation

The IM 153-2/-2 FO is installed. You want to install a new IM 153-2/-2 FO of the same type.

Slot Numbering

If you have given slot numbers to the modules in your system, you must remove the numbering from the old module when you replace the module and use it on the new module.

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IM 153-2: Unplugging the Bus Connector

With a **looped-through interconnecting cable** you can unplug the bus connector from the PROFIBUS-DP interface without interrupting data traffic on the network.

Note

A data communication error may occur on the network.

A network segment must always be terminated at both ends with the terminating resistor. This is not the case, for example, if the power supply is not activated on the last slave with a bus connector. The efficacy of the terminating resistor is impaired because the terminating resistor in the bus connector gets its voltage from the node.

Please make sure that power is always supplied to nodes on which the terminating resistor is active.
Tip: You can use the PROFIBUS terminator as an active bus terminating element.

IM 153-2 FO: Removing the Fiber-Optic Cable

If you remove the fiber-optic cable from the IM 153-2 FO, **all the following DP slaves will also no longer be accessible to the DP master.**



Caution

Do not look directly into the opening of the optical sender diodes.
The light beam could damage your eyes.

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In the Case of Redundancy

Note

Only replace the IM 153-2/-2 FO in a de-energized state!

If you carry out a replacement in an energized state, the specified switchover times cannot be guaranteed and the I/O modules could fail for a certain time and output “0”.

If you replace the IM 153-2/-2 FO in a redundant configuration, the following applies:

”ACT” LED is on:	”ACT” LED is off:
The IM 153-2/-2 FO is the active one of the two IM 153-2/-2 FO modules.	The IM 153-2/-2 FO is the passive one of the two IM 153-2/-2 FO modules. You can replace these IM 153-2/-2 FO modules without the need for switchover operations in the ET 200M.

Removing a Module

To remove the module, proceed as follows:

1. **In the case of redundancy:** The IM 153-2/-2 FO to be replaced must be de-energized! Switch off the associated power supply module or disconnect it from the IM 153-2/-2 FO.



Warning

If in redundancy mode the two IM 153-2 modules are connected to a power supply module, a short circuit could occur at the non-insulated (loose) cable ends if the 24 V supply is disconnected from one of the IM 153-2.
If the power supply is short-circuited in this way, the second IM 153-2 and therefore your ET 200M fail completely.
The greatest care must therefore be taken when disconnecting the supply voltage and the two cable ends must be insulated until they are connected to the new IM 153-2.

No redundancy: Put the on/off switch of the power supply module into the 0 position (⏻: output voltage 0 V).

2. Remove the bus connector or fiber-optic cable.
   In the case of fiber-optic cables: Flip open the grip of the plug-in adapter and remove it from the IM 153-2 FO.

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3. Disconnect the wiring.
4. Remove the fixing screws of the IM 153-2/-2 FO.
5. Swing the IM 153-2/-2 FO out.

Installing a New Module

Install the new module as follows:

1. Set the same DP address on this IM 153-2/-2 FO as for the old IM 153-2/-2 FO.
2. Hook the new IM 153-1/-2 FO onto the rail and swing it down into place.
3. Screw the module on securely.
4. Wire the IM 153-2/-2 FO.
5. Screw the bus connector tight.
6. Put the standby switch of the power supply module into the 1 position (output voltages to rated value).

Response of the ET 200M After Module Replacement

If there is an error after the modules have been replaced, you can have the cause displayed in the diagnostic buffer with *STEP 5* or *STEP 7*.

In the Case of Redundancy:

Note

If the active IM 153-2/-2 FO (”ACT” LED on) is replaced, the I/O system will only continue without interruption if on the passive IM 153-2/-2 FO the BF LED neither comes on nor flashes, or if the SF LED does not flash at 0.5 Hz (see also Table 6-6 on page6-11).

Have you replaced an active IM 153-2/-2 FO (”ACT” LED on)?	**Have you replaced a passive IM 153-2/-2 FO (”ACT” LED off)?**
A switchover took place in the ET 200M to the other IM 153-2/-2 FO, and data traffic continues between it and its DP master.	No change in data traffic: It continues between the active IM 153-2/-2 FO and its DP master.
Does the new IM 153-2/-2 FO have a different version to the one that wasn’t replaced?	
If after replacement, the replaced IM 153-2/-2 FO goes into STOP (all the LEDs flash), the releases are not compatible. In this case you must switch off the ET 200M and upgrade the two IM 153-2/-2 FO or use a compatible version. Contact your Siemens partner.	

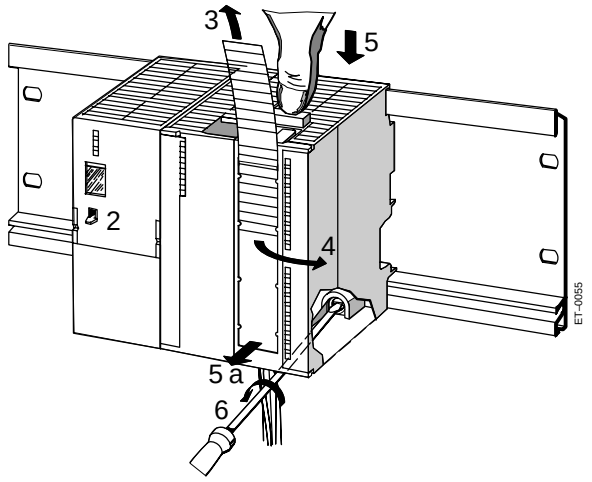
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7.4 Replacing Modules without the ”Module Change During Operation” Function

Removing a Module

Table 7-1 Removing modules without ”module change during operation”

Step	20-Pin Front Connector	40-Pin Front Connector
1.	Switch off the load voltage to the module.	
2.	Switch off the power supply for the IM 153-x.	
3.	Remove the labeling strip from the module.	
4.	Open the front door.	
5.	Unlock the front connector and pull it off the module.	
	To do this, depress the locking button (5) with one hand and, with the other hand, grip the front connector (5a) at the appropriate point and pull it out.	Remove the fixing screw from the middle of the front connector. Pull the front connector out while holding the grips.
6.	Undo the module fixing screw(s).	
7.	Swing the module up and off the rail.	



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Removing the Front Connector Coding Key

Prior to installing the new module, you must remove the front connector coding key from the new module. Reason: This part is already in the wired front connector (see Figure 7-1).

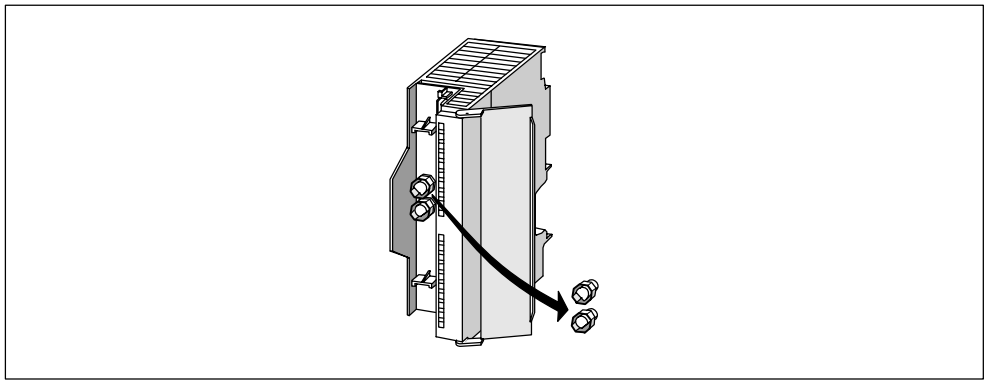
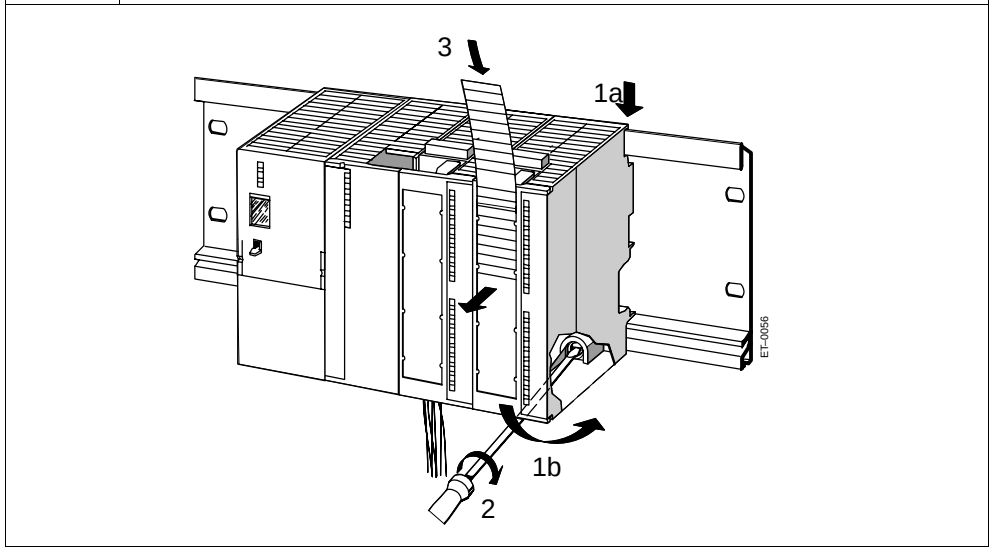


Figure 7-1 Removing the front connector coding key

Installing a New Module

Table 7-2 Installing new modules

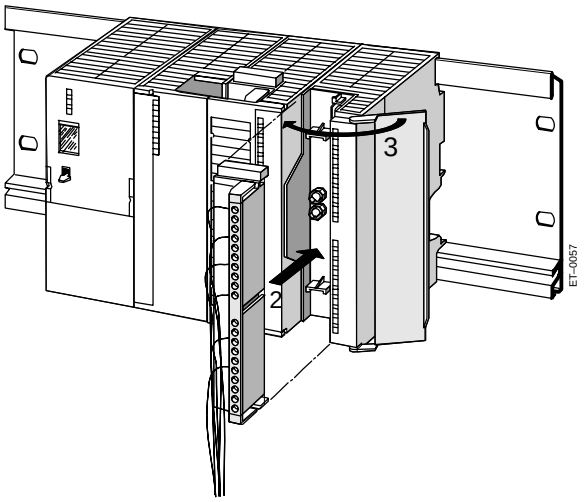
Step	Installing a Module
1.	Hook the new module of the same type onto the rail and swing it down into place.
2.	Screw the module on securely.
3.	Push the labeling strip of the old module into place on the new module.



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Putting a New Module into Service

Table 7-3 Putting new modules into service

Step	Putting a Module into Service
1.	Open the front door.
2.	Bring the front connector back into its operating position.
	
3.	Close the front door.
4.	Switch on the power supply for the IM 153-x.
5.	Switch the load voltage back on.

Response of the ET 200M After Module Replacement

When you have replaced a module and no errors have occurred, the IM 153-x starts data transfer. If the IM 153-x stays in STOP mode, you can display the cause of the error with *STEP 5* or *STEP 7*

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7.5 Replacing Modules with the ”Module Change During Operation” Function

Prerequisites

You can replace the modules during operation of the ET 200M once you have done the following:

- Installed the ET 200M on the rail with active bus modules for the ”module change during operation” function.
- Configured the ET 200M for the ”module change during operation” function.



Warning

When you insert output modules, uncontrolled system states may occur.

This is also the case when you insert input/output modules at an angle to the bus modules.

When you insert an output module, the outputs set by the user program immediately become active.

We recommend that you set the outputs in the user program to ”0” when you remove an output module.

If modules are removed and inserted incorrectly, neighboring modules may be affected via the backplane bus.

Removing a Module

Table 7-4 Removing modules with ”module change during operation”

Step	20-Pin Front Connector	40-Pin Front Connector
1.	Undo the module fixing screw(s).	
2.	Swing the module up and off the rail.	
3.	Open the front door.	
4.	Unlock the front connector and pull it off the module (see the figure in Table 7-1 on page 7-8).	
	To do this, depress the locking button (4) with one hand and, with the other hand, grip the front connector (4a) at the appropriate point and pull it out.	Remove the fixing screw from the middle of the front connector. Pull the front connector out while holding the grips.
5.	Remove the labeling strip from the module.	

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Removing the Front Connector Coding Key

Prior to installing the new module, you must remove the front connector coding key from the new module. Reason: This part is already in the wired front connector (see Figure 7-17-9).

Installing a New Module

Table 7-5 Installing new modules

Step	Installing a Module
1.	Insert the front connector into the module and bring it into its operating position.
2.	Hook the new module onto the rail and swing it down into place.
3.	Screw the module on securely.
4.	Push the labeling strip of the old module into place on the new module.

Response of the ET 200M During Module Replacement

Table 7-6 Response of the ET 200M when modules are removed or inserted

Remove/Insert	Actual = Desired configuration ?	Response of the ET 200M
Removing a module	–	The IM 153-x reports the removal of a module via the diagnosis. The diagnostic event corresponds to the module removal interrupt (see Section 6.4.9). The IM 153-x also enters the removal of the module in the module diagnosis (see Section 6.4.5).
Inserting a module	Yes	When a configured module is inserted, the IM 153-x deletes the entry in the module diagnosis to the effect that the module is no longer addressed by the IM 153-x. If the ET 200M is in user data mode, the IM 153-x reports a diagnostic event that corresponds to the module insertion interrupt (see Section 6.4.9). The inserted module is parameterized in accordance with the last parameter assignment and is accepted in the ET 200M.
	No	The IM 153-x ignores the inserted module. The IM 153-x reports a diagnostic event corresponding to the module insertion interrupt (see Section 6.4.9). The entry concerning the removal of the module remains in the module diagnosis.

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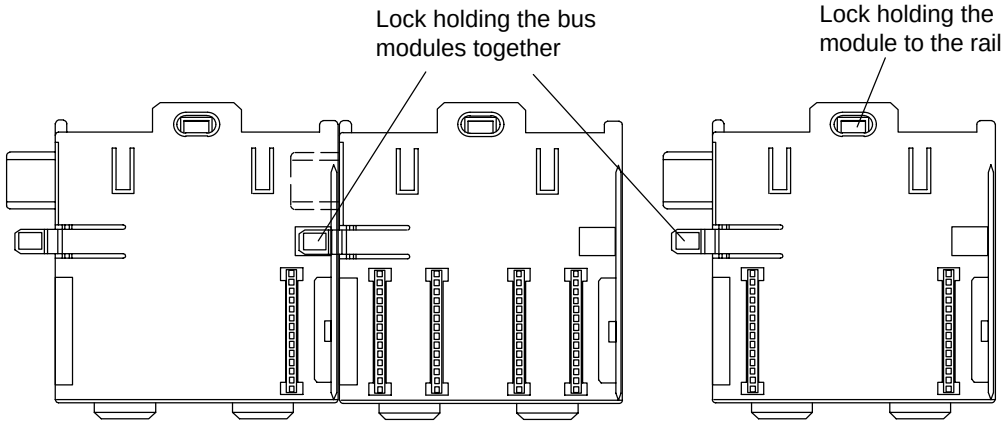
7.6 Replacing the Bus Module

Removing the Bus Module

Only remove bus modules if they are de-energized!

Table 7-7 Removing the bus module

Step	Removing the Bus Module
1.	Put the on/off switch of the power supply module into the 0 position (⏻: output voltage 0 V).
2.	Remove the modules on the bus module that is be replaced, on all the bus modules on the right, as well as the module directly to the left.
3.	The bus modules are locked together. On the bus module that is to be replaced, press down the lock of the bus module on the right, and push the bus module(s) on the right to the right.
4.	On the bus module on the left, press down the lock of the bus module that is to be replaced and push this one to the right.
5.	Using a screwdriver push the lock down towards the rail.
6.	Lift the bus module off the rail. You can also pull the bus module out from the right side of the rail.



Installing a New Bus Module

Install the new bus module as described in Section 4.2.3.

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7.7 Changing Fuses in Digital Output Modules

Fuses for Digital Outputs

Fuses are used for the individual channel groups of the digital outputs of the following digital output modules, to protect these against short circuit:

- SM 322 DO 16 × 120V AC digital output module
- SM 322 DO 8 × 120/230V AC

Replacement Fuses

If you have to change fuses, you can use, for example, the following replacement fuses:

- Fuse 8 A, 250 V (e. g. Wickmann 19 194-8 A; Schurter SP001.013; Littlefuse 217.008)
- Fuse holder (e. g. Wickmann 19 653)

Position of the Fuses

The digital output modules have 1 fuse per channel group. The fuses are located at the left side of the digital output module. Figure 7-2 shows you where to find the fuses on the digital output modules.

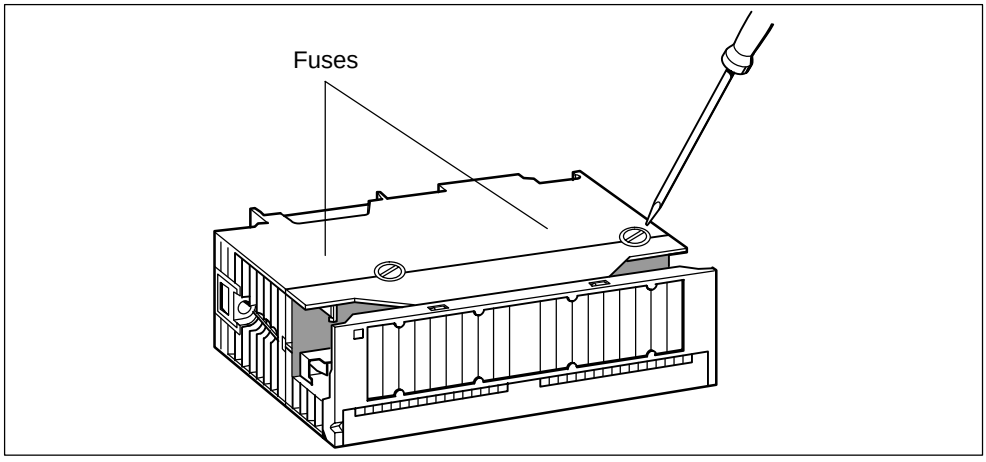


Figure 7-2 Location of the fuses on digital output modules

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Changing Fuses

The fuses are located at the left side of the module.

1. Remove the digital output module as described in Section 7.4
2. Remove the fuse holder from the digital output module.
3. Replace the fuse.
4. Screw the fuse holder back into the digital output module.
5. Install the digital output module again (see Section 7.4).

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7.8 Update of the IM 153-x

7.8.1 Update of the IM 153-1/-2Ax0x

Please contact your SIEMENS partner if you require an update of the IM 153-1 and IM 153-2Ax0x.

7.8.2 Update of the IM 153-2Bx00

When Should You Update the IM 153-2?

You should update the interface module IM 153-2 to the latest firmware version following (compatible) function-related expansions or performance improvements.

Where Can I Obtain the Latest Firmware Version?

You can obtain the latest firmware versions from your Siemens partner or from the Internet:

`http://www.siemens.com/automation/service&support`

Tip: Make a note of the current firmware.

- Make a note of the current version of your firmware before performing the update.
- If you encounter any problems with the new firmware, you can then also download the previous (current) firmware from the Internet and transfer it back to the interface module.

Principle

Updating is possible with IM 153-2 modules as of order number 6ES7 153-2Bx00-0XB0. You will require STEP 7 (V5.2 or higher) for this purpose.

There are 3 ways in which you can perform an update:

- from the PG/PC via PROFIBUS-DP (direct)
- from the PG/PC via PROFIBUS-DP and CPU
- via SIMATIC Micro Memory Card (MMC)

On completion of the update, the sticker showing the previous firmware version of the IM 153-2 must be covered by a sticker showing the updated firmware version.

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Prerequisites

For update via PROFIBUS-DP

- The IM 153-2 in the station which is to be updated must be accessible online.
- The files with the current (new) version of the firmware must be available in the file system of your PG/PC.

For update via MMC

- The update files must be available on the MMC.

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Sample Configuration

Update from the PG/PC via PROFIBUS-DP (Direct)

The PG/PC with the update files is connected directly to the PROFIBUS interface of the IM 153-2 (see Figure 7-3).

Note

If no STEP 7 project containing the IM 153-2 concerned is available, the update can also be performed using the online view (Accessible Nodes) in STEP 7.

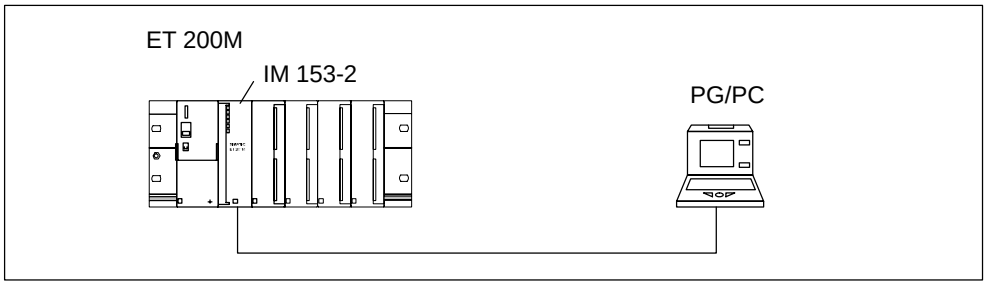


Figure 7-3 Update via PROFIBUS-DP (PG/PC directly connected to IM 153-2)

Update from the PG/PC via PROFIBUS-DP and CPU

The PG/PC with the update files is connected to the MPI interface of the CPU. The IM 153-2 is connected to the 2nd interface of the CPU via PROFIBUS-DP (see Figure 7-4). The IM 153-2 must be integrated in the STEP 7 project on the CPU.

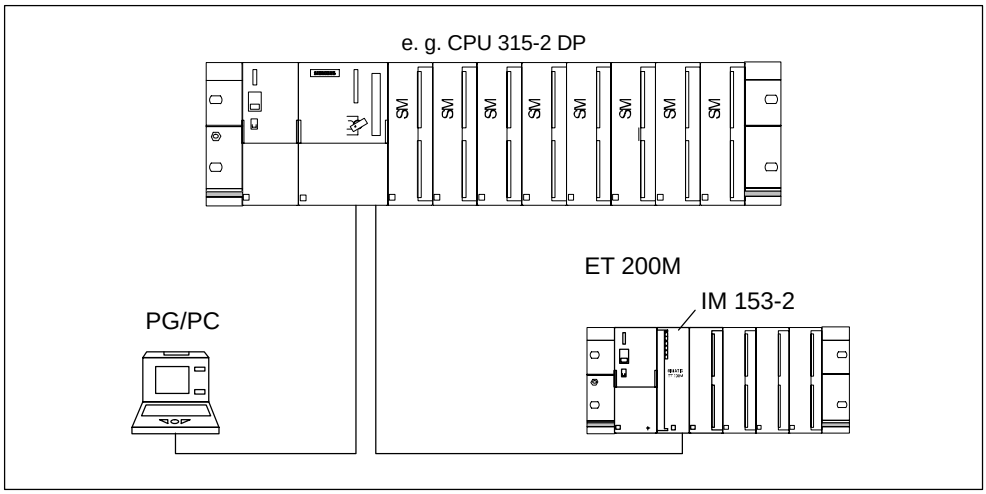


Figure 7-4 Update via PROFIBUS-DP (PG/PC connected to IM 153-2 via CPU)

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Update via MMC

You perform an update via MMC in the following way:

Table 7-8 Update via MMC

Step	You must do this:	This happens at the IM 153-2:
1.	Transfer the update files to an MMC using STEP 7 and your programming device. Any data stored on the MMC is overwritten by the update files.	–
2.	De-energize the IM 153-2 and insert the MMC with the update.	–
3.	Switch on the power supply.	• The IM 153-2 automatically detects the MMC with the update files and starts the update. • The SF and BF LEDs light up during the update. • When the update has been completed, the BF LED flashes at 0.5 Hz.
4.	De-energize the IM 153-2 and remove the MMC with the update. To eject the MMC, press the ejector button in the bottom part of the module compartment using a small screwdriver or ball-point pen.	–

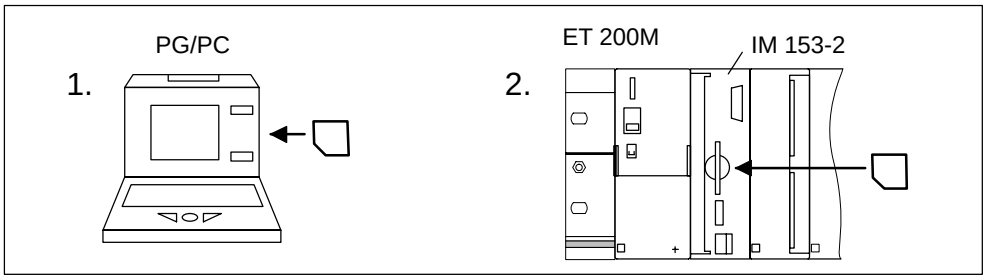


Figure 7-5 Update via MMC

The LED displays which appear during the update are shown in Section 6.2.

The following MMCs are available for the update:

Table 7-9 MMCs available for updating the IM 153-2

Type	Order Numbers
MMC 2M	6ES7 953-8LL00-0AA0
MMC 4M	6ES7 953-8LM00-0AA0
MMC 8M	6ES7 953-8LP10-0AA0

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Update in the Redundant System

If the update of the active IM 153-2 is performed via PROFIBUS-DP, the reset which is performed afterwards automatically triggers the switchover between the two IM 153-2 modules. We recommend that you then also update the second IM 153-2 in the redundant system. The update must be performed separately for each IM 153-2.

Restart After Update

Update via PROFIBUS-DP

In the STEP 7 user interface, it is possible to set whether

- the IM 153-2 performs a reset automatically on completion of the update in order to start up with the newly loaded firmware

Caution

If the ”Update Firmware After Loading” box is selected, there will be a brief station failure of the ET 200M. If no precautions have been taken to counter this, the update causes the CPU to enter STOP mode owing to rack failure.

- the IM 153-2 is to be reset by switching off the supply voltage before the IM 153-2 starts up with the new firmware when the supply voltage is switched on again.

Update via MMC

On completion of the update, the IM 153-2 remains in a state which can only be left by switching off the supply voltage. If the update was successful, the IM 153-2 starts up with the new firmware the next time the supply voltage is switched on.

Update Not Successful

If the update is unsuccessful, the IM 153-2 always starts up with the currently loaded (”old”) firmware when the supply voltage is switched off and then on again.

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Technical Specifications

8

In This Chapter

You will find the following:

- The standards, certificates and approvals for the ET 200M.
- The technical specifications of the IM 153-x slave interface.
- The dimensioned drawing of the IM 153-x slave interface.
- The basic circuit diagram of the IM 153-x slave interface.

Reference Manual

You can find the following in the *Module Specifications* Reference Manual:

- The technical specifications of the modules.
- General technical specifications such as information on interference immunity of the modules and mechanical, climatic environmental conditions.
- Mechanical, climatic environmental conditions for the module for use in an extended range of environmental conditions (”outdoor”).

Chapter Overview

This chapter deals with the following topics:

Section	Subject	Page
8.1	Standards, Certificates and Approvals	8-2
8.2	Parameters of the IM 153-x	8-7
8.3	Technical Specifications	8-9
8.4	Time Delay of the ET 200M	8-12

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8.1 Standards, Certificates and Approvals

CE Approval

The ET 200M distributed I/O system meets the requirements and protection objectives of the following EC Directives and complies with the harmonized European Standards (EN) that have been published in the Official Gazettes of the European Community for programmable logic controllers:

- 73/23/EEC ”Electrical Equipment for Use Within Fixed Voltage Ranges” (Low-Voltage Directive)
- 89/336/EEC ”Electromagnetic Compatibility” (EMC Directive)
- 94/9/EC ”Devices and Protection Systems for Specified Application in Hazardous Areas” (Explosion Protection Directive)

The EC declarations of conformity are being kept available for the cognizant authorities at:

Siemens Aktiengesellschaft
Automation and Drives Group
A&D AS RD4
Postfach 1963
D-92209 Amberg

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UL Approval

Underwriters Laboratories Inc. to

- UL 508 (Industrial Control Equipment)

CSA Approval

Canadian Standards Association to

- C22.2 No. 142 (Process Control Equipment)

or

Underwriters Laboratories Inc. to

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)

or

Underwriters Laboratories Inc. to

- UL 508 (Industrial Control Equipment)
- CSA C22.2 No. 142 (Process Control Equipment)
- UL 1604 (Hazardous Location)
- CSA-213 (Hazardous Location)

HAZ. LOC.

APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

Note

The currently applicable approvals can be found on the rating plate of the respective module.

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FM Approval

Factory Mutual Research (FM) to
Approval Standard Class Number 3611, 3600, 3810
APPROVED for use in
Class I, Division 2, Group A, B, C, D Tx;
Class I, Zone 2, Group IIC Tx

to EN 50021 (Electrical apparatus for potentially explosive atmospheres; Type of protection ”n”)

II 3 G EEx nA II T5

Marking for Australia

The ET 200M distributed I/O system fulfills the requirements of the standard AS/NZS 2064 (Class A).

IEC 61131

The ET 200M distributed I/O system fulfills the requirements and criteria of the standard IEC 61131-2 (Programmable Logic Controllers, Part 2: Equipment Requirements and Tests).

PROFIBUS Standard

The ET 200M distributed I/O system is based on the standard *IEC 61784-1:2002 Ed1 CP 3/1.*

PNO

PNO Certificate No.:

IM 153	Certificate Number
IM 153-1	Z00577
IM 153-2	Z00289
IM 153-2 FO	Z00289

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Ship-Building Approval

Classification organizations:

- ABS (American Bureau of Shipping)
- BV (Bureau Veritas)
- DNV (Det Norske Veritas)
- GL (Germanischer Lloyd)
- LRS (Lloyds Register of Shipping)
- Class NK (Nippon Kaiji Kyokai)

Use in Industrial Environments

SIMATIC products are designed for use in industrial environments.

Table 8-1 Use in industrial environments

Area of application	Requirements regarding	
	Electromagnetic emission	Electromagnetic immunity
Industry	EN 50081-2 : 1993	EN 50082-2 : 1995

Use in residential areas

If you use the ET 200M in residential areas, you must ensure that the emission of radio interference complies with limit class B to EN 55011.

Suitable methods to achieve the radio-interference levels of limit class B are:

- to install the ET 200M in grounded control cabinets/control boxes
- to use filters in supply cables



Warning

Personal injury and material damage may be incurred.

Personal injury and material damage may be incurred in hazardous areas if you disconnect plug and socket connections while the ET 200 distributed I/O device is in operation.

Always de-energize the ET 200M in hazardous areas before disconnecting plug and socket connections.

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Laser Safety Class Certification (for IM 153-2 FO)

Class 1 to EN 60825-1: 1994+A11: 1996 and IEC 60825-1: 1993 incl. Amendment 1:1997
The radiant power emitted when the fiber-optic cable is opened intentionally or unintentionally corresponds to hazard potential 1 to EN 60825-2: 1994 and IEC 60825-2: 1993

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8.2 Parameters of the IM 153-x

Parameter Assignment

Assign parameters to the IM 153-x and the ET 200M with *STEP 7* or *COM PROFIBUS*. If you use another configuration tool, you must integrate the device master file.

Table 8-2 Parameters of the IM 153-x

Parameters	Value Range	Default	Applicability
DPV1 mode	Disable/enable	Enable	ET 200M
Startup if preset configuration ≠ actual configuration?	Yes/no	No	ET 200M
"Module change during operation"?	Yes/no	No	ET 200M
Diagnostic interrupt	Disable/enable	Enable	ET 200M
Process interrupt	Disable/enable	Enable	ET 200M
Removal and insertion interrupts	Disable/enable	Enable	ET 200M
Analog-value format	SIMATIC S 7/ SIMATIC S 5	SIMATIC S7	ET 200M
Enhanced diagnostics	Yes/no	No	ET 200M Configuration: see Section 6.4.1 **No:** 29 bytes; **Yes:** 64 bytes in the case of the IM 153-1 and 96 bytes in the case of the IM 153-2 diagnostic frame
Module diagnosis	Disable/enable	Enable	ET 200M
Module status	Disable/enable	Enable	ET 200M
Channel-specific diagnosis	Disable/enable	Enable	ET 200M

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Parameters for Time Stamping

Assign parameters for time stamping with *STEP 7* for the ET 200M in the DP slave properties and also for each digital input module in the module properties.

Table 8-3 Parameters for time stamping

Parameters	Value Range	Default	Applicability
Time stamping	Yes/no	No	ET 200M Module Channel
RLO edge detection	Rising edge/ falling edge	Rising edge	ET 200M Module Channel
Time interval for time synchronization	1.00 s to 655.35 s (Value must correspond to the setting in the time master)	10 s	ET 200M

Parameters for Clock Synchronism

Assign parameters for clock synchronism with *STEP 7* for the ET 200M in the DP slave properties and also for each module in the module properties.

Table 8-4 Parameters for clock synchronism

Parameters	Value Range	Default	Applicability
Synchronize slave with DP cycle	Disable/enable	disable	ET 200M
Time t_i (read in process values)	(Values are preset by STEP 7)	(Value is preset by STEP 7)	ET 200M
Time t_o (read out process values)	(Values are preset by STEP 7)	(Value is preset by STEP 7)	ET 200M

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8.3 Technical Specifications

General Technical Specifications

In the *Module Specifications Reference Manual* you can find the following for the IM 153-x:

- General technical specifications that are valid for the S7-300 and ET 200M system.
- Deviating technical specifications and tests for the IM 153-1 for the extended range of environmental conditions (”outdoor”) (order number 6ES7 153-1AA**8**x-0XB0).

Technical Specifications of the IM 153

The following table contains the technical specifications for all the functions of the different IM 153-x versions. Check using Table 1-2 on page 1-9 the version as of which your IM 153-x offers this function.

Technical Specifications	IM 153-1	IM 153-2	IM 153-2 F0
Manufacturer ID	$801D_H$	$801E_H$	8071_H
Device master file • for DPV1	SIEM801D.GSD SI01801D.GSG	SIEM801E.GSD SI01801E.GSG (for IM 153-2AA0x) SI02801E.GSG (for IM 153-2BA0x)	SIEM8071.GSD SI018071.GSG (for IM 153-2AB0x) SI028071.GSG (for IM 153-2BB0x)
Dimensions and Weight			
Dimensions W × H × D (mm)	40 × 125 × 117		
Weight	360 g		
PROFIBUS-DP interface			
Baud rates	Up to 12 Mbaud		9.6; 19.2; 45.45 93.75; 187.5; 500 kbaud; 1.5; 12 Mbaud
Baud rate detection	Yes	Yes	Yes
Interface	RS 485		FO
FREEZE compatibility	Yes		
SYNC compatibility	Yes		
PROFIBUS addresses	1 to 125 permissible		
Configuration modification in RUN	No	Yes	Yes

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Technical Specifications	IM 153-1	IM 153-2	IM 153-2 F0
Time Synchronization/Time Stamping	No	Yes	
• Accuracy class	–	10 ms/3 ms	
• Time resolution	–	1 ms	
• Number of digital input signals	–	max. 128;	
• Message buffer	–	15 message buffers with a maximum of 20 messages each	
• Time interval for sending the message buffers when there is a message	–	1s	
• Time stamping	–	• Per digital input • Per digital input module • Whole ET 200M	
• Time stamp in the case of	–	Increasing/falling edge as coming or going signal	
• Time format	–	RFC 1119 Internet (ISP)	
Voltages, Currents, Potentials			
Rated voltage	24 V DC (20.4 to 28.8 V DC)		
Current drawn from 24 V	max. 350 mA	max. 550 mA	Max. 500 mA
Inrush current	2.5 A	2.5 A	3.5 A
I^2t	0.1 A^2s	0.1 A^2s	0.1 A^2s
Recommended external fusing for supply lines	not mandatory for ...		
Power losses	3 W (typical)	5 W (typical)	4.5 W (typical)

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Dimensioned Drawing of the IM 153-1/-2/-2 FO

You can find a dimensioned drawing of the rail for the active bus modules in the *Module Specifications* Reference Manual.

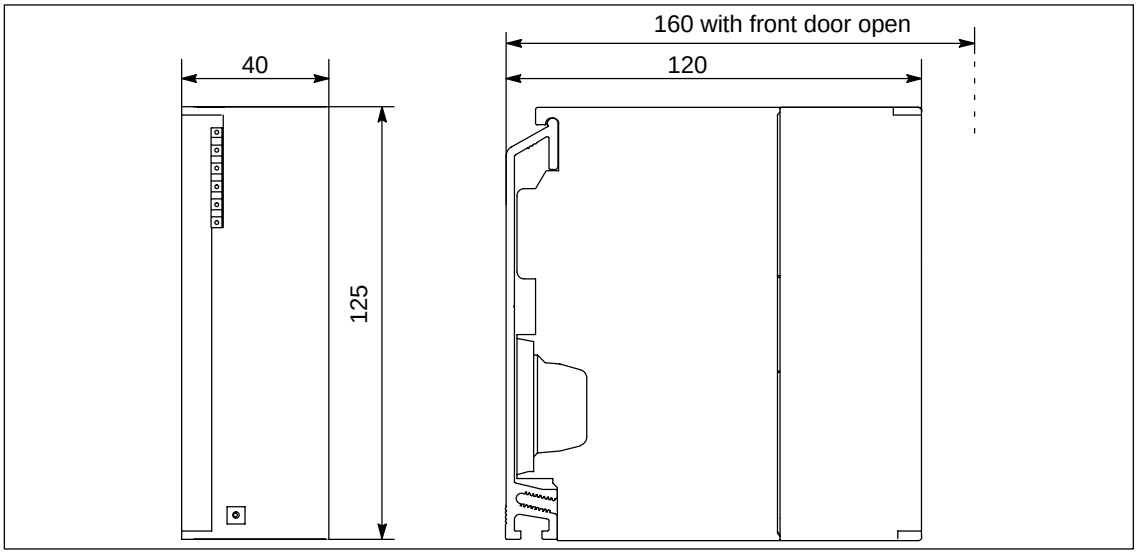


Figure 8-1 Dimensioned drawing of the IM 153-1 and IM 153-2

Basic Circuit Diagram of the IM 153-1/-2/-2 FO

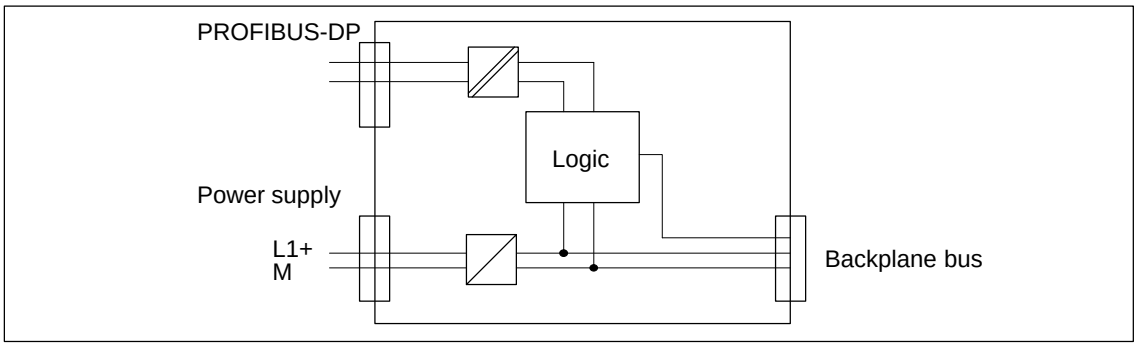


Figure 8-2 Basic circuit diagram of the IM 153-1 and IM 153-2

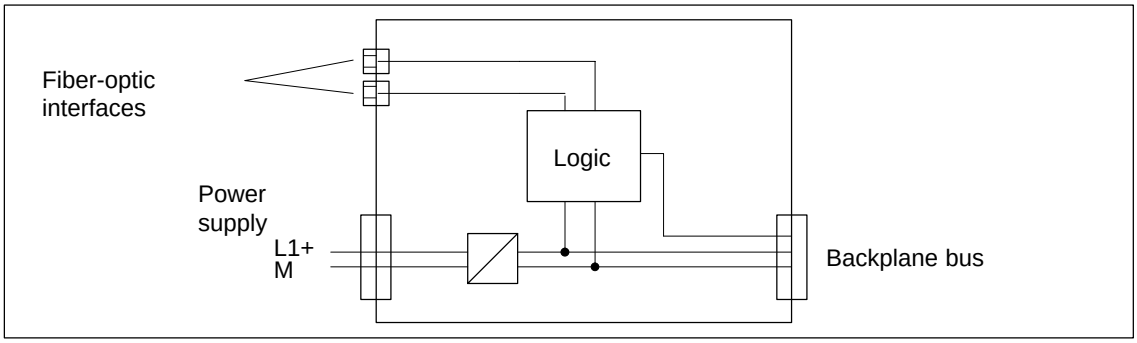


Figure 8-3 Basic circuit diagram of the IM 153-2 FO

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8.4 Time Delay of the ET 200M

Response Time – A Definition

The response time is the time between detection of the input signal and the modification of the associated output signal.

Duration

The response time depends on the bus configuration and on the DP master. You can find fundamentals for calculating the response time in the DP master manuals.

Factors

The response time for the ET 200M depends on the following factors:

- Processing the data through the ET 200M
- Delay of the inputs and outputs (see *Module Specifications Reference Manual*)

ET 200M

The time it takes to process the data in the ET 200M is typically 1 ms. Data processing in the IM 153-x and the data transfer between the IM 153-x and the inserted modules takes place in this time.

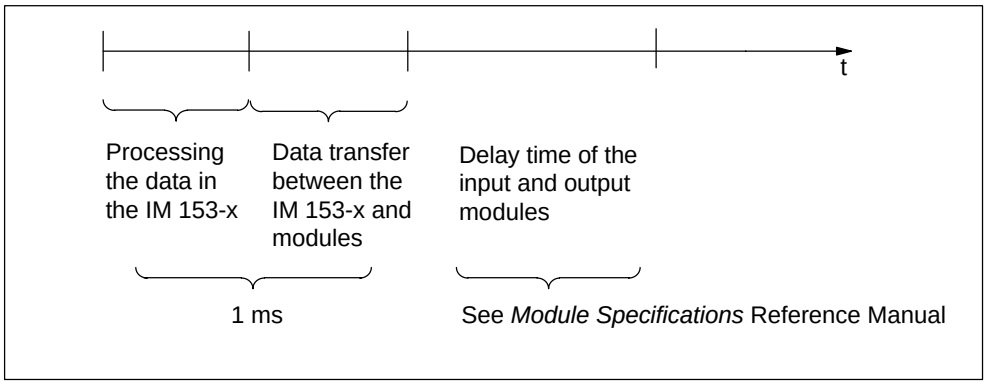


Figure 8-4 Response time of the ET 200M

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Switchover Time in the Case of Redundancy

The switchover time depends on the operating mode and the configuration:

DP Master System	ET 200M with IM 153...	Switchover Time	Configuration
S7-400H	-2AA02	70 ms	Any configuration
	-2AB01	30 ms	... without F, FM or HART modules or similar
	-2Bx00	30 ms	Any configuration
		30 ms	... without F, FM or HART modules or similar
S7 software redundancy S5-115H/155H	-2AA02	70 ms + 2 DP cycles	Any configuration
	-2AB01	30 ms + 2 DP cycles	... without F, FM or HART modules or similar
	-2Bx00	30 ms	Any configuration
		30 ms	... without F, FM or HART modules or similar

or

the set response monitoring time, if this is greater than 30 or 70 ms.

Delay Time of the Input and Output Modules

You can find out more in the technical specifications of the modules (see the *Module Specifications*) Reference Manual.

8.5 Use of the ET 200M/S7-300 in Zone 2 Hazardous Area

The following sections contain important information in the following languages.

Section	Subject
8.5.1	Einsatz der ET 200M / S7 300 im explosionsgefährdeten Bereich Zone 2
8.5.2	Use of the ET 200M / S7 300 in a Zone 2 Hazardous Area
8.5.3	Utilisation de l'ET 200M / S7 300 dans un environment à risque d'explosion en zone 2
8.5.4	Aplicación de la ET 200M / S7 300 en áreas con peligro de explosión, zona 2
8.5.5	Impiego dell'ET 200M / S7 300 nell'area a pericolo di esplosione zona 2
8.5.6	Gebruik van de ET 200M / S7 300 in het explosief gebied zone 2
8.5.7	Brug af ET 200M / S7 300 i det eksplosionfarlige område zone 2
8.5.8	ET 200M / S7 300: n käyttö räjähdysvaarannetuilla alueilla, vyöhyke 2
8.5.9	Användning av ET 200M / S7 300 i explosionsriskområde zon 2
8.5.10	Uso do ET 200M / S7 300 em área exposta ao perigo de explosão, zona 2
8.5.11	Χρηση τηζ συσΚευηζ ET 200M / S7 300 σε ...

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8.5.1 Einsatz der ET 200M / S7-300 im explosionsgefährdeten Bereich Zone 2

Zone 2

Explosionsgefährdete Bereiche werden in Zonen eingeteilt. Die Zonen werden nach der Wahrscheinlichkeit des Vorhandenseins einer explosionsfähigen Atmosphäre unterschieden.

Zone	Explosionsgefahr	Beispiel
2	explosive Gasatmosphäre tritt nur selten und kurzzeitig auf	Bereiche um Flanschverbindungen mit Flachdichtungen bei Rohrleitungen in geschlossenen Räumen
sicherer Bereich	nein	• außerhalb der Zone 2 • Standardanwendungen von dezentraler Peripherie

Nachfolgend finden Sie wichtige Hinweise für die Installation des Dezentralen Peripheriegerätes ET 200M und der SIMATIC S7-300 im explosionsgefährdeten Bereich.

Weitere Informationen

Weitere Informationen zum ET 200M und zu den verschiedenen S7-300-Baugruppen finden Sie im Handbuch.

Fertigungsort

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Zulassung

 **II 3 G** **EEx nA II T3 .. T6** nach EN 50021 : 1999

Prüfnummer: **KEMA 02ATEX1096 X**

Hinweis

Baugruppen mit der Zulassung  II 3 G EEx nA II T3 .. T6 dürfen nur in Automatisierungssysteme SIMATIC S7-300 / ET 200M der Gerätekategorie 3 eingesetzt werden.

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Instandhaltung

Für eine Reparatur muss die betroffene Baugruppe an den Fertigungsort geschickt werden. Nur dort darf die Reparatur durchgeführt werden.

Besondere Bedingungen

1. Das Dezentrale Peripheriegerät ET 200M und die SIMATIC S7-300 müssen in einen Schaltschrank oder ein metallisches Gehäuse eingebaut werden. Diese müssen mindestens die Schutzart IP 54 (nach EN 60529) gewährleisten. Dabei sind die Umgebungsbedingungen zu berücksichtigen, in denen das Gerät installiert wird. Für das Gehäuse muss eine Herstellererklärung für Zone 2 vorliegen (gemäß EN 50021).
2. Wenn am Kabel bzw. an der Kabeleinführung dieses Gehäuses unter Betriebsbedingungen eine Temperatur > 70 °C erreicht wird oder wenn unter Betriebsbedingungen die Temperatur an der Aderverzweigung > 80 °C sein kann, müssen die Temperatureigenschaften der Kabel mit den tatsächlich gemessenen Temperaturen übereinstimmen.
3. Die eingesetzten Kabeleinführungen müssen der geforderten IP-Schutzart und dem Abschnitt 7.2 (gemäß EN 50021) entsprechen.
4. Alle Geräte, einschließlich Schalter etc., die an den Ein- und Ausgängen von ET 200M- und S7-300-Systemen angeschlossen werden, müssen für den Explosionsschutz Typ EEx nA oder EEx nC genehmigt sein.
5. Es müssen Maßnahmen getroffen werden, dass die Nennspannung durch Transienten um nicht mehr als 40 % überschritten werden kann.
6. Umgebungstemperaturbereich: 0° C bis 60° C
7. Innerhalb des Gehäuses ist an einem nach dem Öffnen gut sichtbaren Platz ein Schild mit folgender Warnung anzubringen:
   Warnung
   Das Gehäuse darf nur kurze Zeit geöffnet werden, z. B. für visuelle Diagnose. Betätigen Sie dabei keine Schalter, ziehen oder stecken keine Baugruppen und trennen keine elektrischen Leitungen (Steckverbindungen).
   Diese Warnung kann unberücksichtigt bleiben, wenn bekannt ist, dass keine explosionsgefährdete Atmosphäre herrscht.

Liste der zugelassenen Baugruppen

Die Liste mit den zugelassenen Baugruppen finden Sie im Internet:

`http://www4.ad.siemens.de/view/cs/`

unter der Beitrags-ID 13702947.

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8.5.2 Use of the ET 200M / S7-300 in a Zone 2 Hazardous Area

Zone 2

Hazardous areas are divided up into zones. The zones are distinguished according to the probability of the existence of an explosive atmosphere.

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 200M distributed I/O device and the SIMATIC S7-300 in a hazardous area.

Further Information

You will find further information on the ET 200M and the various S7-300 modules in the manual.

Production Location

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Certification

 **II 3 G** **EEx nA II T3 .. T6** to EN 50021 : 1999

Test number: **KEMA 02ATEX1096 X**

Note

Modules with  II 3 G EEx nA II T3 .. T6 certification can only be used in SIMATIC S7-300/ET 200M automation systems belonging to equipment category 3.

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Maintenance

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

Special Conditions

1. The ET 200M distributed I/O device and the SIMATIC S7-300 must be installed in a cabinet or metal housing. These must comply with the IP 54 degree of protection 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 50021).
2. 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.
3. The cable entries used must comply with the required IP degree of protection and Section 7.2 (in accordance with EN 50021).
4. All devices (including switches, etc.) that are connected to the inputs and outputs of fail-safe signal modules must be approved for EEx nA or EEx nC explosion protection.
5. Steps must be taken to ensure that the rated voltage through transients cannot be exceeded by more than 40 %.
6. Ambient temperature range: 0° C to 60° C
7. A sign containing the following warning must be put up inside the housing in an easily visible position when the housing is opened:
   Warning
   The housing can only be opened for a short time (e.g. 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 (i.e. there is no risk of explosion).

List of Approved Modules

You will find the list of approved modules under the ID 13702947 on the Internet:

http://www4.ad.siemens.de/view/cs/.

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8.5.3 Utilisation de l'ET 200M / S7-300 dans un environnement à risque d'explosion en zone 2

Zone 2

Les environnements à risque d'explosion sont répartis en zones. Les zones se distinguent par la probabilité de présence d'une atmosphère explosive.

Zone	Risque d'explosion	Exemple
2	Formation rare et brève d'une atmosphère gazeuse explosive	Environnement de raccords à joints plats dans le cas de conduites dans des locaux fermés
Zone sûre	Non	• A l'extérieur de la zone 2 • Utilisation standard de périphérie décentralisée

Vous trouverez ci-après des remarques importantes pour l'installation de la station de périphérie décentralisée ET 200M et du SIMATIC S7-300 dans un environnement présentant un risque d'explosion.

Informations complémentaires

Des informations complémentaires sur l'ET 200M et les divers modules S7-300 se trouvent dans le manuel.

Lieu de production

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Homologation

⟨Ex⟩ **II 3 G** **EEx nA II T3 .. T6** selon EN 50021 : 1999

Numéro de contrôle : **KEMA 02ATEX1096 X**

Nota

Les modules homologués ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 ne peuvent être utilisés que dans des automates SIMATIC S7-300 / ET 200M de catégorie 3.

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Entretien

Si une réparation est nécessaire, le module concerné doit être expédié au lieu de production. La réparation ne doit être effectuée qu'en ce lieu.

Conditions particulières

1. La station de périphérie décentralisée ET 200M et le SIMATIC S7-300 doivent être installés dans une armoire ou un boîtier métallique. Ceux-ci doivent assurer au moins l'indice de protection IP 54. Il faut alors tenir compte des conditions d'environnement dans lesquelles l'appareil est installé. Le boîtier doit faire l'objet d'une déclaration de conformité du fabricant pour la zone 2 (selon EN 50021).
2. Si dans les conditions d'exploitation, une température > 70 °C est atteinte au niveau du câble ou de l'entrée du câble dans ce boîtier, ou bien si la température au niveau de la dérivation des conducteurs peut être > 80 °C, les capacités de résistance thermique des câbles doivent corespondre aux températures effectivement mesurées.
3. Les entrées de câbles utilisées doivent avoir le niveau de protection IP exigé et être conformes au paragraphe 7.2 (selon EN 50021).
4. Tous les appareillages (y compris les interrupteurs, etc.) raccordés aux entrées et sorties de modules de signaux à sécurité intrinsèque doivent être homologués pour la protection antidéflagrante type EEx nA ou EEx nC.
5. Il faut prendre des mesures pour que la tension nominale ne puisse pas être dépassée de plus de 40% sous l'influence de transitoires.
6. Plage de température ambiante : 0° C à 60° C
7. A l'intérieur du boîtier, il faut placer, à un endroit bien visible après ouverture, une plaquette comportant l'avertissement suivant :
   Avertissement
   Ouvir le boîtier le moins longtemps possible, par exemple pour effectuer un diagnostic visuel. Ce faisant, n'actionnez aucun commutateur, ne déconnectez aucun module et ne débanchez pas de câbles électriques (connexions).
   Le respect de cet avertissement n'est pas impératif s'il est certain que l'environnement ne présente pas de risque d'explosion.

Liste des modules homologués

Vous trouverez sur Internet la liste des modules homologués :

http://www4.ad.siemens.de/view/cs/

référence ID 13702947.

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8.5.4 Aplicación de la ET 200M / S7-300 en áreas con peligro de explosión, zona 2

Zona 2

Las áreas con peligro de explosión se clasifican en zonas. Las zonas se diferencian según la probabilidad de la existencia de una atmósfera capaz de sufrir una explosión.

Zona	Peligro de explosión	Ejemplo
2	La atmósfera explosiva de gas sólo se presenta rara vez y muy brevemente	Áreas alrededor de uniones abridadas con juntas planas en tuberías en locales cerrados
Área segura	no	• fuera de la zona 2 • Aplicaciones estándar de la periferia descentralizada

A continuación encontrará importantes informaciones para la instalación de la unidad periférica descentralizada ET 200M y del SIMATIC S7-300 en áreas con peligro de explosión.

Otras informaciones

Encontrará otras informaciones relativas a la ET 200S y a los distintos módulos S7-300 en el Manual.

Lugar de fabricación

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Homologación

⟨Ex⟩ **II 3 G** **EEx nA II T3 .. T6** según norma EN 50021 : 1999

Número de comprobación: **KEMA 02ATEX1096 X**

Nota

Los módulos con la homologación ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 pueden utilizarse únicamente en los autómatas programables SIMATIC S7-300 / ET 200M de la categoría de equipo 3.

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Mantenimiento

Para una reparación se ha de remitir el módulo afectado al lugar de fabricación. Sólo allí se puede realizar la reparación.

Condiciones especiales

1. La unidad periférica descentralizada ET 200M y el SIMATIC S7-300 se han de montar en un armario eléctrico de distribución o en una carcasa metálica. Éstos deben garantizar como mínimo el grado de protección IP 54. Para ello se han de tener en cuenta las condiciones ambientales, en las cuales se instala el equipo. La caja deberá contar con una declaración del fabricante para la zona 2 (conforme a EN 50021).
2. Si durante la operación se alcanzara una temperatura > 70° C en el cable o la entrada de cables de esta caja o bien una temperatura > 80° C en la bifurcación de hilos, deberán adaptarse las propiedades térmicas de los cables a las temperaturas medidas efectivamente.
3. Las entradas de cable utilizadas deben cumplir el grado de protección IP exigido y lo expuesto en el apartado 7.2 (conforme a EN 50021).
4. Todos los dispositivos –inclusive interruptores, etc.– conectados a las entradas y salidas de módulos de señales de alta disponibilidad deben estar homologados para la protección contra explosiones del tipo EEx nA o EEx nC.
5. Es necesario adoptar las medidas necesarias para evitar que la tensión nominal pueda rebasar en más del 40 % debido a efectos transitorios.
6. Margen de temperatura ambiente: 0° C hasta 60° C
7. Dentro de la caja deberá colocarse en un lugar perfectamente visible tras su apertura un rótulo con la siguiente advertencia:
   Precaución
   Abrir la caja sólo brevemente, p.ej. para el diagnóstico visual. Durante este tiempo Ud. no deberá activar ningún interruptor, desenchufar o enchufar módulos ni separar conductores eléctricos (conexiones enchufables).
   Esta advertencia puede ignorarse si Ud. sabe que en la atmósfera existente no hay peligro de explosión.

Lista de los módulos homologados

En la internet hallará Ud. una lista con los módulos homologados:

http://www4.ad.siemens.de/view/cs/

bajo el ID de asignación 13702947.

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8.5.5 Impiego dell'ET 200M / S7-300 nell'area a pericolo di esplosione zona 2

Zona 2

Le aree a pericolo di esplosione vengono suddivise in zone. Le zone vengono distinte secondo la probabilità della presenza di un'atmosfera esplosiva.

Zona	Pericolo di esplosione	Esempio
2	L'atmosfera esplosiva si presente solo raramente e brevemente	Aree intorno a collegamenti a flange con guarnizioni piatte nelle condotte in ambienti chiusi
Area sicura	No	• Al di fuori della zona 2 • Applicazioni standard di periferia decentrata

Qui di seguito sono riportate delle avvertenze importanti per l'installazione dell'unità di periferia decentrata ET 200M e del SIMATIC S7-300 nell'area a pericolo di esplosione.

Ulteriori informazioni

Ulteriori informazioni sull'ET 200M e sulle diverse unità S7-300 si trovano nel manuale.

Luogo di produzione

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Autorizzazione

 **II 3 G** **EEx nA II T3 .. T6** secondo EN 50021 : 1999

Numero di controllo: **KEMA 02ATEX1096 X**

Avvertenza

Le unità con l'autorizzazione  II 3 G EEx nA II T3 .. T6 possono essere impiegate solo nei sistemi di controllori programmabili SIMATIC S7-300 / ET 200M della categoria di apparecchiature 3.

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Manutenzione

Per una riparazione, l'unità interessata deve essere inviata al luogo di produzione. La riparazione può essere effettuata solo lì.

Condizioni particolari

1. L'unità di periferia decentrata ET 200M e il SIMATIC S7-300 devono essere montati in un armadio elettrico o in un contenitore metallico. Questi devono assicurare almeno il tipo di protezione IP 54. In questo caso bisogna tenere conto delle condizioni ambientali nelle quali l'apparecchiatura viene installata. Per il contenitore deve essere presente una dichiarazione del costruttore per la zona 2 (secondo EN 50021).
2. Se nei cavi o nel loro punto di ingresso in questo contenitore viene raggiunta in condizioni di esercizio una temperatura > 70 °C o se in condizioni di esercizio la temperatura nella derivazione dei fili può essere > 80 °C, le caratteristiche di temperatura dei cavi devono essere conformi alla temperatura effettivamente misurata.
3. Gli ingressi dei cavi usati devono essere conformi al tipo di protezione richiesto e alla sezione 7.2 (secondo EN 50021).
4. Tutte le apparecchiature, inclusi interruttori, ecc. che vengono collegati agli ingressi/uscite di unità di segnale ad elevata sicurezza, devono essere stati omologati per la protezione da esplosione tipo EEx nA o EEx nC.
5. Devono essere prese delle misure per evitare che la tensione nominale possa essere superata per più del 40% da parte di transienti.
6. Campo termico ambientale: da 0° C a 60° C
7. All'interno del contenitore va apportata, in un luogo ben visibile dopo l'apertura, una targhetta con il seguente avvertimento:
   Attenzione
   Il contenitore può rimanere aperto solo per breve tempo, ad esempio per una diagnostica a vista. In tal caso non azionare alcun interruttore, non disinnestare o innestare unità e non staccare connessioni elettriche (connettori).
   Non è necessario tenere conto di questo avvertimento se è noto che non c'è un'atmosfera a rischio di esplosione.

Elenco delle unità abilitate

La lista con le unità omologate si trova in Internet al sito:

http://www4.ad.siemens.de/view/cs/

all'ID di voce 13702947.

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8.5.6 Gebruik van de ET 200M / S7-300 in het explosief gebied zone 2

Zone 2

Explosieve gebieden worden ingedeeld in zones. Bij de zones wordt onderscheiden volgens de waarschijnlijkheid van de aanwezigheid van een explosieve atmosfeer.

Zone	Explosiegevaar	Voorbeeld
2	Een explosieve gasatmosfeer treedt maar zelden op en voor korte duur	Gebieden rond flensverbindingen met pakkingen bij buisleidingen in gesloten vertrekken
Veilig gebied	neen	• Buiten de zone 2 • Standaardtoepassingen van decentrale periferie

Hierna vindt u belangrijke aanwijzingen voor de installatie van het decentrale periferieapparaat ET 200M en van de SIMATIC S7-300 in het explosief gebied.

Verdere informatie

In het handboek vindt u verdere informatie over de ET 200M en over de verschillende
S7-300-modulen.

Productieplaats

Siemens AG, Bereich A&D
Werner-von-Siemens-Strasse 50
92224 Amberg
Germany

Vergunning

 **II 3 G** **EEx nA II T3 .. T6** conform EN 50021 : 1999

Keuringsnummer: **KEMA 02ATEX1096 X**

Opmerking

Modulen met de vergunning  II 3 G EEx nA II T3 .. T6 mogen slechts worden gebruikt in automatiseringssystemen SIMATIC S7-300 / ET 200M van de apparaatcategorie 3.

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Instandhouding

Voor een reparatie moet de betreffende module naar de plaats van vervaardiging worden gestuurd. Alleen daar mag de reparatie worden uitgevoerd.

Speciale voorwaarden

1. Het decentrale periferieapparaat ET 200M en de SIMATIC S7-300 moeten worden ingebouwd in een schakelkast of in een behuizing van metaal. Deze moeten minstens de veiligheidsgraad IP 54 waarborgen. Hierbij dient rekening te worden gehouden met de omgevingsvoorwaarden waarin het apparaat wordt geïnstalleerd. Voor de behuizing dient een verklaring van de fabrikant voor zone 2 te worden ingediend (volgens EN 50021).
2. Als aan de kabel of aan de kabelinvoering van deze behuizing onder bedrijfsomstandigheden een temperatuur wordt bereikt > 70 °C of als onder bedrijfsomstandigheden de temperatuur aan de adervertakking > 80 °C kan zijn, moeten de temperatuureigenschappen van de kabel overeenstemmen met de werkelijk gemeten temperaturen.
3. De aangebrachte kabelinvoeringen moeten de vereiste IP-veiligheidsgraad hebben en in overeenstemming zijn met alinea 7.2 (volgens EN 50021).
4. Alle apparaten, schakelaars enz. inbegrepen, die worden aangesloten op de in- en uitgangen van tegen fouten beveiligde signaalmodulen, moeten zijn goedgekeurd voor de explosiebeveiliging type EEx nA of EEx nC.
5. Er dienen maatregelen te worden getroffen, zodat de nominale spanning door transiënten met niet meer dan 40 % kan worden overschreden.
6. Omgevingstemperatuurbereik: 0° C tot 60° C
7. Binnen de behuizing dient op een na het openen goed zichtbare plaats een bord te worden aangebracht met de volgende waarschuwing:
   Waarschuwing
   De behuizing mag slechts voor korte tijd worden geopend, bijv. voor een visuele diagnose. Bedien hierbij geen schakelaar, trek of steek geen modulen en ontkoppel geen elektrische leidingen (steekverbindingen).
   Deze waarschuwing kan buiten beschouwing blijven, indien bekend is dat er geen explosieve atmosfeer heerst.

Lijst van de toegelaten modulen

De lijst met de toegelaten modulen vindt u in het internet:

http://www4.ad.siemens.de/view/cs/

onder de bijdrage-ID 13702947.

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8.5.7 Brug af ET 200M / S7-300 i det eksplosionfarlige område zone 2

Zone 2

Eksplosionsfarlige områder inddeles i zoner. Zonerne adskiller sig indbyrdes efter hvor sandsynligt det er, at der er en eksplosiv atmosfære.

Zone	Eksplosionsfare	Eksempel
2	Eksplosiv gasatmosfære optræder kun sjældent og varer kort	Områder rundt om flangeforbindelser med flade pakninger ved rørledninger i lukkede rum
Sikkert område	Nej	• Uden for zone 2 • Standardanvendelser decentral periferi

I det følgende findes vigtige henvisninger vedr. installation af det decentrale periferiudstyr ET 200M og SIMATIC S7-300 i det eksplosionfarlige område.

Yderligere informationer

Yderligere informationer om ET 200M og de forskellige S7-300-komponenter findes i manualen.

Produktionssted

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Godkendelse

⟨Ex⟩ **II 3 G** **EEx nA II T3 .. T6** efter EN 50021 : 1999

Kontrolnummer: **KEMA 02ATEX1096 X**

Bemærk

Komponenter med godkendelsen ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 må kun monteres i automatiseringssystemer SIMATIC S7-300 / ET 200M - udstyrskategori 3.

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Vedligeholdelse

Skal den pågældende komponent repareres, bedes De sende den til produktionsstedet. Reparation må kun udføres der.

Særlige betingelser

1. Det decentrale periferiudstyr ET 200M og SIMATIC S7-300 skal monteres i et kontrolskab eller et metalkabinet. Disse skal mindst kunne sikre beskyttelsesklasse IP 54. I denne forbindelse skal der tages højde for de omgivelsestemperaturer, i hvilke udstyret er installeret. Der skal være udarbejdet en erklæring fra fabrikanten for kabinettet for zone 2 (iht. EN 50021).
2. Hvis kablet eller kabelindføringen på dette hus når op på en temperatur på > 70 °C under driftsbetingelser eller hvis temperaturen på åreforegreningen kan være > 80 °C under driftsbetingelser, skal kablernes temperaturegenskaber stemme overens med de temperaturer, der rent faktisk måles.
3. De benyttede kabelindføringer skal være i overensstemmelse med den krævede IP-beskyttelsestype og afsnittet 7.2 (iht. EN 50021).
4. Alle apparater, inkl. kontakter osv., der forbindes med ind- og udgangene til fejlsikre signalkomponenter, skal være godkendt til eksplosionsbeskyttelse af type EEx nA eller EEx nC.
5. Der skal træffes foranstaltninger, der sørger for, at den nominelle spænding via transienter ikke kan overskrides mere end 40 %.
6. Omgivelsestemperaturområde: 0° C til 60° C
7. I kabinettet skal der anbringes et skilt, der skal kunne ses, når kabinettet åbnes. Dette skilt skal have følgende advarsel:
   Advarsel
   Kabinettet må kun åbnes i kort tid, f.eks. til visuel diagnose. Tryk i denne forbindelse ikke på kontakter, træk eller isæt ikke komponenter og afbryd ikke elektriske ledninger (stikforbindelser).
   Denne advarsel skal der ikke tages højde for, hvis man ved, at der ikke er nogen eksplosionsfarlig atmosfære.

Liste over godkendte komponenter

Listen med de godkendte komponenter findes på internettet:

http://www4.ad.siemens.de/view/cs/

under bidrags-ID 13702947.

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8.5.8 ET 200M / S7-300:n käyttö räjähdysvaarannetuilla alueilla, vyöhyke 2

Vyöhyke 2

Räjähdysvaarannetut alueet jaetaan vyöhykkeisiin. Vyöhykkeet erotellaan räjähdyskelpoisen ilmakehän olemassa olon todennäköisyyden mukaan.

Vyöhyke	Räjähdysvaara	Esimerkki
2	Räjähtävä kaasuilmakehä ilmaantuu vain harvoin ja lyhytaikaisesti	Alueet putkistojen lattatiivisteillä varustuilla laippaliitoksilla suljetuissa tiloissa
turvallinen alue	ei	• vyöhykkeen 2 ulkopuolella • Hajautetun ulkopiirin vakiosovellukset

Seuraavasta löydätte tärkeitä ohjeita hajautetun ulkopiirilaitteen ET 200M ja SIMATIC S7-300 asennukseen räjähdysvaarannetuilla alueilla.

Lisätietoja

Lisätietoja ET 200M:ään ja erilaisiin S7-300-rakenneryhmiin löydätte ohjekirjasta.

Valmistuspaikka

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Hyväksyntä

 **II 3 G** **EEx nA II T3 .. T6** EN 50021 mukaan: 1999

Tarkastusnumero: **KEMA 02ATEX1096 X**

Ohje

Rakenneryhmät hyväksynnän  II 3 G EEx nA II T3 .. T6 kanssa saadaan käyttää ainoastaan laitekategorian 3 automatisointijärjestelmissä SIMATIC S7-300 / ET 200M.

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Kunnossapito

Korjausta varten täytyy kyseinen rakenneryhmä lähettää valmistuspaikkaan. Korjaus voidaan suorittaa ainoastaan siellä.

Erityiset vaatimukset

1. Hajautettu ulkopiirilaite ET 200M ja SIMATIC S7-300 täytyy asentaa kytkentäkaappiin tai metalliseen koteloon. Näiden täytyy olla vähintään kotelointiluokan IP 54 mukaisia. Tällöin on huomioitava ympäristöolosuhteet, johon laite asennetaan. Kotelolle täytyy olla valmistajaselvitys vyöhykettä 2 varten (EN 50021 mukaan).
2. Kun johdolla tai tämän kotelon johdon sisäänviennillä saavutetaan > 70 °C lämpötila tai kun käyttöolosuhteissa lämpötila voi piuhajaotuksella olla > 80 °C, täytyy johdon lämpötilaominaisuuksien vastata todellisesti mitattuja lämpötiloja.
3. Käytettyjen johtojen sisäänohjauksien täytyy olla vaaditun IP-kotelointiluokan ja kohdan 7.2 (EN 50021 mukaan) mukaisia.
4. Kaikkien laitteiden, kytkimet jne. mukaan lukien, jotka liitetään virheiltä suojattujen signaalirakenneryhmien tuloille ja lähdöille, täytyy olla hyväksyttyjä tyypin EEx nA tai EEx nC räjähdyssuojausta varten.
5. Toimenpiteet täytyy suorittaa, ettei nimellisjännite voi transienttien kautta ylittyä enemmän kuin 40 %.
6. Ympäristölämpötila-alue: 0° C ... 60° C
7. Kotelon sisälle, avauksen jälkeen näkyvälle paikalle, on kiinnitettävä kilpi, jossa on seuraava varoitus:
   Varoitus
   Kotelo saadaan avata ainoastaan lyhyeksi ajaksi, esim. visuaalista diagnoosia varten. Älä tällöin käytä mitään kytkimiä, vedä tai liitä mitään rakenneryhmiä, äläkä erota mitään sähköjohtoja (pistoliittimiä).
   Tätä varoitusta ei tarvitse huomioida, kun on tiedossa, että minkäänlaista räjähdysvaarannettua ilmakehää ei ole olemassa.

Hyväksyttyjen rakenneryhmien lista

Lista hyväksiytyistä rakennesarjoista löytyy internetistä osoitteesta:

http://www4.ad.siemens.de/view/cs/

käyttäjätunnuksella 13702947.

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8.5.9 Användning av ET 200M / S7-300 i explosionsriskområde zon 2

Zon 2

Explosionsriskområden delas in i zoner. Zonerna delas in enligt sannolikheten att en atmosfär med explosionsfara föreligger.

Zon	Explosionsfara	Exempel
2	Explosiv gasatmosfär uppstår endast sällan eller kortvarigt	Områden kring flänsförbindelser med packningar vid rörledningar i slutna utrymmen
Säkert område	Nej	• Utanför zon 2 • Standardanvändning av decentral periferi

Nedan följer viktiga anvisningar om installationen av den decentrala periferienheten ET 200M och SIMATIC°S7-300 i ett explosionsriskområde.

Ytterligare information

Ytterligare information om ET 200M och de olika S7-300-komponentgrupperna finner du i handboken.

Tillverkningsort

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Godkännande

 **II 3 G** **EEx nA II T3 .. T6** enligt EN 50021 : 1999

Kontrollnummer: **KEMA 02ATEX1096 X**

Anvisning

Komponentgrupper med godkännande  II 3 G EEx nA II T3 .. T6 får endast användas i automatiseringssystemen SIMATIC S7-300 / ET°200M från apparatgrupp 3.

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Underhåll

Vid reparation måste den aktuella komponentgruppen insändas till tillverkaren. Reparationer får endast genomföras där.

Särskilda villkor

1. Den decentrala periferienheten ET 200M och SIMATIC°S7-300 måste monteras i ett kopplingsskåp eller metallhus. Dessa måste minst vara av skyddsklass IP 54. Därvid ska omgivningsvillkoren där enheten installeras beaktas. För kåpan måste en tillverkardeklaration för zon 2 föreligga (enligt EN 50021).
2. Om en temperatur på > 70°C uppnås vid husets kabel resp kabelinföring under driftvillkor eller om temperaturen vid trådförgreningen kan vara > 80°C under driftvillkor, måste kabelns temperaturegenskaper överensstämma med den verkligen uppmätta temperaturen.
3. De använda kabelinföringarna måste uppfylla kraven i det krävda IP-skyddsutförandet och i avsnitt 7.2 (enligt EN 50021).
4. Alla apparater, inklusive brytare osv, som ansluts till felsäkrade signalenheters in- och utgångar, måste vara godkända för explosionsskydd av typ EEx nA eller EEx nC.
5. Åtgärder måste vidtas så, att märkspänningen ej kan överskridas med mer än 40°% genom transienter.
6. Omgivningstemperatur: 0° C till 60° C
7. När huset öppnats ska en skylt med följande varning monteras på ett tydligt synligt ställe huset:
   Varning
   Huset får endast öppnas under kort tid, t ex för visuell diagnos. Använd därvid inga brytare, lossa eller anslut inga enheter och frånskilj inga elektriska ledningar (insticksanslutningar).
   Ingen hänsyn måste tas till denna varning om det är säkert att det inte råder någon explosionsfarlig atmosfär.

Lista över godkända komponentgrupper

Lista över godkända enheter återfinns i Internet:

http://www4.ad.siemens.de/view/cs/

under bidrags-ID 13702947.

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8.5.10 Uso do ET 200M / S7-300 em área exposta ao perigo de explosão 2

Zona 2

As áreas expostas ao perigo de explosão são divididas em zonas. As zonas são diferenciadas de acordo com a probabilidade da existência de uma atmosfera explosiva.

Zona	Perigo de explosão	Exemplo
2	Só raramente e por um breve período de tempo surgem atmosferas explosivas	Áreas em torno de ligações flangeadas com vedações chatas em tubulações em recintos fechados
Área segura	não	• fora da zona 2 • Aplicações descentralizadas de periferia descentralizada

A seguir, o encontrará avisos importantes para a instalação do aparelho periférico descentralizado ET 200M e da SIMATIC S7-300 em área exposta ao perigo de explosão.

Mais informações

Para obter mais informações sobre o ET 200M e os diversos grupos construtivos S7-300, consulte o manual.

Local de produção

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Licença

⟨Ex⟩ **II 3 G** **EEx nA II T3 .. T6** seg. EN 50021 : 1999

Número de ensaio: **KEMA 02ATEX1096 X**

Aviso

Componentes com a licença ⟨Ex⟩ II 3 G EEx nA II T3 .. T6 só podem ser aplicados em sistemas de automação SIMATIC S7-300 / ET 200M da categoria de aparelho 3.

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Reparo

Os grupos construtivos em questão devem ser remetidos para o local de produção a fim de que seja realizado o reparo. Apenas lá deve ser efetuado o reparo.

Condições especiais

1. O aparelho periférico ET 200M e a SIMATIC S7-300 devem ser montados em um armário de distribuição ou em uma caixa metálica. Estes devem garantir no mínimo o tipo de proteção IP 54. Durante este trabalho deverão ser levados em consideração as condições locais, nas quais o aparelho será instalado. Para a caixa deverá ser apresentada uma declaração do fabricante para a zona 2 (de acordo com EN 50021).
2. Caso no cabo ou na entrada do cabo desta carcaça sob as condições operacionais seja atingida uma temperatura de > 70 °C, ou caso sob condições operacionais a temperatura na ramificação do fio poderá atingir > 80 °C, as caraterísticas de temperatura deverão corresponder às temperaturas realmente medidas.
3. As entradas de cabo utilizadas devem corresponder ao tipo exigido de proteção IP e à seção 7.2 (de acordo com o EN 50021).
4. Todos os aparelhos, inclusive as chaves, etc., que estejam conectadas em entradas e saídas de módulos de sinais protegidos contra erro, devem possuir a licença para a proteção de explosão do tipo EEx nA ou EEx nC.
5. Precisam ser tomadas medidas para que a tensão nominal através de transitórios não possa ser ultrapassada em mais que 40 %.
6. Área de temperatura ambiente: 0° C até 60° C
7. No âmbito da carcaça deve ser colocada, após a abertura, em um ponto bem visível uma placa com a seguinte advertência:
   Advertência
   A carcaça deve ser aberta apenas por um breve período de tempo, por ex. para diagnóstico visual. Não acione nenhum interruptor, não retire ou conecte nenhum módulo e não separe nenhum fio elétrico (ligações de tomada).
   Esta advertência poderá ser ignorada caso se saiba que não há nenhuma atmosfera sujeita ao perigo de explosão.

Lista dos componentes autorizados

A lista com os módulos autorizados encontram-se na Internet:

http://www4.ad.siemens.de/view/cs/

sob o número de ID 13702947.

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8.5.11 Χρήση της συσκευής ET 200M / S7-300 σε επικίνδυνη για έκρηξη περιοχή, ζώνη 2

Ζώνη 2

Οι επικίνδυνες για έκρηξη περιοχές χωρίζονται σε ζώνες. Οι ζώνες διαφέρουν σύμφωνα με την πιθανότητα ύπαρξης ενός ικανού για έκρηξη περιβάλλοντος.

Ζώνη	Κίνδυνος έκρηξης	Παράδειγμα
2	Εκρηκτικό περιβάλλον αερίου παρουσιάζεται μόνο σπάνια και για σύντομο χρονικό διάστημα	Περιοχές γύρω από φλαντζωτές συνδέσεις με τσιμούχες σε σωληνώσεις σε κλειστούς χώρους
Ασφαλής περιοχή	όχι	• Εκτός της ζώνης 2 • Τυπικές εφαρμογές αποκεντρωμένης περιφέρειας

Στη συνέχεια θα βρείτε σημαντικές υποδείξεις για την εγκατάσταση της αποκεντρωμένης περιφερειακής συσκευής ET 200M και του δομικού συγκροτήματος SIMATIC S7-300 σε επικίνδυνη για έκρηξη περιοχή.

Επιπλέον πληροφορίες

Επιπλέον πληροφορίες για τη συσκευή ET 200M και για τα διάφορα δομικά συγκροτήματα (ενότητες) S7-300 θα βρείτε στο εγχειρίδιο.

Τόπος κατασκευής

Siemens AG, Bereich A&D
Werner-von-Siemens-Straße 50
92224 Amberg
Germany

Άδεια

Ex **II 3 G** **EEx nA II T3 .. T6** σύμφωνα με το πρότυπο EN 50021 : 1999

Αριθμός ελέγχου: **KEMA 02ATEX1096 X**

Υπόδειξη

Τα δομικά συγκροτήματα με την άδεια Ex II 3 G EEx nA II T3 .. T6 επιτρέπεται να τοποθετηθούν μόνο σε συστήματα αυτοματισμού SIMATIC S7-300 / ET 200M της κατηγορίας συσκευής 3.

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Συντήρηση

Για μια επισκευή πρέπει να σταλθεί το αντίστοιχο δομικό συγκρότημα στον τόπο κατασκευής. Μόνο εκεί επιτρέπεται να γίνει η επισκευή.

Ιδιαίτερες προϋποθέσεις

1. Η αποκεντρωμένη περιφερειακή συσκευή ET 200M και το δομικό συγκρότημα SIMATIC S7-300 πρέπει να ενσωματωθούν σε ένα ερμάριο ζεύξης ή σε ένα μεταλλικό περίβλημα. Αυτά πρέπει να εξασφαλίζουν το λιγότερο το βαθμό προστασίας IP 54. Σε αυτήν την περίπτωση πρέπει να ληφθούν υπόψη οι περιβαλλοντικές συνθήκες, στις οποίες θα εγκατασταθεί η συσκευή. Για το περίβλημα πρέπει να προβλέπεται δήλωση του κατασκευαστή για τη ζώνη 2 (σύμφωνα με το πρότυπο EN 50021).
2. Εάν στο καλώδιο ή στην είσοδο του καλωδίου αυτού του περιβλήματος κάτω από συνθήκες λειτουργίας η θερμοκρασία ξεπεράσει τους 70 °C ή όταν κάτω από συνθήκες λειτουργίας η θερμοκρασία στη διακλάδωση του σύρματος μπορεί να είναι μεγαλύτερη από 80 °C, πρέπει οι θερμοκρασιακές ιδιότητες των καλωδίων να ταυτίζονται με τις πραγματικά μετρημένες θερμοκρασίες.
3. Οι χρησιμοποιούμενες εισόδοι καλωδίων πρέπει να συμμορφώνονται με το βαθμό προστασίας IP 54 στην ενότητα 7.2 (σύμφωνα με το πρότυπο EN 50021).
4. Όλες οι συσκευές, συμπεριλαμβανομένων διακοπτών κ.α., που συνδέονται στις εισόδους και εξόδους δομικών συγκροτημάτων ασφαλών σημάτων, πρέπει να φέρουν εγκριμένη προστασία κατά έκρηξης τύπου EEx nA ή EEx nC.
5. Πρέπει να ληφθούν μέτρα, να μην μπορεί να γίνει υπέρβαση της ονομαστικής τάσης μέσω αιφνίδιας μεταβολής της τάσης πάνω από 40 %.
6. Περιοχή θερμοκρασίας περιβάλλοντος: 0° C έως 60° C
7. Πρέπει να τοποθετηθεί μέσα στο περίβλημα σε ευδιάκριτο σημείο μετά το άνοιγμα μία πινακίδα με την ακόλουθη προειδοποίηση:
   Προειδοποίηση
   Το περίβλημα επιτρέπεται να ανοίγει μόνο για μικρό χρονικό διάστημα, π.χ. για τη διενέργεια οπτικής διάγνωσης. Μην κάνετε χρήση διακοπτών, μην τραβάτε ή εμβυσματώνετε δομικά συγκροτήματα και μη διαχωρίζετε ηλεκτροφόρους αγωγούς (εμβυσματώσιμες συνδέσεις).
   Η προειδοποίηση αυτή δε χρειάζεται να ληφθεί υπ' όψιν, εάν είναι γνωστό ότι δεν υφίσταται ατμόσφαιρα παρουσιάζουσα κίνδυνο έκρηξης.

Κατάλογος των εγκεκριμένων δομικών συγκροτημάτων

Η λίστα με τα εγκριμένα δομικά συγκροτήματα υπάρχει στο διαδίκτυο:

http://www4.ad.siemens.de/view/cs/

με τον κωδικό συνδρομής 13702947.

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Compatibility Between the IM 153-x Modules

9

In This Chapter

... You can find all the important information required to change from an older IM 153-x to a newer or different IM 153-x.

Chapter Overview

Section	Subject	Page
9.1	Compatibility Between the Versions of the IM 153 and IM 153-1	9-2
9.2	Compatibility Between the Versions of the IM 153-2/-2 FO	9-5
9.3	RC Network with 1 MΩ for a Configuration with Ungrounded Reference Potential	9-8

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9.1 Compatibility Between the Versions of the IM 153 and IM 153-1

The Versions of the IM 153-1

Table 9-1 Features and variants of the IM 153-1

Functions/Features	Interface Module and Order Number 6ES7 ...					
	153-1AA..					
	00	01	02	03	82	83
Minimum interval between two slave list cycles	1 ms	0.1 ms	0.1 ms	0.1 ms	0.1 ms	0.1 ms
SYNC, FREEZE	–	×	×	×	×	×
Module change during operation	–	–	×	×	–	–
Direct communication	–	–	as of E07	×	as of E06	×
Enhanced diagnostics • 64-byte diagnostic frame	–	–	–	× As of E02	–	×
Extended range of environmental conditions (outdoors)	–	–	–	–	×	×
RC network with 10 MΩ for ungrounded configuration (see Sections 5.1.3 and 9.3)	– (1 MΩ)	– (1 MΩ)	as of E08	×	as of E07	×
DPV1 mode	–	–	–	as of E05	–	as of E03

E Version

Compatibility Between 153-1AA00- and 153-1AA01-...

The IM 153-1 (order number 6ES7 153-1AA**01**-0XB0) is partially downward compatible. This means you can also use the configuration and the user program for the IM 153-1 (order number 6ES7 153-1AA**01**-0XB0) for the IM 153 (order number 6ES7 153-1AA**00**-0XB0), **except** if SYNC and FREEZE are used in these user programs. Note the different Min_Slave_interval (see Table 9-1).

Upgrading to 153-1AA02-...

You can pay to have the IM 153-1 (order number 6ES7 153-1AA**01**-0XB0) upgraded to the IM 153-1 (order number 6ES7 153-1AA**02**-0XB0).

For more information, get in touch with your Siemens partner.

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Response to the Removal/Insertion Interrupt

Up to 153-1AA03, version 01	**As of 153-1AA03, version 02**
The ET 200M is set up on active bus modules. The removal/insertion interrupt is disabled at parameter assignment. The removal or insertion of a module results in station failure.	The ET 200M is set up on active bus modules. The removal/insertion interrupt is disabled at parameter assignment. It is still, however, possible to remove and insert modules. An interrupt is not reported, but the events are displayed in the diagnosis.

Startup Characteristics When Response Monitoring is Switched Off

The IM 153-1 **as of** 6ES7 153-1AA**02**-0XB0, version **05** performs differently when the DP standard master is restarted with response monitoring switched off:

When response monitoring is switched off, the outputs of the ET 200M keep their set values when the DP master fails.

When the DP master is restarted **without resetting the DP slave** these initial values remain valid until new output data is received from the DP master.
If the DP slave is not reset, it is not enabled for other DP masters. Bit 6 of ”Octet 1: Station_status, Unlock_Req” has the value ”0” in the parameter assignment frame (for example, in the DP master of the
SIMATIC 505).

In the case of previous versions: When the DP master is restarted, the outputs of the ET 200M are briefly set to ”0”, until they are reset by the DP master.

When **response monitoring is switched on**, the IM 153-1AA02 as of E05 behaves like the previous versions.

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Configuration of the IM 153-1 with the General Identification Format

You can also configure the IM 153 (as of order number 6ES7-1AA03-0XB0, version 2) with the general identification format (AKF). This configuration assumes detailed knowledge of the structure of the general identification format. Use the ID 0x00 for slots 1 to 3.



Warning

If you carry out configuration with the general identification format, the quality of the comparison between the desired and actual configurations at startup of the DP slave or when modules are removed or inserted is very low. Since there is no type ID available for the comparison, an incorrect configuration cannot be easily detected!

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9.2 Compatibility Between the Versions of the IM 153-2/-2 FO

The Versions of the IM 153-2/-2 FO

Table 9-2 Features and variants of the IM 153-2

Functions/Features	Interface Module with Order Number 6ES7 ...						
	153-2AA..			153-2BA..	153-2AB.. (FO)		153-2BB.. (FO)
	00	01	02	00	00	01	00
RS 485 interface	×	×	×	×	–	–	–
Fiber-optic interface	–	–	–	–	×	×	×
SYNC, FREEZE	–	–	–	×	–	–	×
Module change during operation	×	×	×	×	×	×	×
Direct communication	–	–	×	×	–	×	×
Enhanced diagnostics • 96-byte diagnostic frame	–	–	× as of E07	×	–	× as of E06	×
Forwarding of parameter assignment data from the programming device/PC (for HART modules, for example)	–	×	×	×	×	×	×
Parameterizable FM in an ET 200M	–	×	×	×	×	×	×
Time synchronization on the PROFIBUS bus system, time stamping of input signals • In the case of redundancy	–	–	× as of E07	× ×	×	× as of E06	× ×
Redundancy[1]	–	–	×	×	–	×	×
Configuration modification in RUN • In the redundant system • In the non-redundant system	– –	– –	× –	× ×	– –	× –	× ×
Clock synchronism[1]	–	–	–	×	–	–	×
Identification data	–	–	–	×	–	–	×
Update	–	–	–	×	–	–	×
RC network with 10 MΩ for ungrounded configuration (see Sections 5.1.3 and 9.3)	– (1 MΩ)	as of E03	×	×	×	×	×
DPV1 mode	–	–	as of E09	×	–	as of E08	×

E Version
1 SYNC, FREEZE should not be used with these functions (see Section 3.5 and 3.7).

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Upgrading

You can upgrade the IM 153-2 (order number 6ES7 153-2AA02-0XB0; version 06) to version 07 for a charge.
You can upgrade the IM 153-2 FO (order number 6ES7 153-2AB01-0XB0, version 05) to version 06 for a charge.

For more information, get in touch with your Siemens partner.

Response to the Removal/Insertion Interrupt

Up to 153-2AA02, version 06 153-2AB01, version 05	**As of 153-2AA02, version 07 153-2AB01, version 06**
The ET 200M is set up on active bus modules. The removal/insertion interrupt is disabled at parameter assignment. The removal or insertion of a module results in station failure.	The ET 200M is set up on active bus modules. The removal/insertion interrupt is disabled at parameter assignment. It is still, however, possible to remove and insert modules. An interrupt is not reported, but the events are displayed in the diagnosis.

Parameterizable FM in a Configuration with the IM 153-2

To use the FM 353/354/355 in a distributed configuration with full S7 functionality, you can use the following CPUs and FMs only as of the specified order numbers and versions.
You can only use the CPUs and FMs not listed in Table 9-3 (CPU 316-2 DP, for example) as of the first version.

Table 9-3 Restrictions with DP Master CPUs and FMs for the IM 153-2

Module	As of Order Number	With Version	Operating System Update Possible as of Version
CPU 315-2 DP	6ES7 315-2AF01-0AB0	03	01
CPU 413-2 DP	6ES7 413-2XG01-0AB0	02	01
CPU 414-2 DP	6ES7 414-2XG01-0AB0 6ES7 414-2XJ00-0AB0	02 04	01 03
CPU 416-2 DP	6ES7 416-2XK00-0AB0 6ES7 416-2XL00-0AB0	04 04	03 03
FM353	6ES7 353-1AH01-0AE0	01	–
FM354	6ES7 354-1AH01-0AE0	01	–
FM 355C	6ES7 355-0VH10-0AE0	01	–
FM 355S	6ES7 353-1VH10-0AE0	01	–

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Configuration of the IM 153-2 with the General Identification Format

You can also configure the IM 153-2 (as of order number 6ES7-2AA02-0XB0, version 07, and 6ES7-2AB01-0XB0, version 06) with the general identification format (AKF). This configuration assumes detailed knowledge of the structure of the general identification format. Use the ID 0x00 for slots 1 to 3.



Warning

If you carry out configuration with the general identification format, the quality of the comparison between the desired and actual configurations at startup of the DP slave or when modules are removed or inserted is very low. Since there is no type ID available for the comparison, an incorrect configuration cannot be easily detected!

Functionality of the Previous Version

If you insert the interface module IM 153-2Bx00

- on a bus module BM IM/IM (6ES7 195-7HD00-0XA0), or
- if you configure the interface module IM 153-2Bx00 as IM 153-2AA02/-2AB01 using STEP 7, or
- if you configure the interface module IM 153-2Bx00 with device master file revision 2,

the interface module will have the same functionality as an IM 153-2AA02/-2AB01.

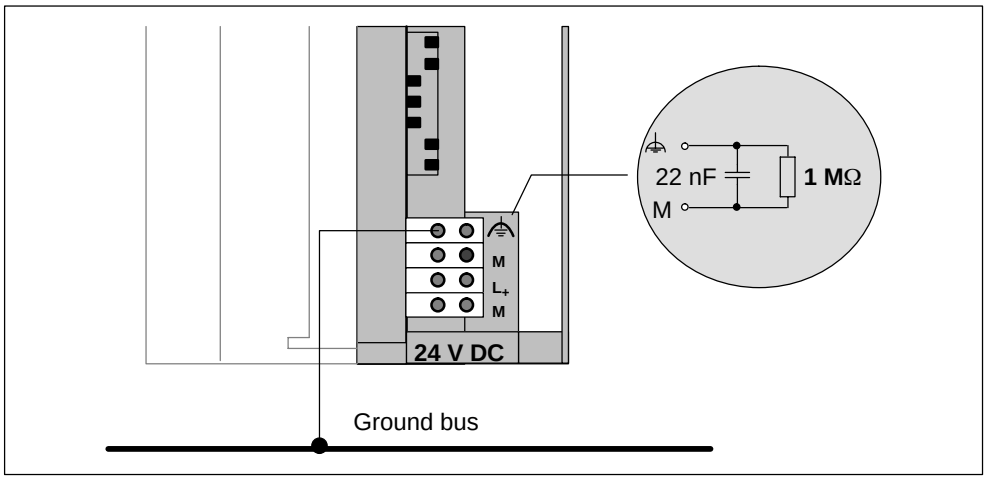
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9.3 RC Network with 1 MΩ for a Configuration with Ungrounded Reference Potential

For more on the principle behind this, please read Section 5.1.3.

The following IM 153-x modules have a resistance of 1 MΩ in the RC network:

- IM 153-1 up to and including
  153-1AA02, version 07
  153-1AA82, version 06
- IM 153-2 up to and including
  153-2AA01, version 02



The Following Applies to This IM 153-x:

You can operate a **maximum of 18 nodes** on the PROFIBUS-DP in an ungrounded configuration on one power supply.

If there are more than 18 nodes, you must use an additional power supply.

Subsequent Versions

All subsequent versions have a resistance of 10 MΩ in the RC network.

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Order Numbers for the ET 200M

A

Components for the ET 200M

Table A-1 Components for the ET 200M

Accessories and Spare Parts for the ET 200M	Order Number
Active bus modules	
• Bus module BM IM/IM (...7HD) for redundancy with 2 × IM 153-2AA02/-2AB01	6ES7 195-7HD00-0XA0
• Bus module BM IM/IM (...7HD) for redundancy with 2 × IM 153-2Bx00	6ES7 195-7HD10-0XA0
• Bus module BM PS/IM (...7HA) for power supply and IM 153	6ES7 195-7HA00-0XA0
• Bus module 2 × 40 (...7HB) for one or two S7-300 modules 40 mm wide	6ES7 195-7HB00-0XA0
• Bus module 1 × 80 (...7HC) for an S7-300 module 80 mm wide	6ES7 195-7HC00-0XA0
Covers (includes 4 backplane bus covers and 1 bus module cover)	6ES7 195-1JA00-0XA0
Explosion-proof partition	6ES7 195-1KA00-0XA0
Rail for the ”module change during operation” function	
• 482.6 mm	6ES7 195-1GA00-0XA0
• 530 mm	6ES7 195-1GF30-0XA0
• 620 mm	6ES7 195-1GG30-0XA0
• 2000 mm	6ES7 195-1GC00-0XA0
Bus connector	
• Up to 12 Mbaud without programming port with programming port	 6ES7 972-0BA40-0XA0 6ES7 972-0BB40-0XA0
Interconnecting cable	
• Normal	6XV1 830-0AH10
• Direct-buried cable	6XV1 830-3AH10
• Drum cable	6XV1 830-3BH10
• Festoon attachment for PROFIBUS bus system	6XV1 830-3CH10
Fiber-optic cable	
• SIMATIC NET PROFIBUS Plastic Fiber Optic, Duplex core (50 m ring)	6XV1 821-2AN50

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Table A-1 Components for the ET 200M, continued

Accessories and Spare Parts for the ET 200M	Order Number
• SIMATIC NET PROFIBUS Plastic Fiber Optic, standard cable per meter 50 m ring 100 m ring	 6XV1 821-0AH10 6XV1 821-0AN50 6XV1 821-0AT10
• SIMATIC NET PROFIBUS PCF Fiber Optic, standard cable different lengths from 50 m to 300 m	6XV1 821-1Cxxx
Connectors for fiber-optic cables	
• Packet of 100 Simplex connectors and 5 polishing sets	6GK1 901-0FB00-0AA0
• Packet of 50 plug-in adapters	6ES7 195-1BE00-0XA0
PROFIBUS terminator	6ES7 972-0DA00-0AA0

STEP 7 and SIMATIC S7 Manuals

You can find the order numbers for these manuals in the ST 70 catalog.

Table A-2 STEP 7 and SIMATIC S7 Manuals

Manual	Contents
S7-300 programmable controller • Installation • CPU data, CPUs 312 IFM to 318-2 DP • CPU data, CPUs 312C to 314C-2 DP/PtP	Among other things: • Description of the PROFIBUS-DP interface of the CPU 31x-2 DP, CPU 31xC-2 DP • Installing a PROFIBUS-DP network • Bus connector and RS 485 repeater
M7-300 programmable controller • Installation • CPU data	Among other things: • Description of the PROFIBUS-DP interfaces in M7-300 • Installing a PROFIBUS-DP network • Bus connector and RS 485 repeater
S7-400, M7-400 Programmable Controller • Installation	Among other things: • Description of the PROFIBUS-DP interfaces in S7-400 and M7-400 • Installing a PROFIBUS-DP network • Bus connector and RS 485 repeater
System Software for S7-300/400 Program Design Programming Manual	Including: Description of addressing and diagnostics on SIMATIC S7
System Software for S7-300 and S7-400 System and Standard Functions Reference Manual	Description of the SFCs in STEP 7

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Table A-2 STEP 7 and SIMATIC S7 Manuals

Manual	Contents
Communication with SIMATIC	Introduction to the communication options in SIMATIC
SIMATIC NET - PROFIBUS Networks	• Introduction to PROFIBUS networks • Network configuration • Components for PROFIBUS networks
PCS 7 Configuration Manual	• Introduction to the PCS 7 system philosophy • Description of the configuration of a system with PCS 7
”Intrinsically Safe I/O Modules” Reference Manual	Description and technical specifications of the intrinsically safe modules of the S7-300
Manuals FM 35x	Description and technical specifications of the FM 35x function modules (one manual for each FM)

Manual for the ET 200 in SIMATIC S5

To configure and commission an ET 200M with COM PROFIBUS you need the following manual (order number 6ES5 998-3ESx2).

Table A-3 Manual for the ET 200 in SIMATIC S5

Manual	Contents
ET 200 Distributed I/O System	• Description of the IM 308-C master interface for the S5-115U, S5-135U and S5-155U • Description of the S5-95U with the PROFIBUS-DP master interface • Handling the FB IM308C
COM PROFIBUS Manual	• Handling COM PROFIBUS Electronic manual on CD ROM and part of *COM PROFIBUS* (as of version 5.x)

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Books

Table A-4 Technical Literature

Technical guide	Contents
Decentralizing with PROFIBUS-DP *– Structure, Configuration and Use of PROFIBUS-DP with the SIMATIC S7 –* Josef Weigmann, Gerhard Kilian Publicis MCD Verlag, 1998 Order number: A 19100-L531-B714	Instruction manual for a simple introduction to the PROFIBUS-DP and implementation of automation tasks with the PROFIBUS-DP and SIMATIC S 7. Use of the PROFIBUS-DP is illustrated for the SIMATIC S 7 with a large number of practice-related examples.
Plastic Fiber-Optic Cables *Fundamentals, Components, Installation* Weinert, Andreas Publicis MCD Verlag, Order number: A 19100-L531-B693	Introduction to the fundamentals of signal transmission on plastic fiber-optic cables. Notes on how to use and install plastic fiber-optic cables.

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Glossary

Automation system

An automation system is a → programmable logic controller consisting of at least one → CPU, various input and output modules and operator interfaces.

Backplane bus

The backplane bus is a serial data bus via which the modules communicate and via which the necessary power is supplied to the modules. The connection between the modules is established by bus connectors.

Baud rate

The baud rate of a data transfer is measured in bits transmitted per second (baud rate = bit rate).

In the case of the ET 200, baud rates of 9.6 kbaud to 12 Mbaud are possible.

Bus

A common transmission line connecting all nodes. Has two defined ends.

In the case of the ET 200, the bus is a two-wire or fiber-optic cable.

Bus node

A device that can send, receive or amplify data via the bus, such as a DP master, DP slave, RS 485 repeater or active star coupler.

Bus segment

→ Segment

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Chassis ground

Chassis ground refers to all the interconnected inactive parts of a piece of equipment that, even in the event of a fault, cannot carry voltage that is dangerous to the touch.

Clock synchronism

With clock synchronism, all cycles concerned (e.g. user program cycle, DP bus cycle, signal conditioning cycle in the modules of the DP slaves) run in common mode and with identical length. As a result, the process response times are of the same length and reproducible.

Configuration

Assignment of modules to racks/slots and addresses. A distinction is drawn between the actual configuration (= modules actually inserted) and the desired configuration. You can specify the desired configuration using *STEP 7*, *COM PROFIBUS* (or COM ET 200 Windows). This way the operating system can detect any incorrectly installed modules at startup.

Configuration modification in RUN

With a configuration modification in RUN it is possible to carry out certain configuration modifications while a system is still in operation. Processing is stopped for just a few seconds. During this time the process outputs retain their current values which has virtually no effect on processing sequences in process-oriented systems.
A configuration modification in RUN is only possible with distributed I/Os.

CPU

Central processing unit of the S7 programmable controller with open and closed-loop control systems, memory, operating system and interface for programming device.

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Device master file

All slave-specific
characteristics are stored in a device master file (GSD file). The format of the device master file is defined in the IEC 61784-1:2002 Ed1 CP 3/1 standard.

Diagnostic interrupt

Diagnostics-capable modules use diagnostic interrupts to report system errors that they have detected to the central CPU.

In SIMATIC S7/M7: When an error is detected or disappears (e. g. wire break), the module triggers a diagnostic interrupt, provided the interrupt is enabled. The CPU interrupts the processing of the user program and lower priority classes and processes the diagnostic interrupt block (OB 82).

In SIMATIC S5: The diagnostic interrupt appears in the station diagnosis. Using cyclical querying of the diagnostic bits in the station diagnosis you can detect errors such as a wire break.

Diagnostics

Diagnostics is the detection and localizing of errors. The structure of the diagnosis is defined in the IEC 61784-1:2002 Ed1 CP 3/1 standard. The diagnosis of the ET 200M is in keeping with the standard.

Distributed I/O devices

These are input/output units that are not located in the base unit; instead, they are distributed at some distance from the CPU. The following are examples of such units:

- ET 200M, ET 200B, ET 200C, ET 200U
- DP/AS-I Link
- S5-95U with PROFIBUS-DP slave interface
- Other DP slaves from either Siemens or other vendors

The distributed I/O devices are connected to the DP master via PROFIBUS-DP.

DP master

A → master performing to the IEC 61784-1:2002 Ed1 CP 3/1 standard is classed as a DP master.

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DP slave

A → slave run on the PROFIBUS bus system with the PROFIBUS-DP protocol and performing to the IEC 61784-1:2002 Ed1 CP 3/1 standard is referred to as a DP slave.

DP standard

The bus protocol of the ET 200 distributed I/O system in accordance with the IEC 61784-1:2002 Ed1 CP 3/1 standard.

Equipotential bonding

Electrical connection (equipotential bonding conductor) that brings the parts of electrical equipment and other conductive parts to the same or approximately the same potential in order to prevent troublesome or dangerous voltages arising between these parts.

External power supply

Power supply for the signal and function modules and the process peripherals connected to them.

Fiber-optic cable

Fiber-optic cables are made of glass fiber or plastic and have an extremely high transmission rate. They are insensitive to electromagnetic interference and are very difficult to tap.

FREEZE

This is a control command of the DP master to a group of DP slaves.

When a DP slave receives the FREEZE control command, it freezes the current status of the **inputs** and transfers them cyclically to the DP master.

After each subsequent FREEZE control command, the DP slave freezes the status of the **inputs** again.

The input data is not transferred from the DP slave to the DP master again cyclically until the DP master sends the UNFREEZE control command.

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Functional grounding

Grounding which has the sole purpose of safeguarding the intended purpose of the electrical equipment. Functional grounding short-circuits interference voltages which would otherwise have an impermissible impact on the equipment.

Ground

The conductive mass of earth, the electrical potential of which can be set to zero at any point.

In the vicinity of grounding electrodes the potential may not be zero. The term ”reference ground” is often used here.

Grounding

Grounding means to connect a conductive component with the grounding electrode via a ground system.

H system

System with high availability consisting of at least two central processing units or two separate devices, e.g. PCs (master/reserve). The user program is processed identically in the master and reserve PCs.

Identification data

Identification data is information stored in a module and supports the user when

- eliminating faults in a system
- checking the system configuration
- locating hardware modifications in a system

I/O bus

The I/O bus is part of the → S7-300 backplane bus in the programmable logic controller, optimized for the rapid exchange of signals between the IM 153-x module(s) and the signal modules. → User data (e.g. digital input signals of a signal module) and system data (e. g. default parameter data records of a signal module) are transferred via the I/O bus.

I/Os, single-channel

A single-channel I/O is when – in contrast to redundant I/Os – the I/O module is available only once for a process signal. It can be connected on a one-sided or switched basis.

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IP20

Degree of protection to DIN 40050: Protection against contact with fingers and against foreign bodies longer than 12 mm ∅.

Isolated

In the case of isolated input/output modules, the reference potentials of the control and load circuit are galvanically isolated – by means of optical isolators or relay contacts, for example. Input/output circuits can be grouped.

Master

When they are in possession of the token, masters can send data to and request data from other nodes (= active node).

→ The CPU 315-2 DP and the IM 308-C are examples of DP masters.

Master-slave access method

A bus access method in which only one node is the → DP master and all the other nodes are → DP slaves.

Non-isolated

In the case of non-isolated input/output modules, the reference potentials of the control and load circuit are electrically connected.

Parameter assignment

Parameter assignment means setting the behavior of a module.

Parameter assignment master

Each DP slave has **one** parameter assignment master. During startup the parameter assignment master transfers the parameterization data to the DP slave. The master has read and write access to the DP slave and it can change the configuration of a DP slave.

PLC

→ Programmable controller

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Process interrupt

A process interrupt is triggered by S7-300 modules with interrupt capability because of a certain event in the process. The process interrupt is reported to the central CPU. The assigned organization block is then processed in accordance with the priority of this interrupt.

In SIMATIC S7/M7: As a result of the parameterization of an upper and lower limit value, for example, an operating range is defined. If the process signal (e. g. temperature) of an analog input module leaves this range, the module triggers a process interrupt (assuming an interrupt is enabled). The CPU interrupts the processing of the user program and lower priority class and processes the process interrupt block (OB 40).

In SIMATIC PCS 7: If the IM 153-2 reports a process interrupt, there is at least one data record containing messages concerning time-stamped signal changes or special messages. The DP master CPU can read and evaluate the data record(s).

In SIMATIC S5: The process interrupt appears in the station diagnosis. Using cyclical querying of the diagnostic bits in the station diagnosis, you can recognize process interrupts such as an upper limit violation.

PROFIBUS

PROcess FIeld BUS which is defined in the PROFIBUS IEC 61784-1:2002 Ed1 CP 3/1 standard. It defines the functional, electrical and mechanical properties of a bit-serial field bus system.

PROFIBUS is a bus system that networks PROFIBUS-compatible programmable logic controllers and field devices at the cell and field level. PROFIBUS is available with the protocols DP (the German abbreviation for distributed I/O), FMS (= field bus message specification) or TF (= technology functions).

PROFIBUS address

Each bus node must receive a PROFIBUS address to uniquely identify it on the PROFIBUS-DP bus system.

The PC/programming device or the hand-held ET 200 have the PROFIBUS address ”0”.

DP master and DP slaves have a PROFIBUS address from 1 to 125.

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PROFIBUS-DP

This is the PROFIBUS bus system with the DP protocol. DP stands for distributed I/O in German. The ET 200 distributed I/O system is based on the IEC 61784-1:2002 Ed1 CP 3/1 standard.

Programmable controller

Programmable controllers (PLCs) are electronic controllers whose function is saved as a program in the control unit. The configuration and wiring of the unit are therefore independent of the function of the control system. The programmable controller has the structure of a computer; it consists of a CPU (central processing unit) with memory, input/output modules and an internal bus system. The I/Os and the programming language are oriented to control engineering needs.

Programming device

Programming devices (PGs) are essentially personal computers which are compact, portable and suitable for industrial applications. They are equipped with special hardware and software for SIMATIC programmable controllers.

Redundant systems

Redundant systems are characterized by the fact that important automation components are duplicated (redundant). If a redundant component fails, there is no interruption in the program processing.

Reference potential

Potential from which the voltages of the circuits involved can be observed and/or measured.

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Response monitoring

This is a slave parameter. If a DP slave is not addressed within the response monitoring time, then it goes into the safe status, i. e. the DP slave sets its outputs to ”0”.

Response time

The response time is the average time between changing an input and the consequent changing of an output.

S7 diagnostics

An S7 diagnosis can be requested for all the modules in the SIMATIC S7/M7 range of modules in the user program. The structure of the S7 diagnostic data is the same for both central and distributed modules.

The diagnostic data of a module is in data records 0 and 1 of the system data area of the module. Data record 0 contains 4 bytes of diagnostic data describing the current state of a module. The data record 1 also contains module-specific diagnostic data.

Data records 0 and 1 are included in the slave diagnosis.

Segment

The bus line between two terminating resistors forms a segment. A segment contains 0 to 32 → bus nodes. Segments can be interconnected by means of RS 485 repeaters.

Signal module

Signal modules (SMs) represent the interface between the process and the programmable controller. Input and output modules can be digital (input/output module, digital) or analog (input/output module, analog).

Slave

A slave can only exchange data with a → master when requested by it to do so.

By slaves we mean, for example, all DP slaves, such as ET 200B, ET 200C, ET 200M etc.

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STEP 7

Programming language for developing user programs for SIMATIC S7 PLCs.

Substitute value

Substitute values are values that are issued to the process in the event of failed signal output modules or that are used in the event of failed signal input modules in the user program instead of a process value. The substitute values must be specified by the user (e. g. retain the old value).

SYNC

This is a control command of the DP master to a group of DP slaves.

By means of the SYNC control command the DP master causes the DP slave to freeze the current statuses of the **outputs**. In the subsequent frames, the DP slave stores the output data, but the statuses of the outputs remain unchanged.

After each new SYNC control command, the DP slave sets the outputs that it has stored as output data.

The outputs are not cyclically updated again until the DP master sends the UNSYNC control command.

Terminating resistor

This is a resistor required for the purpose of adaptation on the interconnecting cable; terminating resistors are always required at the end of cables and segments.

In the case of the ET 200, the terminating resistors are switched on and off in the → bus connector.

Time stamp

This is the date and time specified for a message.

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Time stamping

Binary input signals are given a time stamp when they are changed. All binary signals parameterized for this must be time stamped throughout the system with a specified accuracy (e.g. 10 ms) when there is a change. This means that if 2 encoders of two stations on different PROFIBUS-DP master systems are being used at the same time, the time stamps of these signal changes can only differ by the specified accuracy (in this case 10 ms).

Time synchronization

Time synchronization ensures that all the clocks in a system have the same time. This is achieved by a master clock in a configured cycle issuing the time to all the other components in the automation system that have a clock. The components use the time issued to set their own clocks.

Ungrounded

Without a conductive connection to → ground.

Update

You should update the interface module IM 153-2 to the latest firmware version following (compatible) function-related expansions or performance improvements.

Version

All products with an order number have a release number; this indicates the version of the product. The product version is incremented with each upwardly compatible function enhancement, production-related modification (use of new components) or bug-fix.

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Index

Numbers

24 V DC supply, 5-3

A

Active bus module, 1-6, 4-5
Active bus modules
  installing, 4-14
  order number, A-1
Aids to finding information in the manual, vi
Ambient temperature, permissible, 4-2
Approval
  CE, 8-2
  CSA, 8-3
  FM, 8-4
  ship-building, 8-5
  UL, 8-3
Arrangement of the modules, 4-4
Automation system, Glossary-1

B

Backplane bus, Glossary-1
Backplane bus cover, 1-6
Basic circuit diagram
  IM 153-1, 8-11
  IM 153-2, 8-11
Baud rate, Glossary-1
Books, A-4
Bus, Glossary-1
Bus connector
  connecting, 4-17
  order number, A-1
Bus module
  active, 1-6, 4-5
    number for installation for module change during configuration, 4-7
  order number, A-1
  replacing, 7-13
Bus module cover, 1-6, 4-14
Bus modules, active, installing, 4-14
Bus node, Glossary-1
Bus segment, Glossary-1

C

CD-ROM, electronic manual, vi
CE, approval, 8-2
Certificates and approvals, 8-2
Changes, since previous manuals, iv
Changing modules during operation, configuration rules, 4-5
Channel-specific diagnosis, 6-24
Channel-specific error messages, 6-26
Chassis ground, Glossary-2
Clearance measurements, 4-3
Clock synchronism, Glossary-2
Commissioning, 6-1
  prerequisites, 6-2
Communication processor, 1-7
Compatibility, 9-1
  IM 153 to IM 153-1, 9-2
Components of an ET 200M, 1-6
Conductor cross-sections, 5-13
Configuration, Glossary-2
  for changing modules during operation, 4-5
  for redundancy with the IM 153-2, 4-5
Configuration frame. *See* on the Internet at http://www.ad.siemens.de/simatic-cs
Configuration modification in RUN, Glossary-2
Configuration options, ET 200M, 3-1
Configuration with active bus modules, 4-14
Contents of the manual, v
Covers for bus modules, order number, A-1
CPU, Glossary-2
CSA, approval, 8-3
Cycle end interrupt, 6-29

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D

Device master file, Glossary-3
  on the Internet at ..., 1-4
Diagnosis, 6-16
  channel-specific, 6-24
    error messages, 6-26
  enhanced, 6-17
    channel-specific, 6-24
    H-status, 6-28
    module status, 6-23
  H-status, 6-28
  interrupts, 6-29
  module status, 6-23
  station, 6-38
  structure, 6-17
Diagnostic interrupt, 6-29, 6-38, Glossary-3
  analog inputs, 6-35
  analog outputs, 6-36
  digital inputs, 6-33
  digital outputs, 6-34
Diagnostics, Glossary-3
  displaying with STEP 7 or STEP 5, 6-13
Dimensioned drawing
  IM 153-1, 8-11
  IM 153-2, 8-11
  IM 153-2 FO, 8-11
Direct communication, 3-26
Direct-buried cable, order number, A-1
Distributed I/O device, 1-1, Glossary-3
Diverting faults, via the integrated RC network, 5-9
DP address. *See* PROFIBUS address
DP master, 1-2
DP slave, 1-2, Glossary-4
DP-master, Glossary-3
DP-standard, Glossary-4
Drum cable, order number, A-1

E

Electrical exposure, protection from, 5-4
Electrical installation, configuring, 5-2
Electronic manual, vi
EMERGENCY STOP devices, 5-2
Equipotential bonding, Glossary-4
Error messages, channel-specific, 6-26
ET 200M
  accessories, 1-6
  components, 1-6
  configuration, 1-4
  definition, 1-4
  important order numbers, A-1
  installing, 4-8
  module arrangement, 4-4
  number of plug-in modules, 4-4
  possible uses, 3-1
  wiring, 5-13
ET 200M distributed I/O device, 1-4
Explosion-proof partition, 1-6
  installing, 4-14
  order number, A-1
External power supply, Glossary-4

F

Festoon attachment for PROFIBUS bus system, order number, A-1
Fiber-optic network, with IM 153-2 FO, 3-25
Fiber-optic cable
  See also fiber-optic cable; optical waveguide
  bending radius, 4-20
  connecting, 4-18
  order number, A-1
Fiber-optic duplex cable, 1-6
Fixing bracket, for shield terminals, 5-21
FM
  approval, 8-4
  with IM 153-2, 3-4
FREEZE, Glossary-4
Front connector
  wiring, 5-17
  wiring position, 5-18
Front connector encoding device, 5-20
Function module, 1-7
Functional grounding, Glossary-5
Fuse, changing, 7-14

G

Galvanically isolated modules, 5-10

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General technical specifications. *See* Module Specifications Reference Manual
Ground, Glossary-5
Grounded supply, 5-5
Grounding, Glossary-5
GSD file, Glossary-3

H

H system, Glossary-5
H-status, 6-28

I

I/O bus, Glossary-5
I/O device, distributed, 1-1
I/Os, single-channel, Glossary-5
Identification data, Glossary-5
Identifying modules, with slot numbers, 4-15
IEC 61131, 8-4
IEC 61784, 8-4
IM 153 to IM 153-1, compatibility, 9-2
IM 153-1
  See also IM 153-x
  basic circuit diagram, 8-11
  dimensioned drawing, 8-11
  front view, 1-10
  LEDs, 6-10
  manufacturer ID, 6-21
  replacing, 7-3
  sample configuration, 3-2
  startup, 6-4
  upgrading, 9-2
  versions, 9-2
IM 153-2
  See also IM 153-x
  basic circuit diagram, 8-11
  dimensioned drawing, 8-11
  LEDs, 6-11
  manufacturer ID, 6-21
  parameterization data to intelligent field devices, 3-3
  replacing, 7-4
  sample configuration for redundancy, 3-10
  sample configuration for time stamping, 3-6
  sample configuration with FM, 3-4
  startup, 6-5
    with time stamping, 6-7
  versions, 9-5
IM 153-2 FO
  See also IM 153-x
  basic circuit diagram, 8-11
  connecting the fiber-optic cable, 4-18
  dimensioned drawing, 8-11
  fiber-optic network, 3-25
  LEDs, 6-11
  manufacturer ID, 6-21
  plug-in adapter, 4-18
  replacing, 7-4
  startup, 6-5
    with time stamping, 6-7
  versions, 9-5
IM 153-2AA02, front view, 1-10
IM 153-2AB01, front view, 1-10
IM 153-2Bx00, front view, 1-11
IM 153-x, 1-6
  parameters, 8-7
  setting the PROFIBUS address, 4-20
  technical specifications, 8-9
  variants, 1-8
  wiring, 5-15
Input delay, 8-13
Insertion interrupt, 6-29
Installation
  configuring, 4-2
  for module change during operation
    number of active bus modules, 4-7
    number of modules, 4-7
  horizontal, 4-2
  in an intrinsically safe area, 4-5
  of the ET 200M, 4-8
  of the modules, 4-12
  of the modules on rail for active bus modules, 4-14
  vertical, 4-2
Installation guidelines, of the PNO, 5-1
Interconnecting cable, 1-6
  order number, A-1
Interrupt
  cycle end, 6-29
  diagnostics, 6-29
  from station diagnosis, 6-38
  process, 6-29
  removal, 6-29
IP 20, Glossary-6
Isolated, Glossary-6

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J

Jumper, 5-15

L

Labeling strip, 5-20
Laser safety class, 8-6
LEDs
  IM 153-1, 6-10
  IM 153-2, 6-11
  IM 153-2 FO, 6-11
Load power supply, features, 5-6

M

Machinery directives, 5-2
Mains voltage, 5-3
Maintenance, 7-1
Manual
  changes since previous manuals, iv
  delivery package, v
Manuals, order numbers, A-2
Manufacturer ID, 6-21
Marking for Australia, 8-4
Master PROFIBUS address, 6-21
Master-slave access method, Glossary-6
Masters, Glossary-6
Module diagnosis, 6-22
Module insertion interrupt, 6-38
Module removal interrupt, 6-38
Module status, 6-23
Modules
  galvanically isolated, 5-10
  identifying with slot numbers, 4-15
  non-isolated, 5-12
  number in installation setup for module change during operation, 4-7
  number in the standard configuration, 4-4
  open, 4-1

N

Network, PROFIBUS-DP, 1-3
Node, Glossary-1
Non-isolated, Glossary-6
Non-isolated modules, 5-12
Number wheel, 4-16

O

Open modules, 4-1
Optical waveguide, Glossary-4
Order number, of the IM 153, iii
Order numbers, for accessories, A-1
Output delay, 8-13
Overall configuration, in the TN-S system, 5-7

P

Parameter assignment, Glossary-6
Parameter assignment frame. *See* on the Internet at http://www.ad.siemens.de/simatic-cs
Parameter assignment master, Glossary-6
Parameterization data to intelligent field devices, IM 153-2, 3-3
Parameters, IM 153-x, 8-7
Plug-in adapter
  for the IM 153-2 FO, 4-18
  order number, A-2
PNO, installation guidelines, 5-1
PNO certificate, 8-4
Possible uses, ET 200M, 3-1
Power consumption, rules, 5-4
Power loss, rules, 5-4
Power supply, 1-6
  replacing, 7-1
  wiring, 5-15
Process interrupt, 6-29, 6-38, Glossary-7
  analog inputs, 6-37
  digital inputs, 6-37
  of the IM 153-2, 6-36
  time stamping, 6-36
PROFIBUS, Glossary-7
PROFIBUS address, Glossary-7
  setting, 4-20
PROFIBUS module, order number, A-2
PROFIBUS-DP, 1-2, Glossary-8
  network, 1-3
PROFIBUS-standard, 8-4
Programmable controller, Glossary-8
Programming device, Glossary-8
Protection from electrical exposure, 5-4
Protective conductor connection, on rail, 4-11
Purpose of the manual, iii

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R

Radio interference, 5-3
Rail, 1-6
  fixing holes, 4-10
  for active bus modules, 1-6, 4-8
  for module change during operation, 4-8
    order number, A-1
  installing, 4-8
  lengths, 4-4
  protective conductor connection, 4-11
RC network
  for ungrounded configuration, 1 Mohm, 9-8
  integrated, 5-9
Recycling, vi
Redundancy
  switchover time, 8-13
  time stamping, 3-7
  with the IM 153-2, 3-10
    configuration rules, 4-5
Redundant systems, Glossary-8
Reference potential, Glossary-8
  ungrounded, 5-9
Regulations, on operating the ET 200M, 5-2
Release. *See* version
Removal interrupt, 6-29
Removing and inserting. *See* changing modules during operation
Replacing
  active bus module, 7-13
  IM 153-1, 7-3
  IM 153-2, 7-4
  IM 153-2 FO, 7-4
Replacing modules
  with the module change during operation function, 7-11
  without the module change during operation function, 7-8
Response Monitoring, Glossary-9
Response time, 8-12, Glossary-9
Rules, general, on operating the ET 200M, 5-2

S

S7 diagnostics, Glossary-9
Scope of validity of the manual, iii
Segment, Glossary-9
Shield contact element, 5-21
Shield terminal, 5-21
Ship-building, approval, 8-5
Signal module, 1-7, Glossary-9
SIMATIC TOP connect, 1-7
Simplex connectors, order number, A-2
Single-channel I/Os, Glossary-5
Slave, Glossary-9
Slave diagnosis, 6-17
Slot numbers, 4-15
Standard configuration, installing, 4-12
Standards, 8-2
Startup
  IM 153-1, 6-4
  IM 153-2, 6-5
    with time stamping, 6-7
  IM 153-2 FO, 6-5
    with time stamping, 6-7
  of the system, 5-2
Startup characteristics, without response monitoring, 153-1AA02, 9-3
Station diagnosis, 6-38
Station statuses 1 to 3, 6-19
STEP 7, Glossary-10
Strain relief, 5-19
Stripping lengths, 5-13
Substitute value, Glossary-10
Supply
  24 V DC , 5-3
  grounded, 5-5
Supply isolating switch, 5-3
Switchover time, in the case of redundancy, 8-13
SYNC, Glossary-10
System, redundant, Glossary-8

T

Technical specifications
  general. *See* Module Specifications Reference Manual
  IM 153-x, 8-9
Terminating resistor, Glossary-10
Time delay, ET 200M, 8-12
Time stamp, Glossary-10
Time stamping, Glossary-11
  process interrupt, 6-36
  startup of the IM 153-2, 6-7
  startup of the IM 153-2 FO, 6-7
  with IM 153-2, 3-6
  with redundancy, 3-7
Time synchronization, Glossary-11
  sample configuration with ET 200M, 3-6
TN-S system, 5-7

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U

UL, approval, 8-3
Ungrounded, Glossary-11
Ungrounded reference potential, 5-9
Update, Glossary-11
Upgrading, IM 153-1, 9-2
Use in industrial environments, 8-5
Use in residential areas, 8-5

V

Version, iii, Glossary-11
Versions
  IM 153-1, 9-2
  IM 153-2, 9-5
  IM 153-2 FO, 9-5
  IM 153-x, 1-8
  of the IM 153-x, 9-1

W

Wire end ferrules, 5-13
Wiring, 5-13
Wiring position, of the front connector, 5-18
Wiring rules, 5-13
Wiring the power supply and IM 153-x, 5-15

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In the documentation package 6ES7 153-1AA00-8BA0)

This product information contains **important information** related to the description in the manual "Distributed I/O Device ET 200M".

The product information is part of supplied documentation package. In cases of doubt the statements contained in the product information override other statements in their binding nature.

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1 On Section 1.3 and 9.2

Further information for IQ-Sense

As from Firmware Version V3.0.1 IQ-Sense is supported by the IM 153-2Bx00.
The following supplements result for the function tables:

For Table 1-2

Functions / Properties	Interface Module With Order Number 6ES7 ...		
	153-1AA..	153-2Ax..	153-2Bx..
IQ-Sense	–	–	x (as from firmware V3.0.1)

For Table 9-2

Functions / Properties	Interface Module With Order Number 6ES7 ...						
	153-2AA..			153-2BA..	153-2AB.. (FO)		153-2BB.. (FO)
	00	01	02	00	00	01	00
IQ-Sense	–	–	–	x (as from firmware V3.0.1)	–	–	x (as from firmware V3.0.1)

2 On Section 3.5

Further information on redundancy with IM 153-2

You can operate the IM 153-2 redundantly

- At an SIMATIC S7-400H (e.g. CPU 417-4H)
- With a GSD file at any DP masters (e.g. S5-115H)
  In case of configuration with a GSD file, redundant operation of the IM 153-2 can only be carried out in the DPV0 operating mode. Setting of this operating mode is carried out differently depending on the configuring tool used.
- With software redundancy
  The optional software "SIMATIC S7 Software Redundancy" is required in addition to the *STEP 7* basic package.
- Conforming to standard
  Specification System Redundancy (SR) V1.0, Dec. 2001 of the PROFIBUS user organization

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3 On Section 3.7

Further information on the jitter

The maximum jitter amounts to 10 µs if

- The equidistance cycle of the DP master (pulse control at the PROFIBUS DP) does not exceed a jitter of 1.3 *s and
- only the IM 153-2Bx.. is regarded with PROFIBUS DP and I/O bus.

The jitter is not always observed when asynchronous events (e.g. withdrawing and plugging, diagnostics) occur. It is possible to eliminate the influence of asynchronous events on the jitter by configuring "Reserve periods".

Due to existing variety the jitter of the periphery (I/O) modules of the ET 200M cannot be taken into consideration.

Further information on the properties

In case of asynchronous events (e.g. withdrawing and plugging, diagnostics and interrupts of periphery (I/O) modules) the reaction of the of the IM 153-2 to the I/O units can fail or a larger jitter can occur during a cycle.

Further information on the properties

If the ET 200M is operated at a non-S7 DP master, stable equidistant operation is only ensured if the DP master fulfils the following requirements:

- The DP master has to be configured with the "delayed" interrupt mode.
  The data transfer is then not interrupted. A diagnostic message is inserted into the next free time window for acyclic jobs.
- The DP master has to operate with the repeat strategy "retry next cycle“.
  The repetition of a message is then not carried out in the same cycle in which the fault occurred, but rather in the following cycle.
- The DP master has to support the modified Target Rotation Time process (in accordance with IEC 61784-1:2002 Ed1 CP 3/1) for further active stations.

Otherwise asynchronous events (such as hardware interrupts, diagnostics) can cause cycle failures or a larger jitter. These failures / larger jitters can always be expected when the asynchronous events occur very often

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Further information on time calculation

The following more precise equations apply for the time calculation:

Inputs

$$t_i\ [\mu s] = K_t + \sum_{n=4}^{11} [di_n\ (1 + 5b_n) + ai_n\ (30 + 16w_n)]$$

with K_t = 60, if $ai_n = 0$

= 90 otherwise

Outputs

$$t_o\ [\mu s] = K_o + \sum_{n=4}^{11} [do_n\ (1 + 4b_n) + ao_n\ (25 + 10w_n)]$$

with K_o = 70, if $ao_n = 0$

= 80 otherwise

4 On Section 6.3

Options for reading out the diagnosis

The following supplement applies for Table 6-7:

Automation system with DP master	Block or register in *STEP 7*	Application	See ...
SIMATIC S7/M7	SFB 52	Read data record from a DP slave	Online help of *STEP 7*
	SFB 54	Receive interrupts from the interrupt OBs	

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5 On Section 6.4.7

Information on channel-specific diagnosis

Errors which affect all the channels of a module (e.g. supply voltage of the module failed) are only mapped to Channel 0 in the channel-specific diagnostics.

This reduces the number of channel-specific diagnostics and prevents a "diagnostic overflow".

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