

SIMATIC

ET 200M Distributed I/O Device

Manual

This manual is part of the following documentation packages with order no:

ET 200M Distributed I/O Device:
6ES7 153-1AA00-8BA0

Preface, Contents

Product Overview

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ET 200M

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A

Safety Guidelines

This manual contains notices which you should observe to ensure your own personal safety, as well as to protect the product and connected equipment. These notices are highlighted in the manual by a warning triangle and are marked as follows according to the level of danger:



Danger

indicates that death, severe personal injury or substantial property damage **will** result if proper precautions are not taken.



Warning

indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.



Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken.

Note

draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground, and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage

Note the following:



Warning

This device and its components may only be used for the applications described in the catalog or the technical descriptions, and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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Technical data subject to change.

Important Information

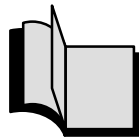
Purpose of the Manual

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.

Delivery Package

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

ET 200M Distributed I/O Device



- Mechanical and electrical configuration
- Installation and wiring
- 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

Scope of Validity of the Manual

Module	Order Number	As of Version
IM 153-1	6ES7 153-1AA03-0XB0	02
IM 153-2	6ES7 153-2AA02-0XB0	07
IM 153-2 FO	6ES7 153-2AB01-0XB0	06
IM 153-3	6ES7 153-3AA01-0XB0	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.

Some versions of the IM 153-x can also be used as modules 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-x in the *Module Specifications* Reference Manual.

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.

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 4):

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

- New slave diagnosis with module status and channel-specific diagnosis
- Signal changes are time stamped during redundancy with 2 x IM 153-2

You can find a detailed overview of the functions and features and how the IM 153-x modules and their previous versions differ in Section 8

Standards, Certificates and Approvals

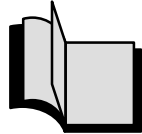
The ET 200M fulfills the requirements and criteria of IEC 1131, Part 2 and EN 50170, Volume 2, PROFIBUS. The ET 200M fulfills the requirements regarding CE labeling. The ET 200M has CSU, UL and FM certificates and approvals.

Please refer to Section 7.1 for further details on standards, certificates and approvals.

Position in the Information Landscape

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>

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.

Recycling and Disposal

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

For further information about environmentally friendly recycling and the procedure for disposing of your old equipment, please contact:

Siemens Aktiengesellschaft
Anlagenbau und Technische Dienstleistungen
ATD ERC Essen Recycling/ Remarketing
Frohnhauser Str. 69
45127 Essen

Phone: +49 201/816 1540 (hotline)
Fax: +49 201/816 1504

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.

Additional Support

Please contact your local Siemens representative if you have any queries about the products described in this manual.

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.

We provide courses to enable you to become familiar with the ET 200 distributed I/O system. Please contact your local training center or the central training center in Nuremberg, D-90027 Germany (tel. +49 (911) 895-3154)

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

If you have any questions or comments about the manual, please return the completed comment sheet to us. You will find this sheet at the end of the manual.

You can obtain constantly updated information from the following sources

You can obtain constantly updated information on the SIMATIC products:

- On the Internet at <http://www.ad.siemens.de/>

In addition, SIMATIC Customer Support provides you with up-to-date information and downloads that can be useful to you when using SIMATIC products:

- On the Internet at <http://www.ad.siemens.de/simatic-cs>
- Via the SIMATIC Customer Support Mailbox at +49 (911) 895-71 00

To access the mailbox, use a modem with up to V.34 (28.8 kbps), and set the parameters as follows: 8, N, 1, ANSI. Alternatively, access it using ISDN (x.75, 64 kbps).

You can reach SIMATIC Customer Support by phone on +49 (0) 180 50 50 222 and by fax on +49 (0) 180 50 50 223.

Queries can also be addressed to us by Internet mail or by mail to the mailbox specified above.

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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

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1.2	What Is the ET 200M Distributed I/O Device?	1-4
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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.

What Is PROFIBUS-DP?

PROFIBUS-DP is an open bus system based on the *EN 50170, Volume 2, PROFIBUS* 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 *EN 50170, Volume 2, PROFIBUS*. 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

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.

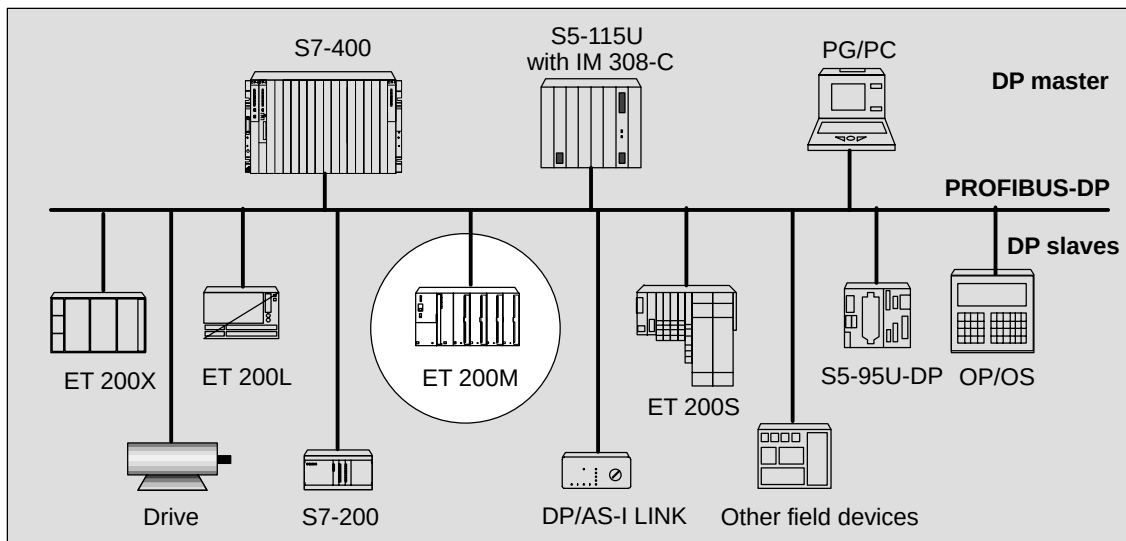


Figure 1-1 Typical PROFIBUS-DP Network Structure

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 can be enhanced with the I/O modules of the S7-300.

Structure of the ET 200M (Example)

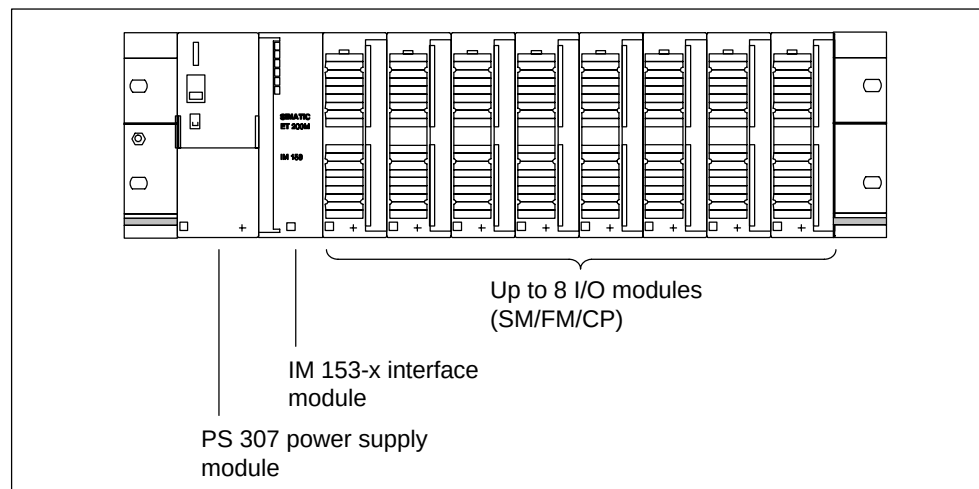


Figure 1-2 Structure of the ET 200M Distributed I/O Device (Example)

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

“SIMATIC S7-DP Slave”

The ET 200M distributed I/O system is integrated in 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.).

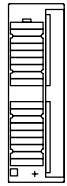
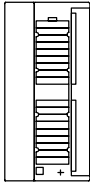
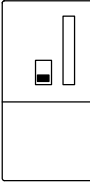
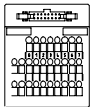
Components

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 - 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: Power connector	... 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.	

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.	

1.3 IM 153-x: variants and features

Brief Overview of the Different IM 153-x

IM 153-1	– Simple I/O interface module for SM, FM, CP – RS 485 interface – Additional IM 153-1 for an extended range of environmental conditions (outdoors)
IM 153-2 IM 153-2 FO	– I/O interface module for SM, FM, CP – RS 485 or fiber-optic cable interface – Redundancy with 2 × IM 153-2 – Time stamping of signal changes and time synchronization on the PROFIBUS DP – Complete S7 functionality with FM/CP – Forwards parameterization data to intelligent field devices – IM 153-2 FO, in addition, for an extended range of environmental conditions (outdoors)
IM 153-3	– Redundant PROFIBUS interface module – RS 485 interface

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 1-8.

You can find a comparison with the previous versions, which are not included in this table, in Chapter 8.

Tabelle 1-2 IM 153-x: Features and Variants

Functions/ Features	Interface Module and Order Number 6ES7 ...								
	153-1AA..				153-2AA..		153-2AB.. (FO)		153- 3AA..
	02	03	82	83	01	02	00	01	01
RS 485 interface	×	×	×	×	×	×	–	–	×
Fiber-optic cable interface	–	–	–	–	–	–	×	×	–
Module change during operation	×	×	–	–	×	×	×	×	×
SYNC/FREEZE	×	×	×	×	–	–	–	–	–
Forwarding of parameterization data from PG/PC (see Section 2.2)	–	–	–	–	×	×	×	×	–
Parameterizable FM in an ET 200M (see Section 2.3)	–	–	–	–	×	×	×	×	–
Time synchronization on the PROFIBUS bus system, time stamping of input signals • In the redundant system (See Section 2.4)	–	–	–	–	–	×	×	×	–
Redundancy (see Sections 2.5 and 2.7)	–	–	–	–	–	×	–	×	×
Direct communication (see Section 2.8)	As of E07	×	As of E06	×	–	×	–	×	–
Enhanced diagnostics (see Section 5.4)	–	As of E02	–	As of E02	–	×	–	×	–
Extended range of environmental conditions (outdoors)	–	–	×	×	–	–	–	–	–

Front View of the IM 153-1 and -2

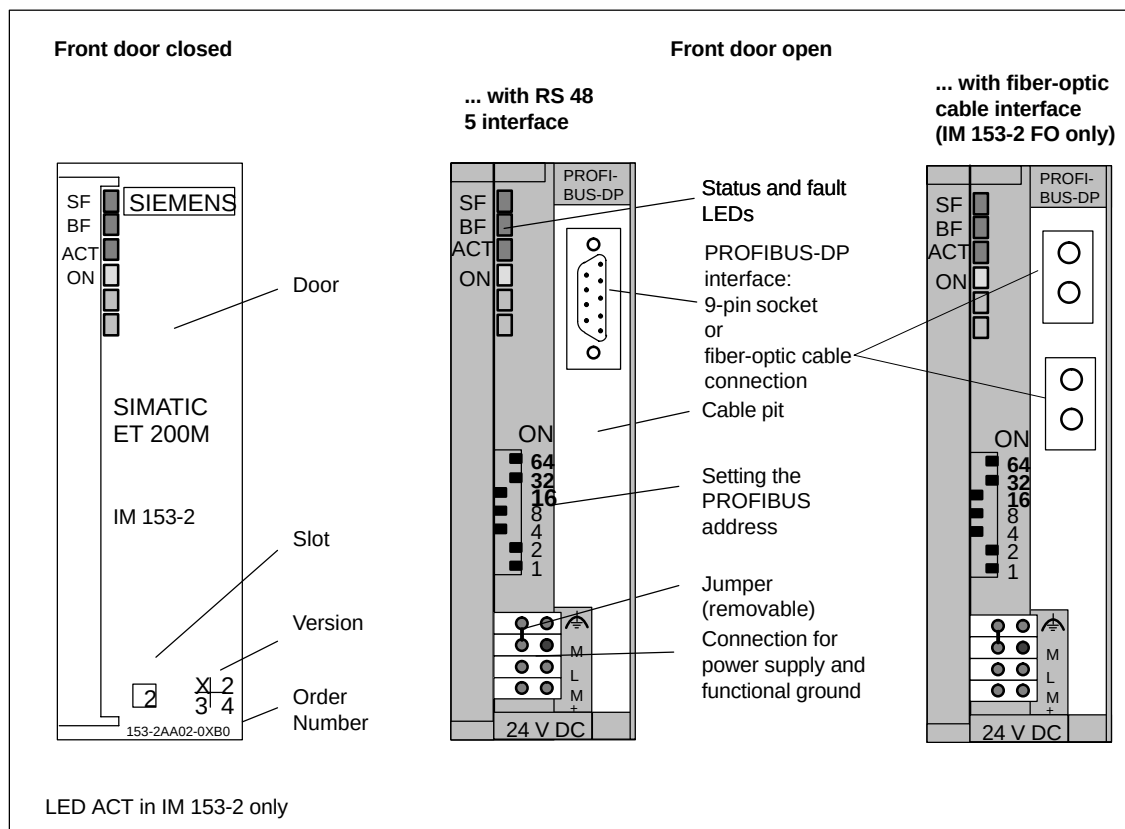


Figure 1-3 Front View of the IM 153-1 and IM 153-2

Front View of the IM 153-3

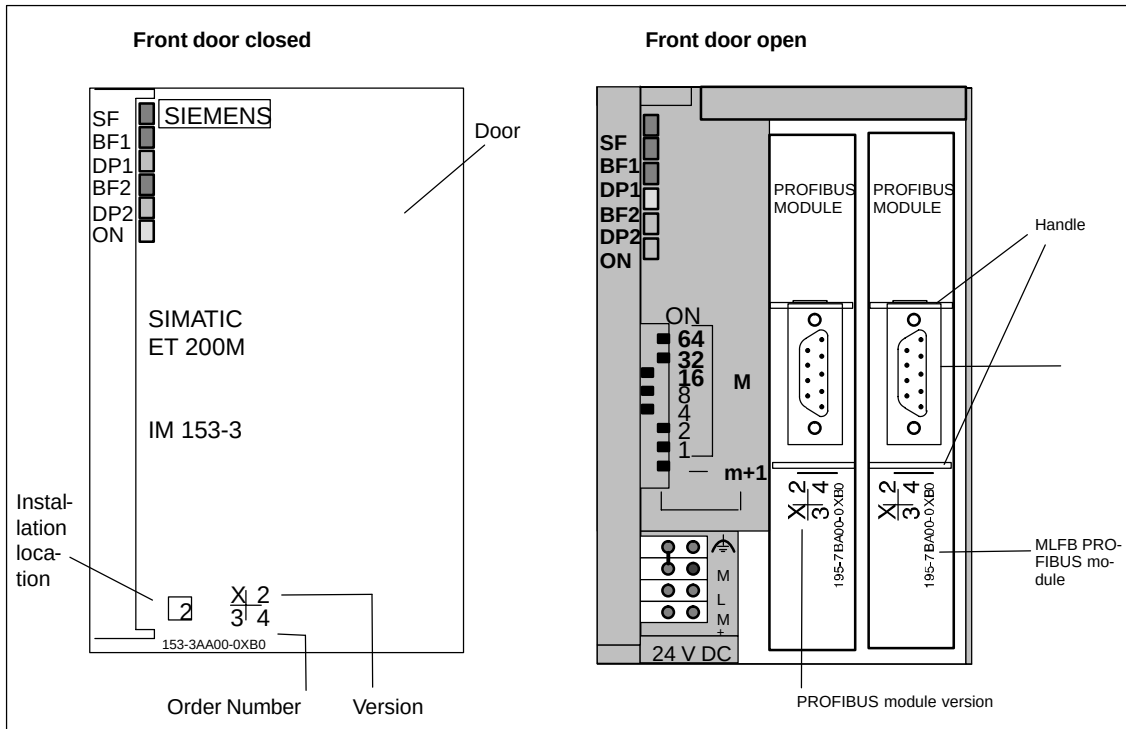


Figure 1-4 Front View of the IM 153-3

Configuration Options with the ET 200M

2

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

In This Chapter

Section	Subject	Page
2.1	Distributed I/Os with the IM 153-1	2-2
2.2	Forwarding Parameterization Data from the PG/PC with the IM 153-2	2-3
2.3	Parameterizable FM in a Configuration with the IM 153-2	2-4
2.4	Time Stamping with the IM 153-2	2-7
2.5	Redundancy with the IM 153-2	2-5
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2.7	Redundancy with the IM 153-3	2-10
2.8	Direct Communication	2-12

2.1 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 2-1 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.

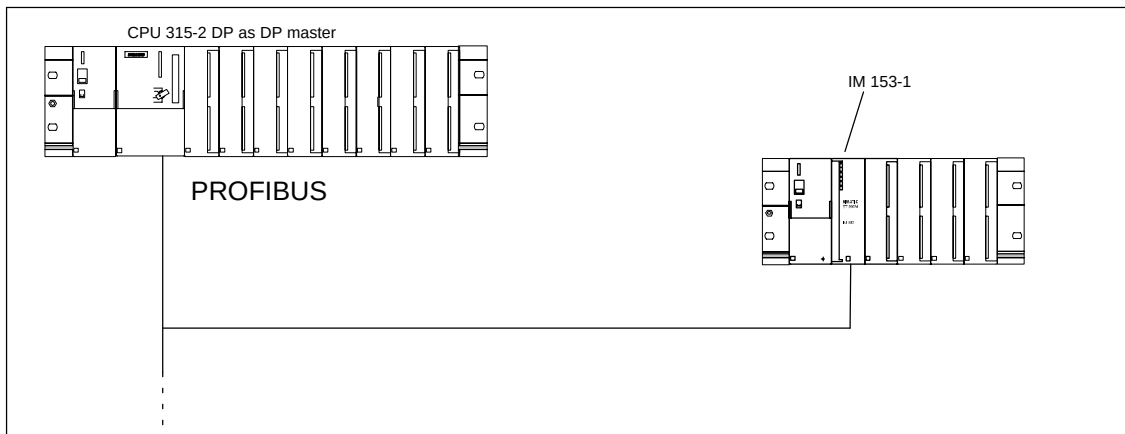


Figure 2-1 Distributed I/Os with the IM 153-1

2.2 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*.

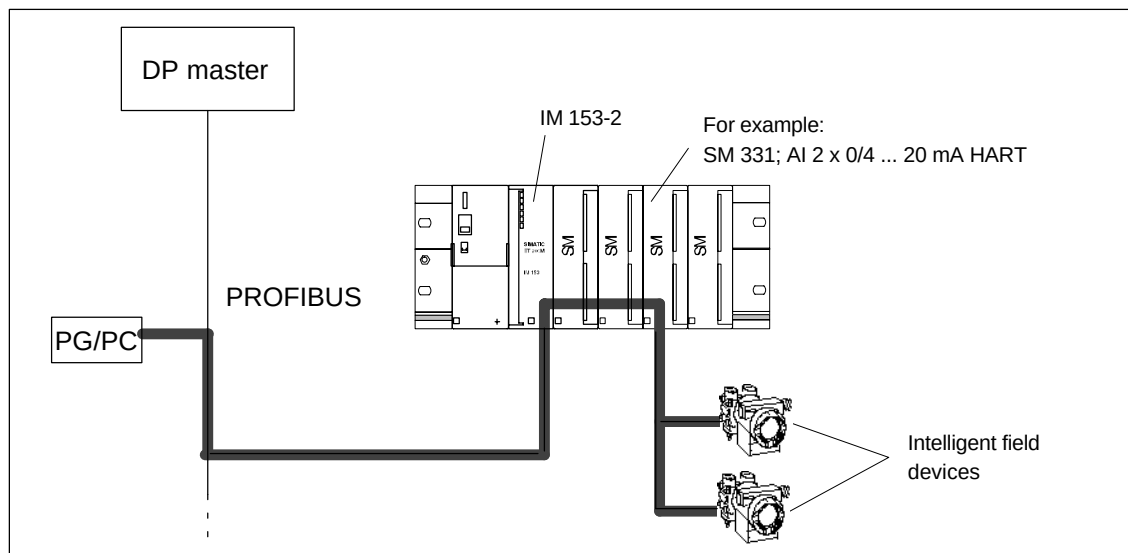


Figure 2-2 Forwarding Parameterization Data with an IM 153-2 and HART Modules

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

Sample configuration with an IM 153-2 and FM

Figure 2-3 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 8.1 if the DP master and the FM you are using have the functionality for distributed FMs.

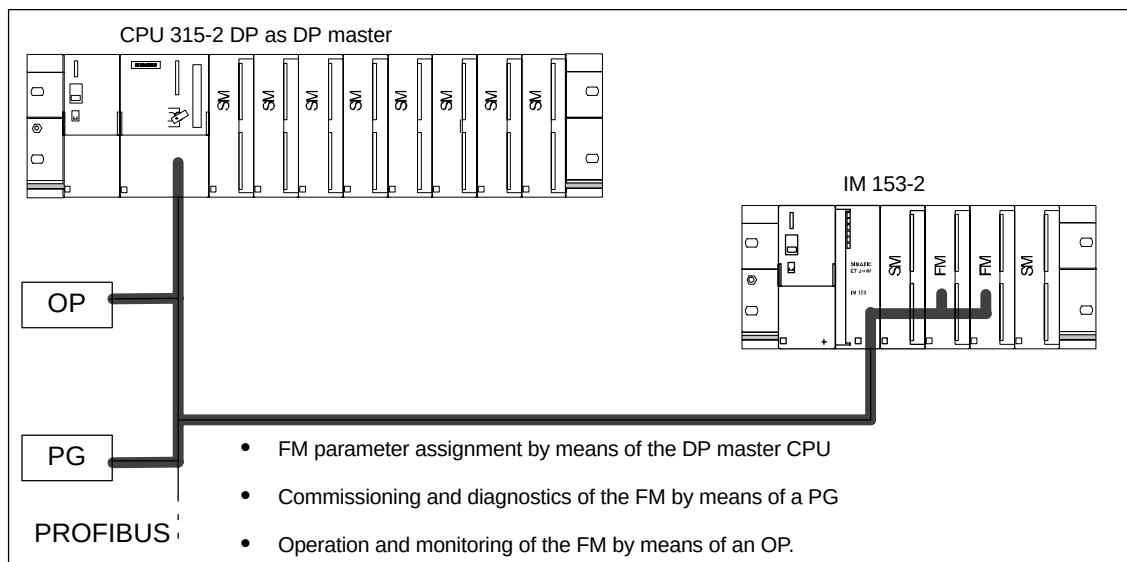


Figure 2-3 Parameterizable FM in an ET 200M with an IM 153-2

2.4 Time Stamping with the IM153-2

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.

Sample Configuration with the IM 153-2 and Time Stamping of Signal Changes

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.

You can find a detailed description of time stamping and time synchronization in the *PCS 7* documentation.

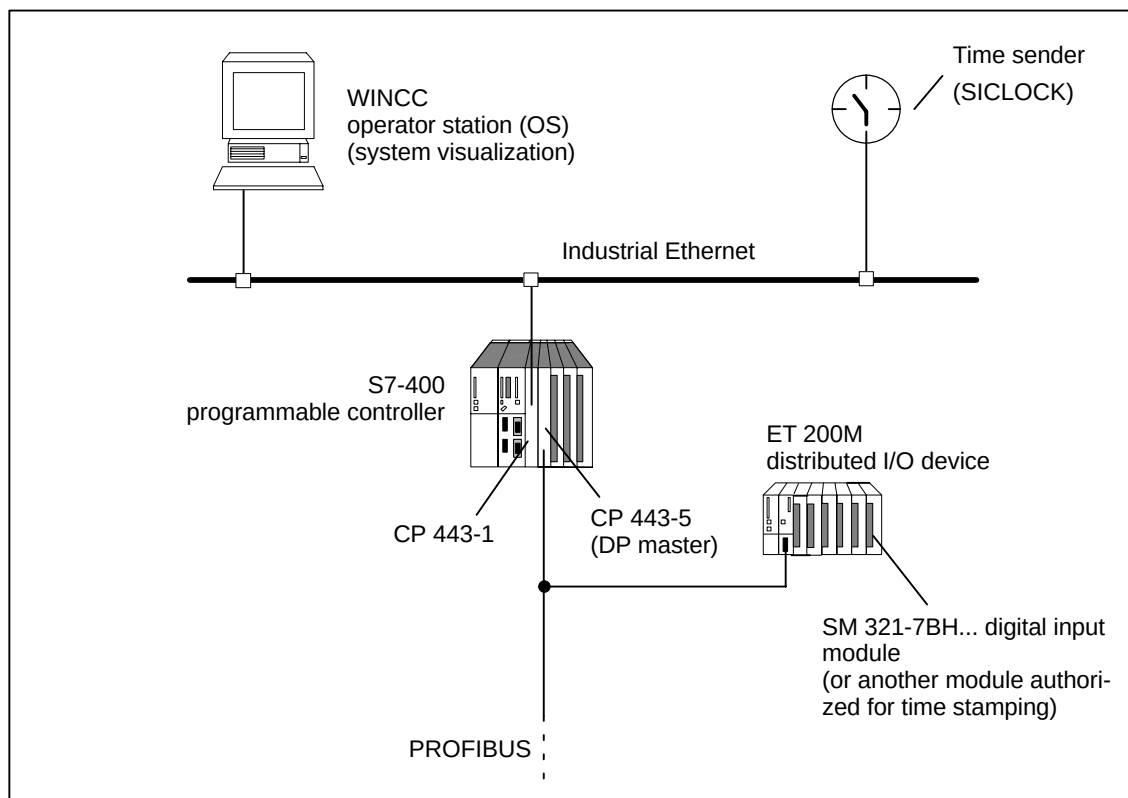


Figure 2-4 Sample Configuration with an IM 153-2 and Time Stamping of Signal Changes

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 message lists 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 report the current message lists 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.

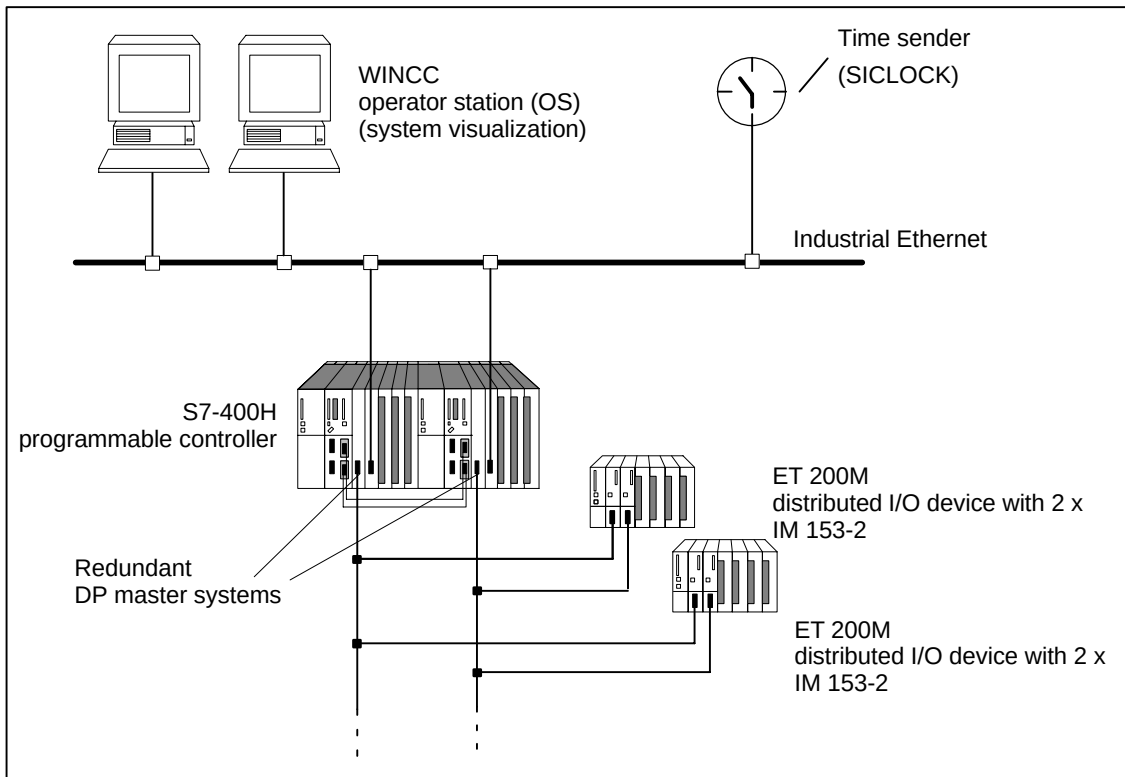


Figure 2-5 Sample Configuration with 2 × IM 153-2 for Redundancy in a Fault-Tolerant System

2.5 Redundancy with the IM 153-2

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

Figure 2-6 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*.

You can also use S5 DP masters or software redundancy.

Prerequisites for the ET 200M:

- Installation on active bus modules
- 2 × The IM 153-2 on the BM IM/IM bus module
- Possible with the IM 153-2/-2 FO as of 6ES7 153-2AA02/-2AB01
- 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.

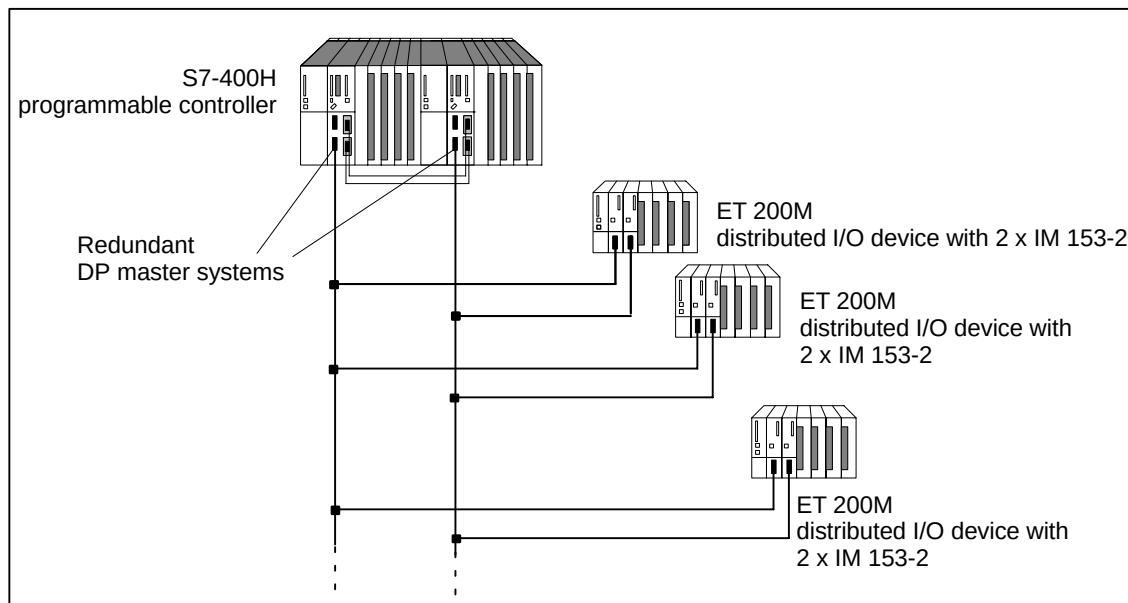


Figure 2-6 Redundancy with 2 × IM 153-2 Modules in an H System

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 153-2AA02, versions 7, 6 and 5

IM 153-2AB01, versions 6, 5 and 4.

Note: The functions that can be used are limited to those of the lower version in each case.

Prerequisites

To configure the S7-400H system you require *STEP 7* as of V 5.0.

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 .

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*.

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

The IM 153-2 FO also makes available the functions described in Sections 2.2, 2.3, 2.4 and 2.5. This section shows you the configuration of a fiber-optic network irrespective of the purpose for which the IM 153-2 FO is used.

Sample Configuration

Figure 2-7 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 only be configured as a line.
- If you remove the fiber-optic cable from an integrated fiber-optic interface, the following nodes will also no longer be accessible:

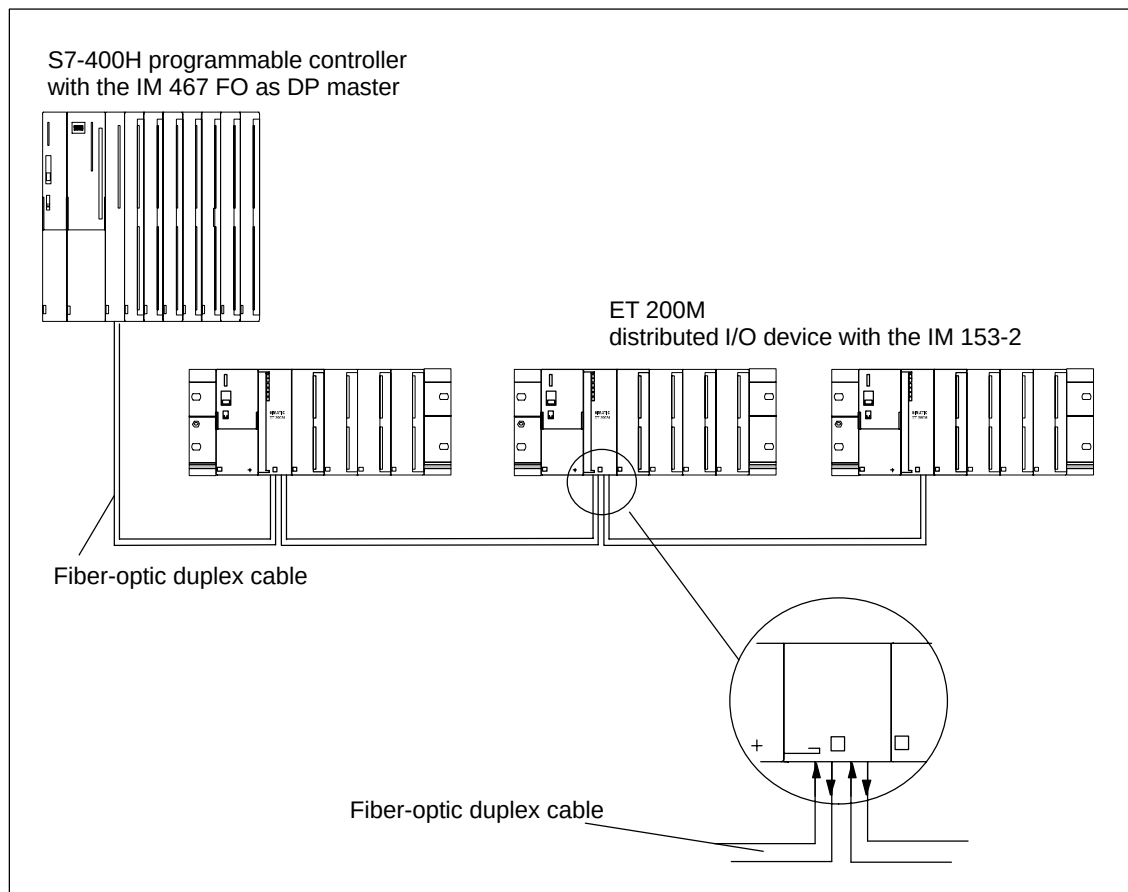


Figure 2-7 Fiber-Optic Network with the IM 153-2 FO

2.7 Redundancy with the IM 153-3

Redundancy with the IM 153-3

Figure 2-8 shows an example of an ET 200M with an IM 153-3 and a redundant PROFIBUS on an H (fault-tolerant) system. The ET 200M is connected to two DP masters via the two PROFIBUS interfaces of the IM 153-3.

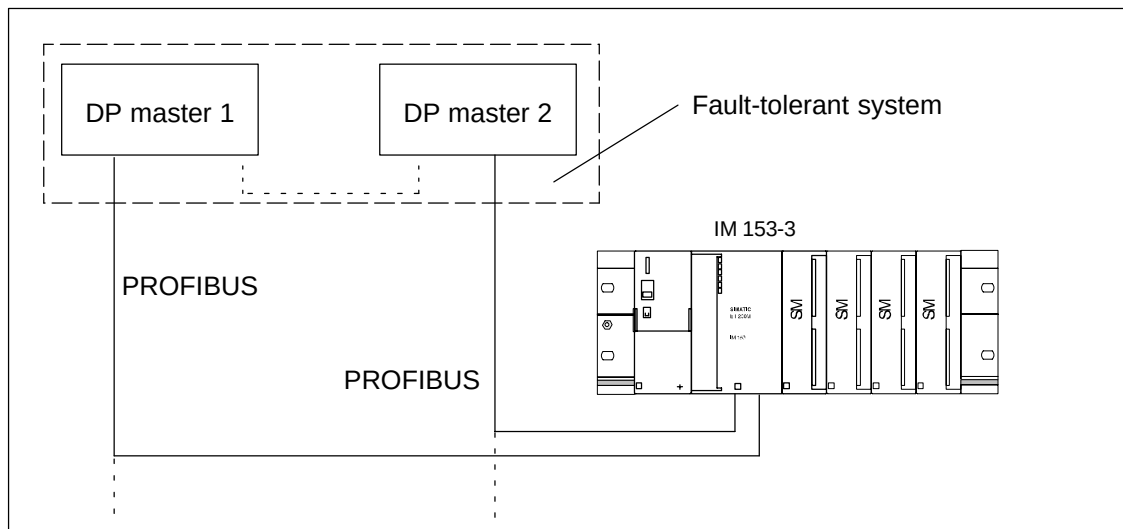


Figure 2-8 Redundancy with the IM 153-3

Note: Using the IM 153-3 with the two PROFIBUS modules is only advisable in an H system.

Note the following possible uses of the individual versions of the IM 153-3:

H System	153-3AA00		153-3AA01
	Version 01	As of Version 02	As of Version 01
S5-115H/155H	Yes	Yes	Yes
S7 software redundancy	No	Yes	Yes
S7-400H	No	No	Yes

Configuration with Active Bus Modules

You must configure the ET 200M with active bus modules for use with the **S7-400H**.

You should only configure an ET 200M with the IM 153-3 with active bus modules. This enables you to change the modules during ET 200M operation.

Method of Operation

The IM 153-3 consists essentially of 2 two slave interfaces, the PROFIBUS modules. Each PROFIBUS module monitors the operating status of the other.

Data is transferred via the two PROFIBUS modules to the assigned DP master. One of the two PROFIBUS modules is always active. The other PROFIBUS module is passive and on standby. Data is transferred directly to the outputs only via the active PROFIBUS module. The inputs of the I/O modules are read by both PROFIBUS modules.

There are two ways to switch between the PROFIBUS modules:

- If the active PROFIBUS module fails, a switchover takes place to the passive PROFIBUS module. Data transfer is then continued with the image of the data from the memory.
- The DP master forces a switchover from the active to the passive PROFIBUS module (e.g. with CPU STOP).

Note

When the IM 153-3 switches from the active to the passive PROFIBUS module, all the output data remains at its current value for approx. 30 ms + 2 DP cycles. The output modules keep their current values.

Prerequisites

The following prerequisites must be met for redundancy operation with the IM 153-3:
DP master 1 and DP master 2 ...

- Process the same user program.
- Have the same parameter assignment and configuration for the IM 153-3

S5-115H/155H as DP Master

If you use the IM 153-3 on an S5-H system, you must configure two DP master systems in *COM PROFIBUS*.

2.8 Direct Communication

As of *STEP 7 V 5.x* you can configure direct communication for the PROFIBUS nodes. The IM 153-x can participate in direct communication as the sender. In Table 1-2 on page 1-8 you can find out the version as of which the respective IM 153-x modules support direct communication.

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 2-9 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.

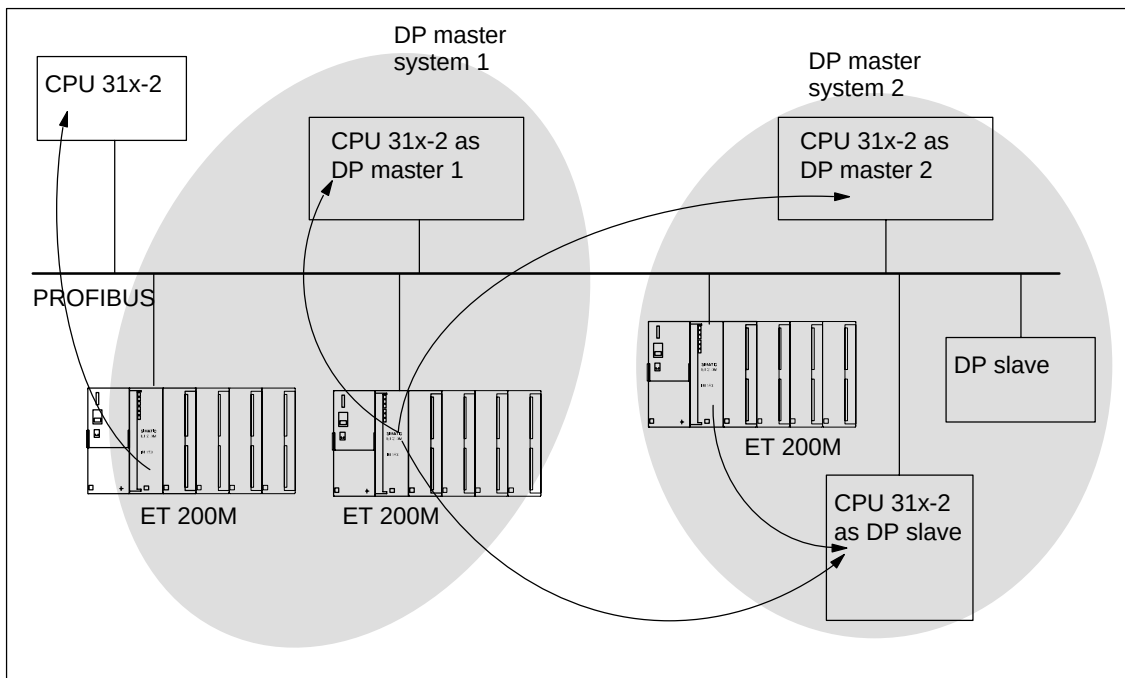


Figure 2-9 Direct Communication with the IM 153-x

Installation

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 4, entitled “Wiring”.

Contents

Section	Contents	Page
3.1	Mechanical Configuration	3-2
3.2	Installation	3-7
3.3	Connecting the Bus Connector	3-17
3.4	Connecting the Fiber-Optic Cable to the IM 153-2 FO	3-18
3.5	Setting the PROFIBUS Address	3-20

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 that are only 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.

3.1 Mechanical Configuration

In This Section

Section	Subject	Page
3.1.1	Horizontal and Vertical Installation of an ET 200M	3-2
3.1.2	Clearance Measurements	3-3
3.1.3	Arrangement of the Modules in an ET 200M Configuration	3-4
3.1.4	Rules for Configuring the "Module Change During Operation" and "Redundancy" Functions	3-5

3.1.1 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

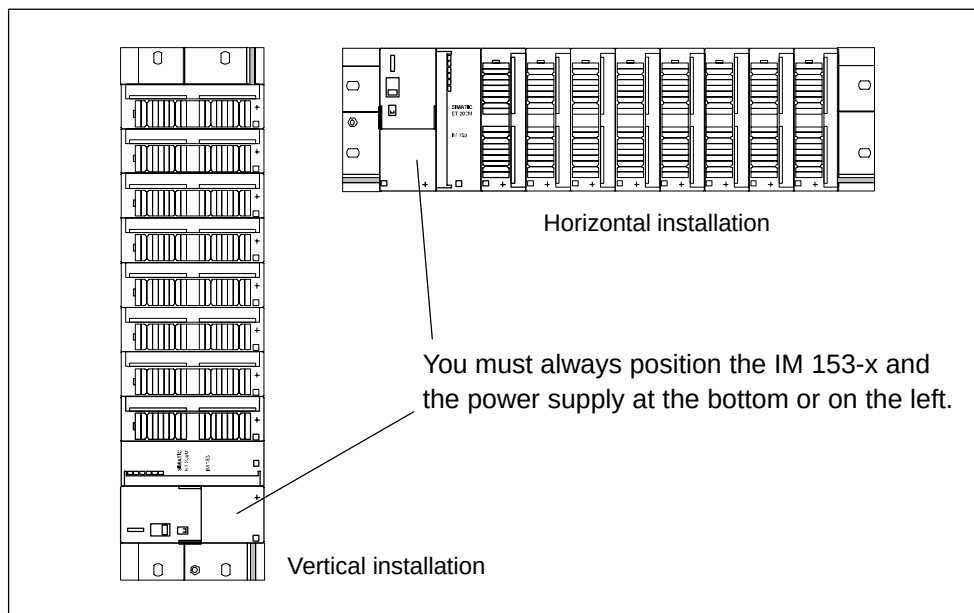


Figure 3-1 Horizontal and Vertical Installation of an ET 200M

3.1.2 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 4.2.4). 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 3-2 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.

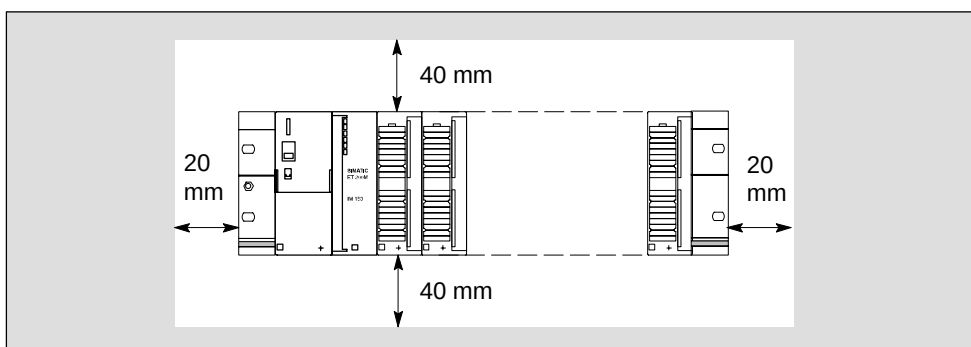


Figure 3-2 Clearance Measurements for an ET 200M Installation on a Mounting Rack

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 7.3.

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 3.2.1)

3.1.3 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 3-3 shows the arrangement of the modules in an ET 200M configuration with eight S7-300 modules.

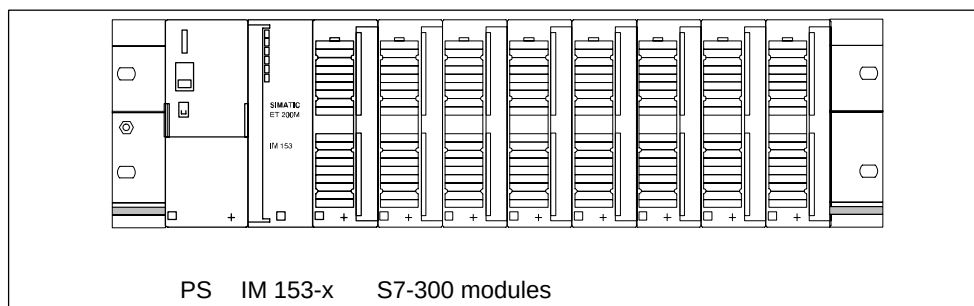


Figure 3-3 Arrangement of the Modules of an ET 200M

Installation in an Intrinsically Safe Area

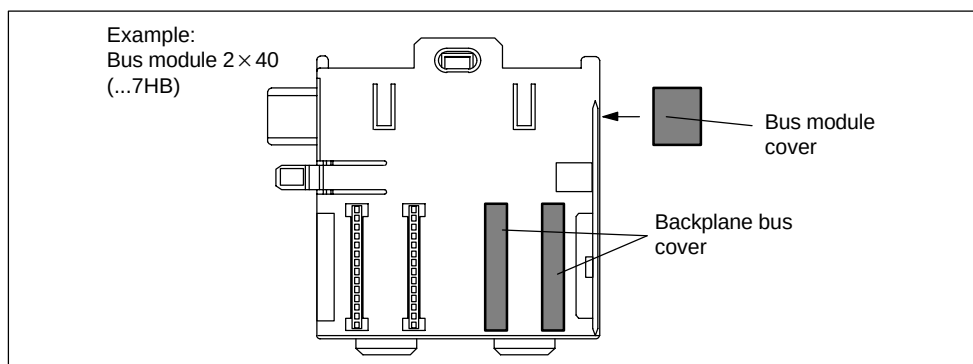
If you use the ET 200M in intrinsically safe areas, you must insert a DM 370 dummy module between the IM 153-x and the modules in the intrinsically safe area. This is the only way to adhere to the required thread length (see also the *Intrinsically Safe I/O Modules*) Reference Manual.

3.1.4 Rules for Configuring the "Module Change During Operation" and "Redundancy" Functions

Rules

The following rules apply in addition to those listed in Section 3.1.3:

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

Note

Not all S7-300 modules support the "module change during operation" function.

You can find a list in Section 8.5 in Table 8-5 of the S7-300 modules with which the "module change during operation" function cannot be used.

Installation Options

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

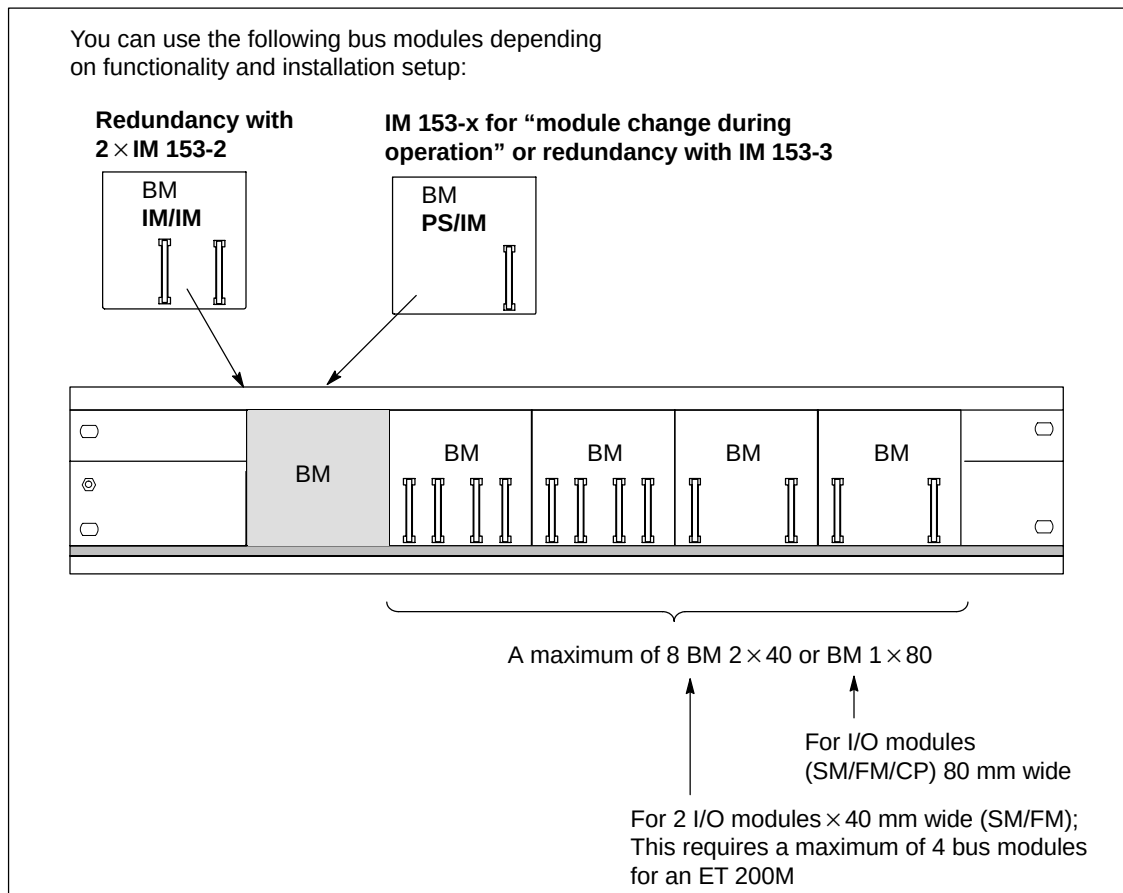


Figure 3-4 Installation Setup with Active Bus Modules

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.
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.
IM 153-3 on BM PS/IM	You must install the PS 307 on a separate S7 DIN rail.

3.2 Installation

In This Section

Section	Subject	Page
3.2.1	Installing the Rail	3-7
3.2.2	Installing the Modules on the Rail	3-11
3.2.3	Installing the Modules on the Rail for Active Bus Modules	3-13
3.2.4	After Installation	3-15

3.2.1 Installing a Rail

Uniform Installation

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

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 the fixing screws (dimensions: see Figure 3-5)
 - 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 3-5). 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.

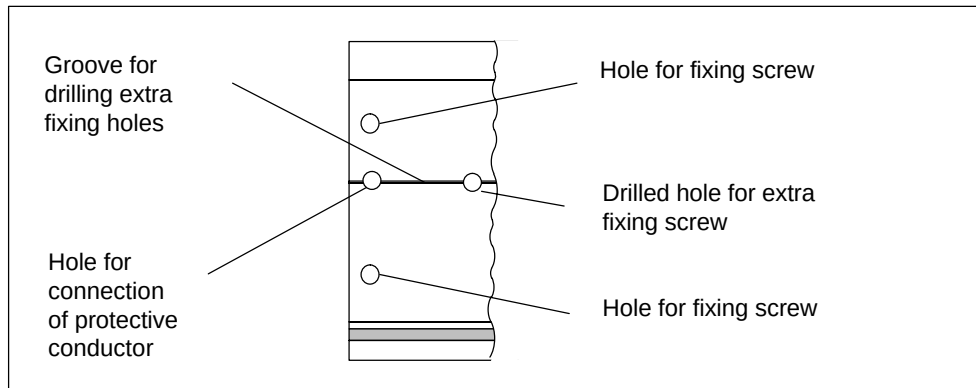
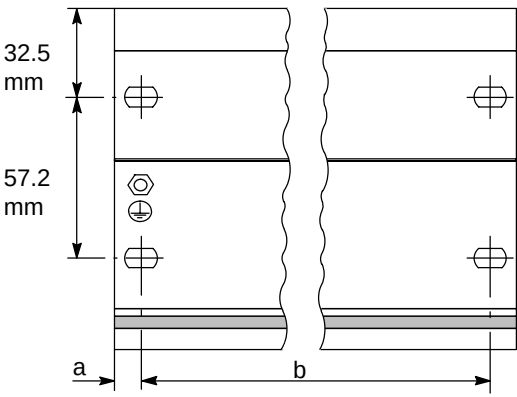
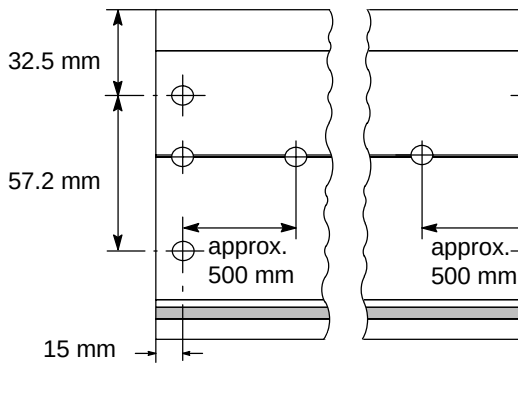


Figure 3-5 Fixing Holes of the 2 m Rail

Dimensioned Drawing for Fixing Holes

The fixing-hole dimensions for the rail are shown in Table3-1.

Table 3-1 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 to 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)	

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 3-2 on page 3-3)
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 mm².

Note

Ensure that your connection to the protective conductor is low-impedance (see Figure 3-6). 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 3-6 shows you how to connect the protective conductor to the rail.

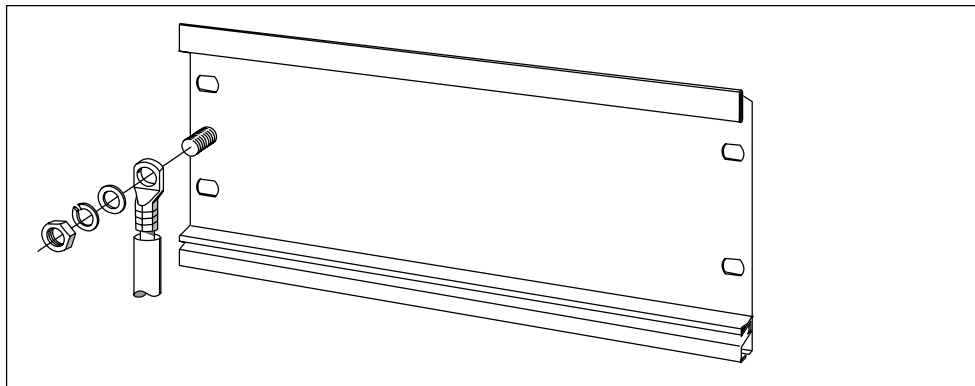


Figure 3-6 Connecting the Protective Conductor to the Rail

3.2.2 Installing the 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 3-2 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

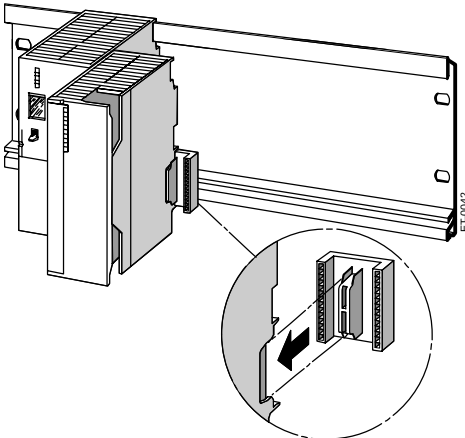
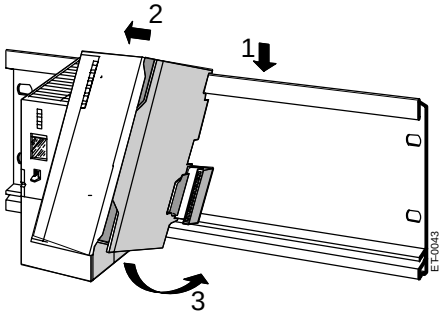
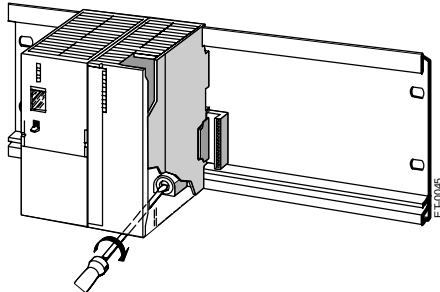
1. Power supply module
2. IM 153-x
3. Signal module(s)

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).

Sequence for Installation

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

Table 3-3 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!	 ET-0042
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).	 ET-0043
Bolt the modules tight, applying a torque of between 0.8 and 1.1 Nm.	 ET-0045

3.2.3 Installing the Modules on the Rail for Active Bus Modules

Introduction

To configure an ET 200M with the "module change during operation" function, use the associated rails (order number 6ES7 195-1Gx00). Only these rails can take the active bus modules.

Installing the Rail

Install this rail in the same way as a DIN rail (see Section 3.2.1).

Installing Bus Modules and Modules

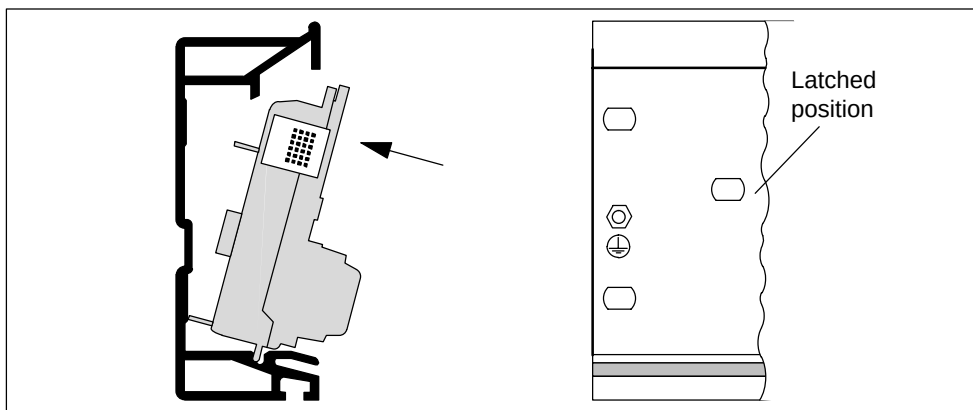
To install the active bus modules and modules, proceed as follows:

Only install the active bus modules in a deenergized 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.

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



Warning

When you plug in output modules, uncontrollable 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!

3.2.4 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 3-4 shows the slot number assignment.

Table 3-4 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 include these slots in the *STEP 7* or *COM PROFIBUS* configurations.

Applying Slot Numbers

Figure 3-7 shows you how to apply the slot numbers. The slot number labels are included with the IM 153-x.

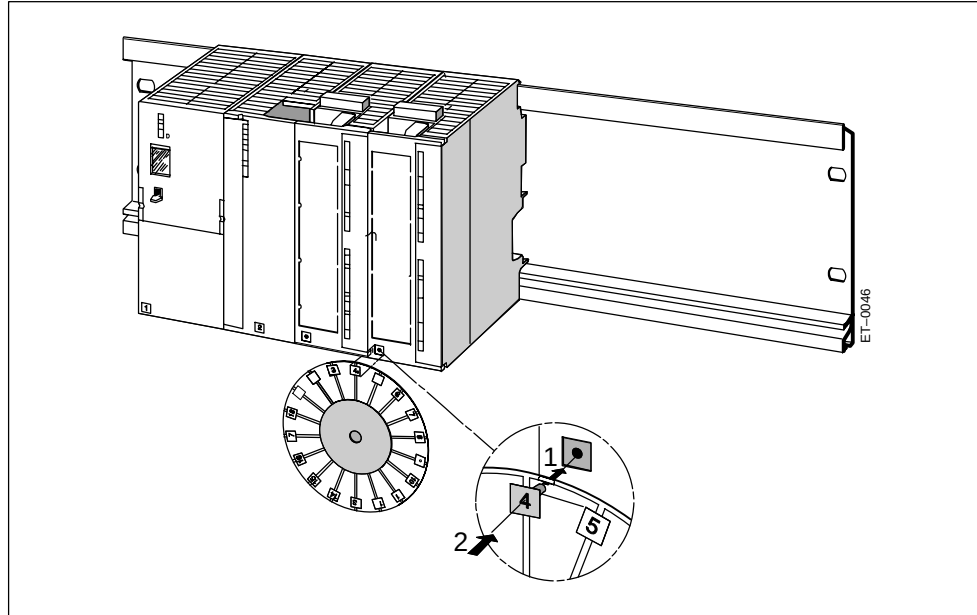


Figure 3-7 Applying Slot Numbers to the Modules

3.3 Connecting the Bus Connector

The following bus connectors are available:

- Up to 12 Mbps
 - Without programming device socket (6ES7 972-0BA11-0XA0)
 - With programming device socket (6ES7 972-0BB11-0XA0)
- Up to 12 Mbps, 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 DC 24 V terminal.

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

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

Accessories Required:

- Pack of Simplex connectors and polishing sets (6GK1901-0FB00-0AA0)
- Pack of plug-in adapters (6ES7 195-1BE00-0XA0)

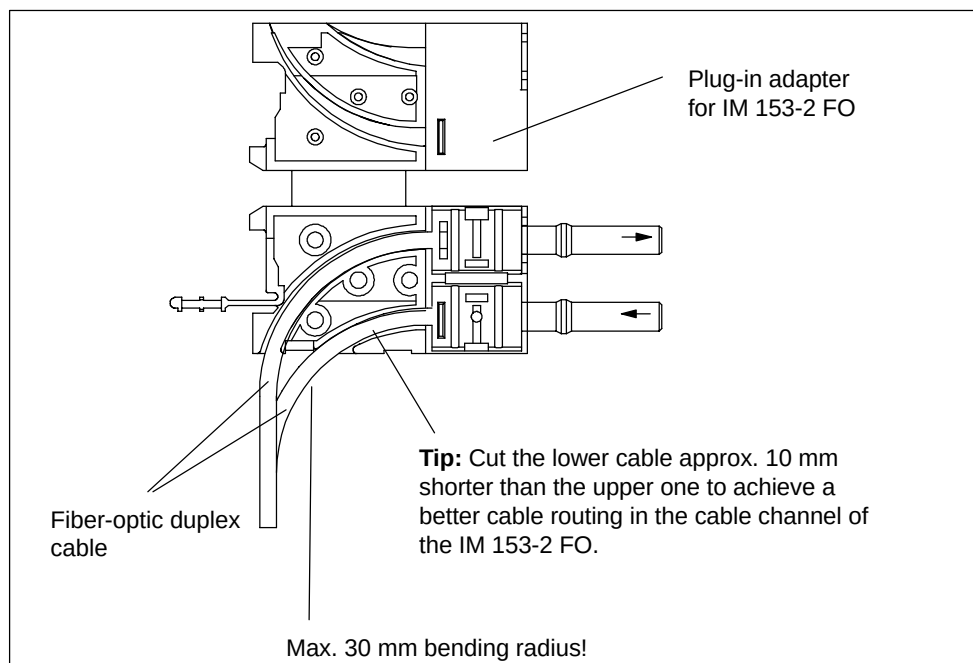
Installing Connectors

1. Remove approximately 30 cm of the sheath of 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!



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.

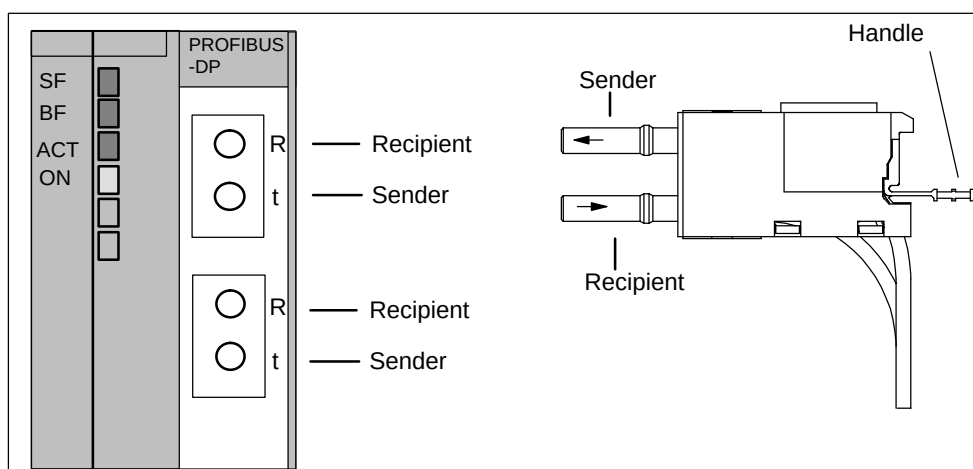


Figure 3-8 Inserting the Fiber-Optic Cables into the IM 153-2 FO

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 *SIMATIC NET PROFIBUS Networks* manual.

3.5 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.
Are you using the IM 153-3? If so, then you can set the same or different PROFIBUS addresses for both PROFIBUS modules. In the case of different PROFIBUS addresses, the PROFIBUS module 2 is given the PROFIBUS address of the PROFIBUS module +1.
- Each PROFIBUS address can only be assigned once on the bus.

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).

IM 153-3: If you want to assign different addresses to the PROFIBUS modules, put switch **m+1** into the ON position. PROFIBUS module 1 then has the PROFIBUS address **m**, and PROFIBUS module 2 has the PROFIBUS address **m+1**.

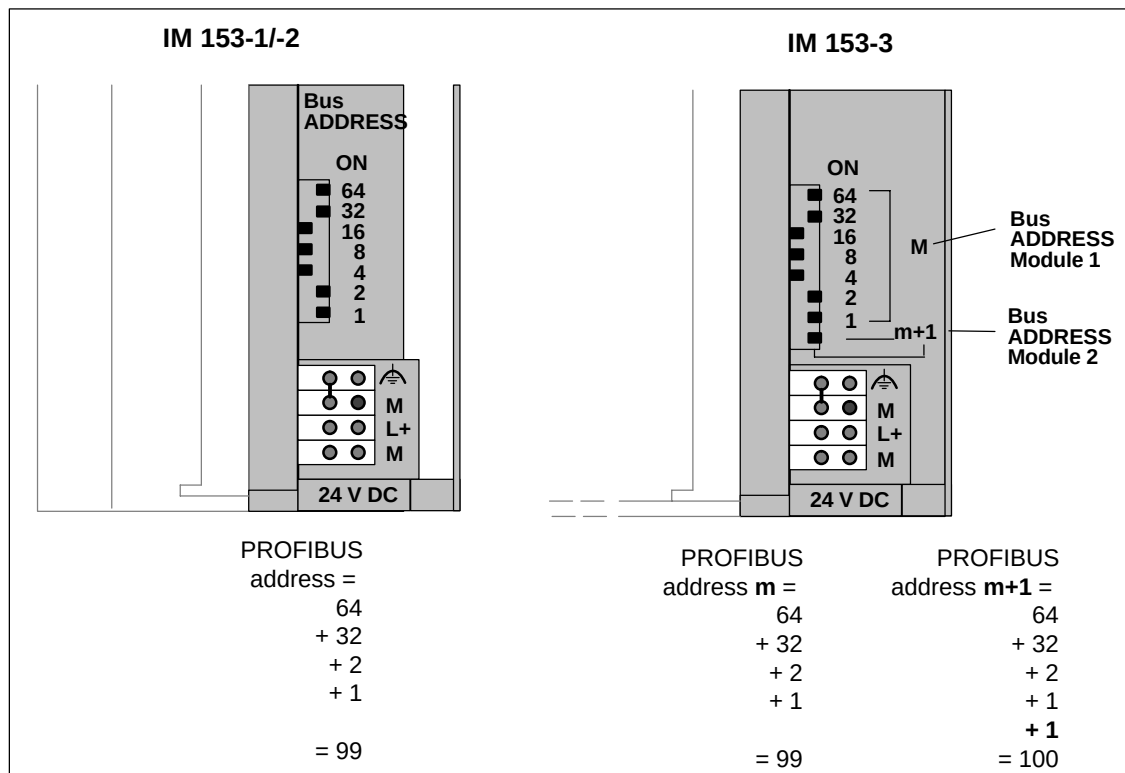


Figure 3-9 Setting the PROFIBUS Address

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 DC 24 V supply has been turned off and on again.

Wiring

4

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 3.1.

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.

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4.1 Electrical Configuration

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4.1.1 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 protection guidelines).

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.

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 mains 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.

With ...	Pay Attention to ...	
Buildings	Outdoor lightning protection	Install lightning protection (e.g. lightning conductors).
24 V DC power supply cables, signal cables	Indoor lightning protection	
24 V power supply	Safe electrical isolation of safety extra-low voltage	

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.

4.1.2 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 4-1.

Table 4-1 DIN VDE Specifications for Configuring a PLC System

Compare ...	Reference in Figure 4-1 (Page 4-7)	DIN VDE 0100	DIN VDE 0113
Circuit-breaking device for PLC, sensors and actuators	①	... Part 460: Main switch	... Part 1: Disconnecter
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

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	If the output voltage tolerances are exceeded, we recommend you fit a back-up capacitor Rating: 200 μ F 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 4-1, [4](#)). In the event of power distribution faults, this makes it easier to localize ground faults.

ET 200M in the Overall Configuration

Figure 4-1 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.

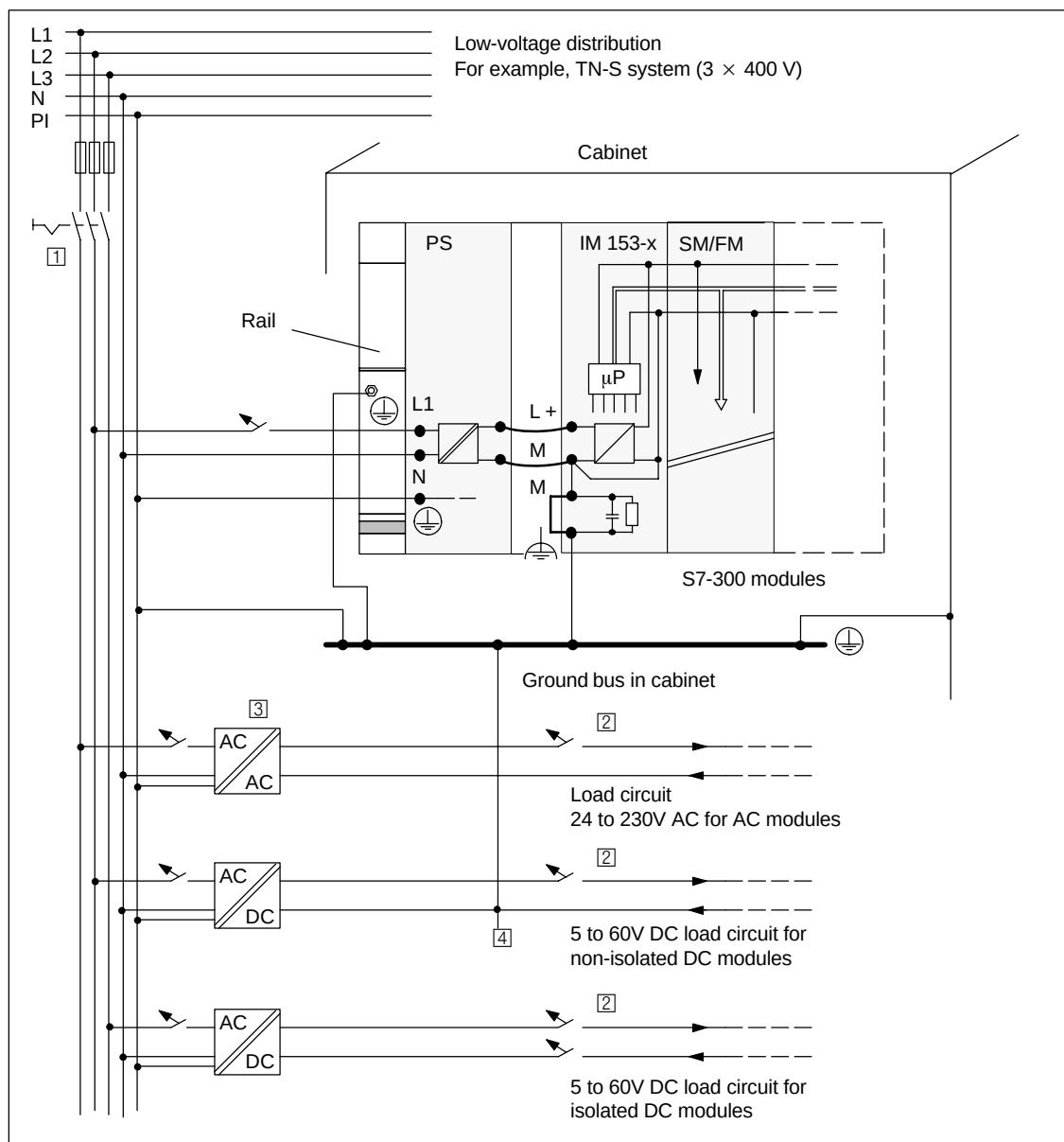


Figure 4-1 S7-300 Modules Operated on a Grounded Incoming Supply

ET 200M with Load Power Supply from the PS 307

Figure 4-2 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.

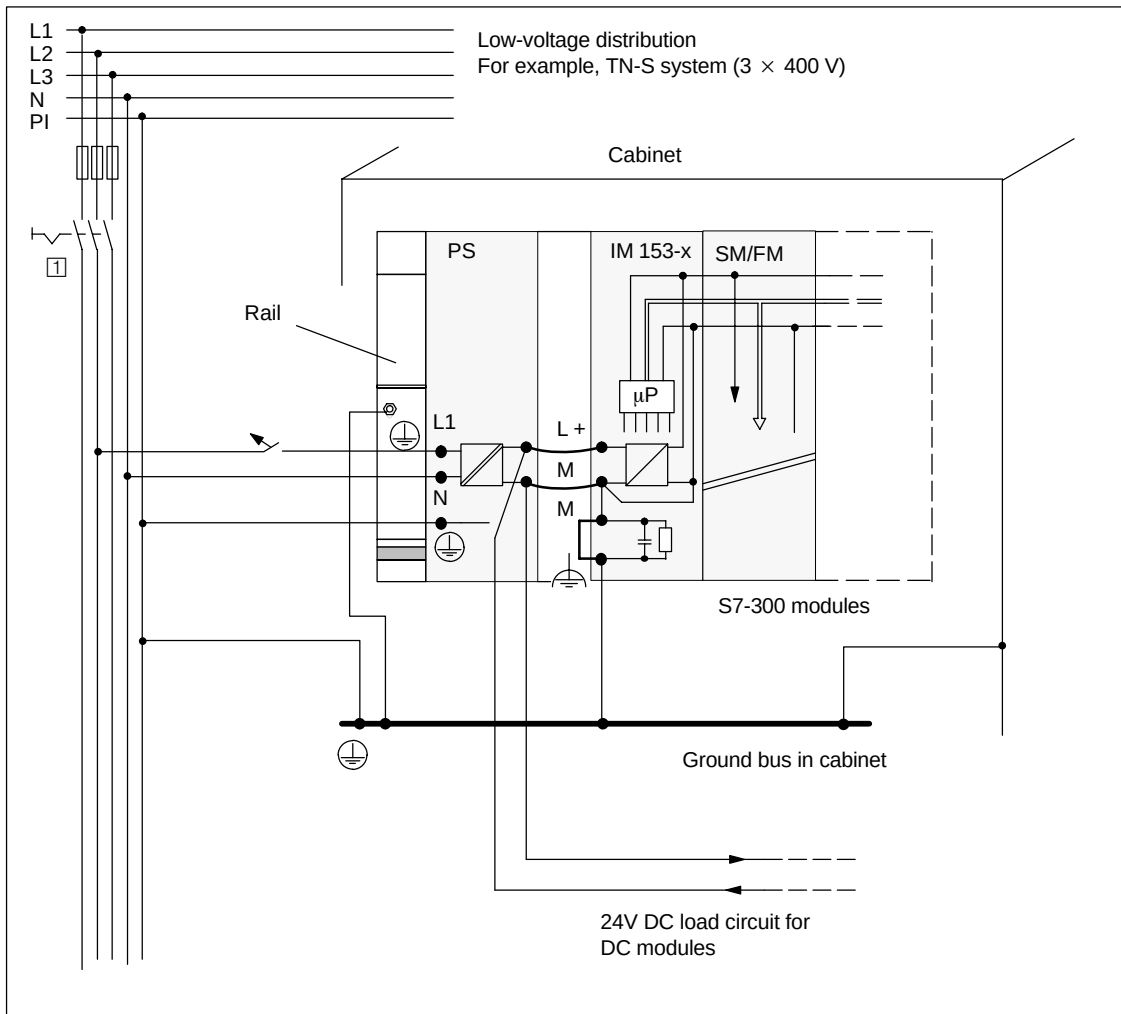


Figure 4-2 S7-300 Modules Operated from the PS 307

4.1.3 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 4-3).

See also Section 8.6 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 4-3 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.

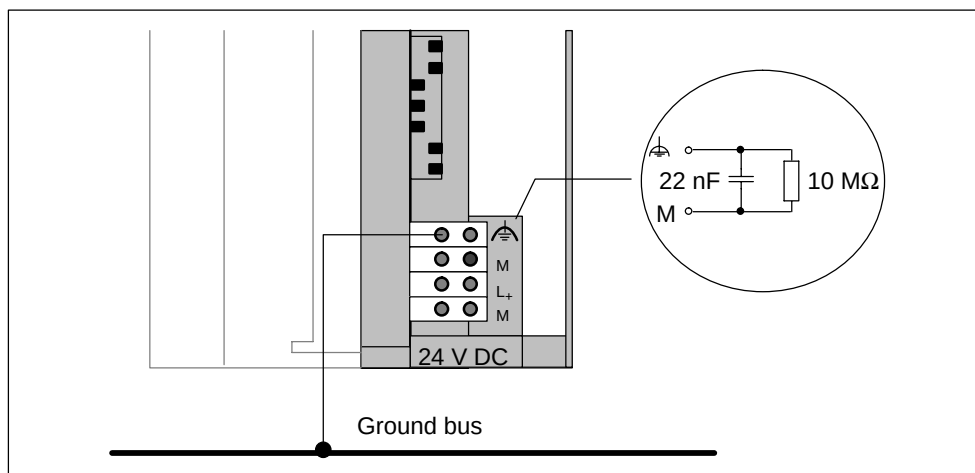


Figure 4-3 Configuring the ET 200M with Ungrounded Reference Potential

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.

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.

4.1.4 Configuring the ET 200M with 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 4-4).

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.

Configuration with Isolated Modules

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

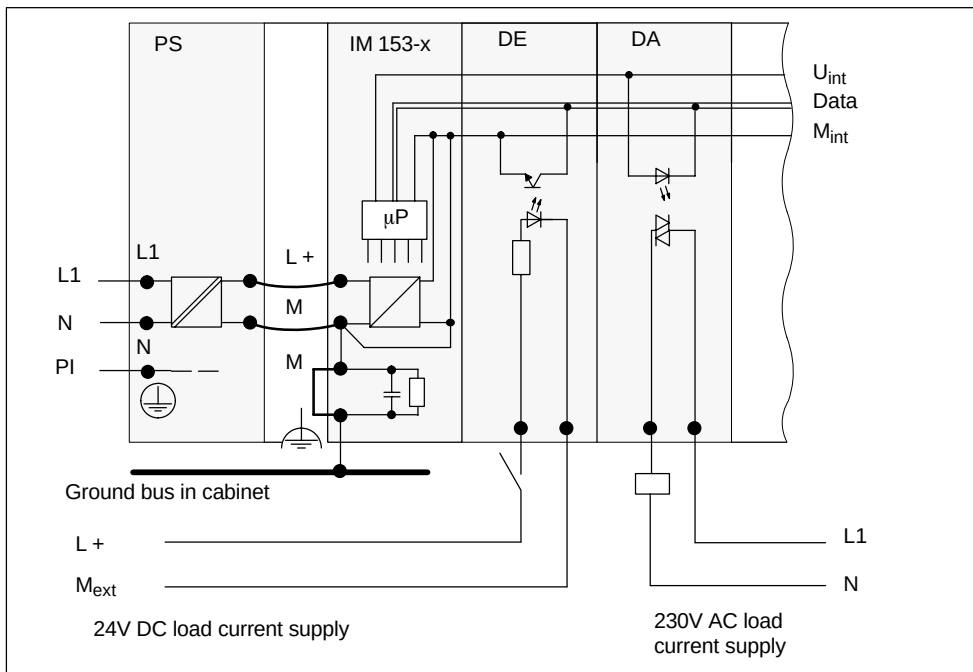


Figure 4-4 Simplified Illustration of the Configuration with Isolated Modules

4.2 Wiring

In This Section

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4.2.2	Wiring the Power Supply Module and the IM 153-x	4-15
4.2.3	Wiring the Front Connectors of the Signal Modules	4-17
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4.2.1 Wiring Rules

Note: The cables for the front connectors are longer in a configuration for module change during operation (see Section 4.2.3).

Table 4-2 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		Ø 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
Wire end ferrules to DIN 46228	With insulating collar	Form E, up to 12 mm long

Table 4-3 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		Ø 3.1 mm Max. qty. 20	Ø 2.0 mm Max. qty. 40
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

4.2.2 Wiring the Power Supply and IM 153-x

Power Cables

To wire the power supply, use flexible cables (see Table 4-2 on page 4-13). If you use only one cable per connection, you don't need an end ferrule.

Power Cable

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

Other 24 V Connections

Above the power cable 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.

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

Wiring with the Power Cable

To wire the power supply module and IM 153-x, proceed as follows (see Figure 4-6).



Warning

Make sure the ET 200M is deenergized 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 power cable and screw tight.
6. Close the front doors.

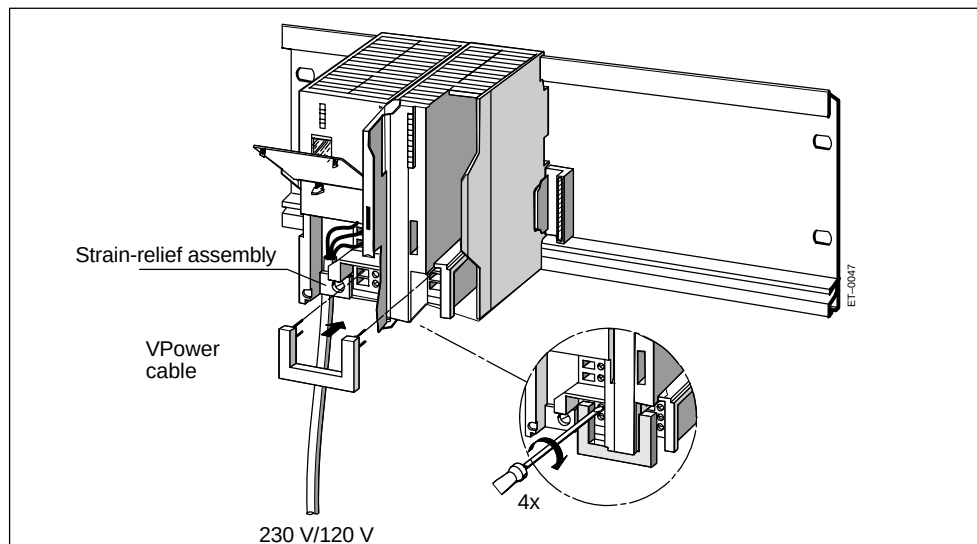


Figure 4-6 Wiring the PS 307 Power Supply Module and the IM 153-x with the Power Cable

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.

4.2.3 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 4-3 on page 4-14. You do not need wire end ferrules. If you use wire end ferrules, only use those listed in Table 4-3 on page 4-14.

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.

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 deenergized 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 4-7 shows you how to get the front connector into wiring position.

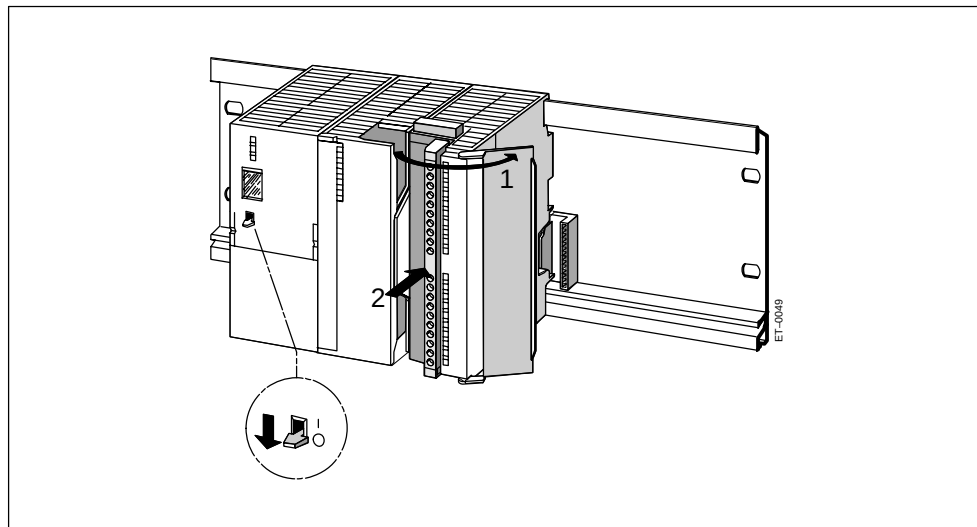


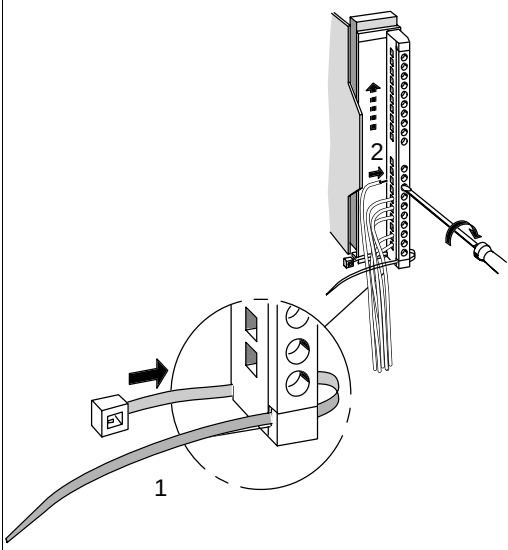
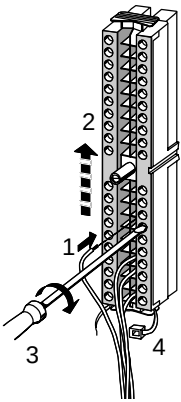
Figure 4-7 Bringing the Front Connector into the Wiring Position

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

If so: Press the end ferrules and the cables together

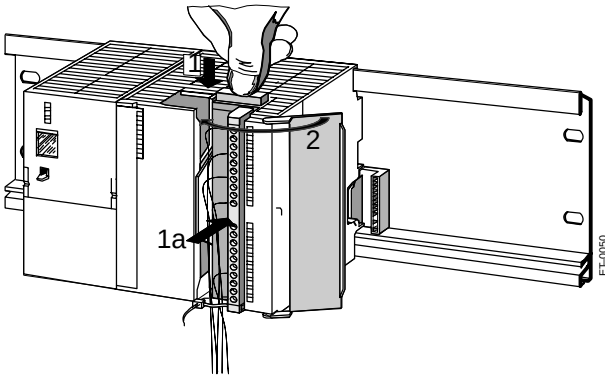
Wiring the Front Connector

Table 4-4 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. If not: Start with terminal 1, and wire the terminals in the following order: terminal 1, 2, ... 20.	Starting at terminal 40 or 20, wire the terminals alternately (i.e. terminals 39, 19, 38, 18 etc. down to terminals 21 and 1). 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.	
—		

Preparing the Signal Module for Operation

Table 4-5 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. 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.	Tighten screws to bring front connector to its operating position.
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.	
—		

4.2.4 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 4-6 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 8 mm	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.

Installing the Shield Contact Element

Install the shield contact element as follows:

1. Push the two bolts of the mounting bracket into the guide on the underside of the rail. Position the mounting bracket under the modules to be wired.
2. Bolt the mounting 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 mounting bracket (see Figure 4-8). 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.

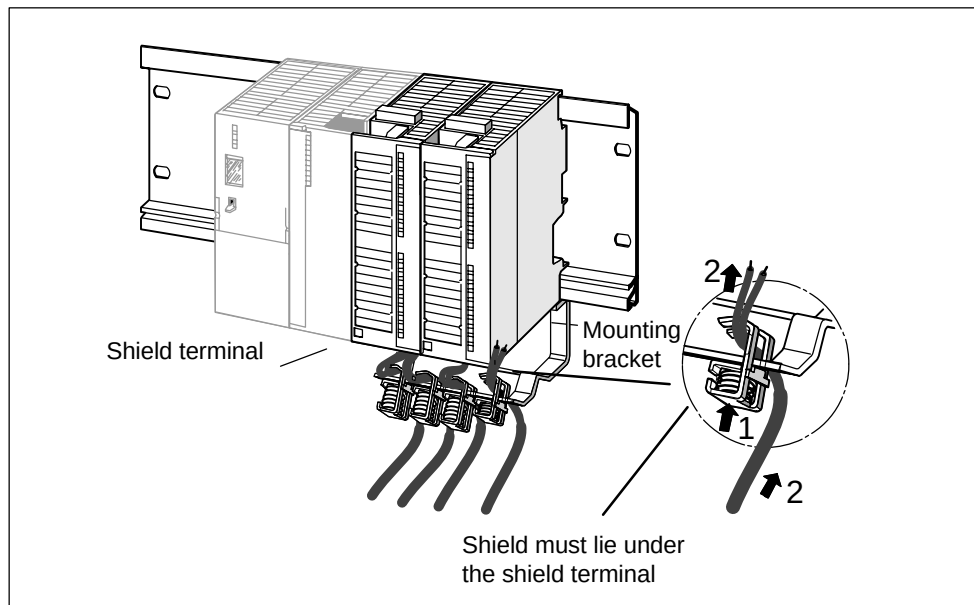


Figure 4-8 Attaching Shielded 2-Wire Cables to a Shield Contact Element

Attaching Cables

You can only attach one or two shielded cables per shield terminal (see Figure 4-8 and Table 4-6). 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.

Commissioning and Diagnostics

5

In This Chapter

Section	Subject	Page
5.1	Commissioning and Startup of the DP Slave	5-1
5.2	Diagnostics Using LEDs	5-10
5.3	Diagnostics Using STEP 7 and STEP 5	5-15
5.4	Structure of the Diagnosis	5-18

5.1 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
5.1.1	Prerequisites for Commissioning	5-2
5.1.2	Startup of the IM 153-1	5-4
5.1.3	Startup of the IM 153-2/153-2 FO	5-6
5.1.4	Startup of the IM 153-3	5-9

5.1.1 Prerequisites for Commissioning

Software Prerequisites

Table 5-1 Software Prerequisites for Commissioning

Configuration Software Used	Version	Notes
<i>STEP 7</i>	–	If you configure the IM 153-x from the <i>STEP 7</i> 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 <i>STEP 7</i> .
<i>COM PROFIBUS</i>	< Version 3.0	You have integrated the IM 153-x with the type file in COM PROFIBUS:
	≥ Version 3.0	You have integrated the IM 153-x with the device master file in <i>COM PROFIBUS</i> .
Configuration software for DP master used	–	You integrate the device master file of the DP slave.

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

Prerequisites for Commissioning

Table 5-2 Commissioning prerequisites for the DP slave

Required Activity	DP Interface		See ...
	RS 485	FO	
1. DP slave installed	×	×	Section 3.2
2. PROFIBUS address set on the DP slave	×	×	Section 3.5
3. Bus connector and fiber-optic cable connected	×	×	Section 3.3 and 3.4
4. If the DP slave is at the segment end, the terminating resistor on the DP slave is connected	×	–	Section 3.3
5. If the DP slave is at the end of a fiber-optic line, close the unused fiber-optic interface with filler plugs	–	×	Section 3.4
6. The DP slave configured	×	×	Online help system/manual for configuration software
7. Supply voltage switched on for DP master	×	×	DP master manual
8. DP master set to RUN mode	×	×	DP master manual

Commissioning the DP Slave

Table 5-3 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.

5.1.2 Startup of the IM 153-1

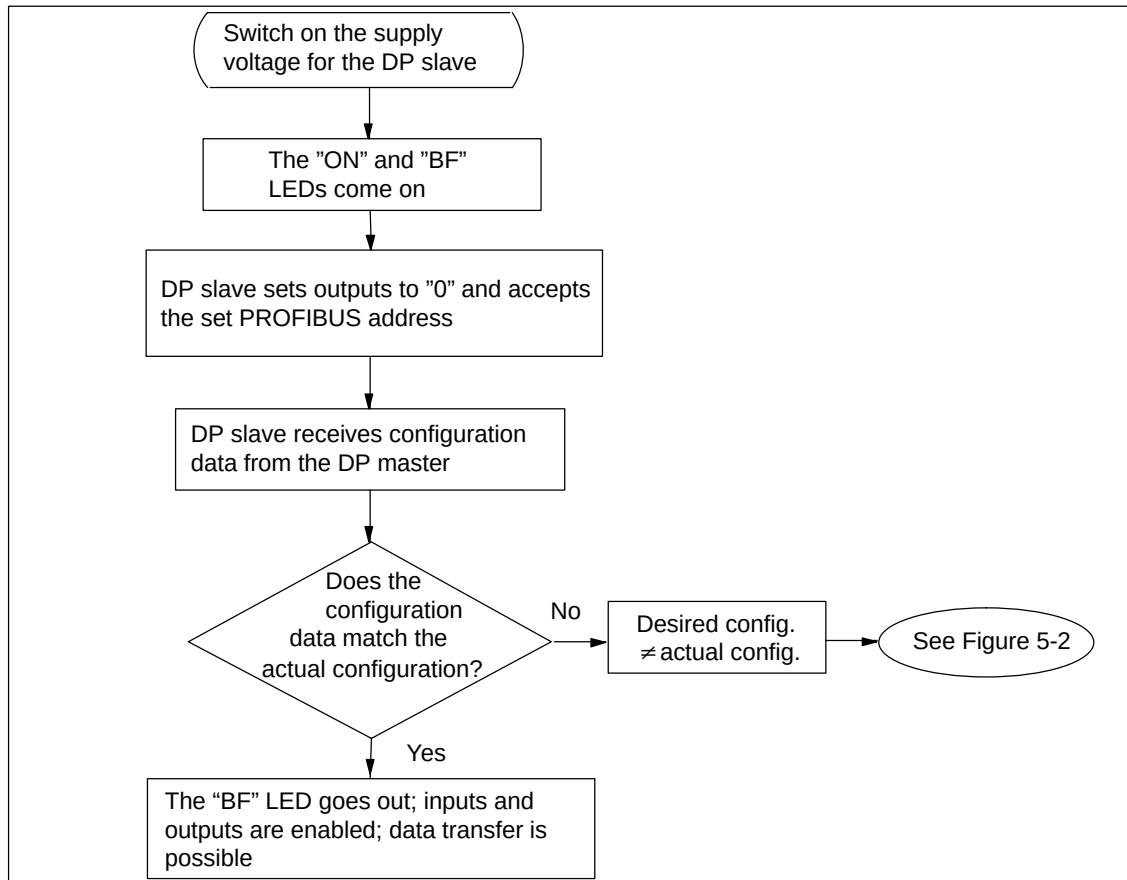


Figure 5-1 Startup of the IM 153-1

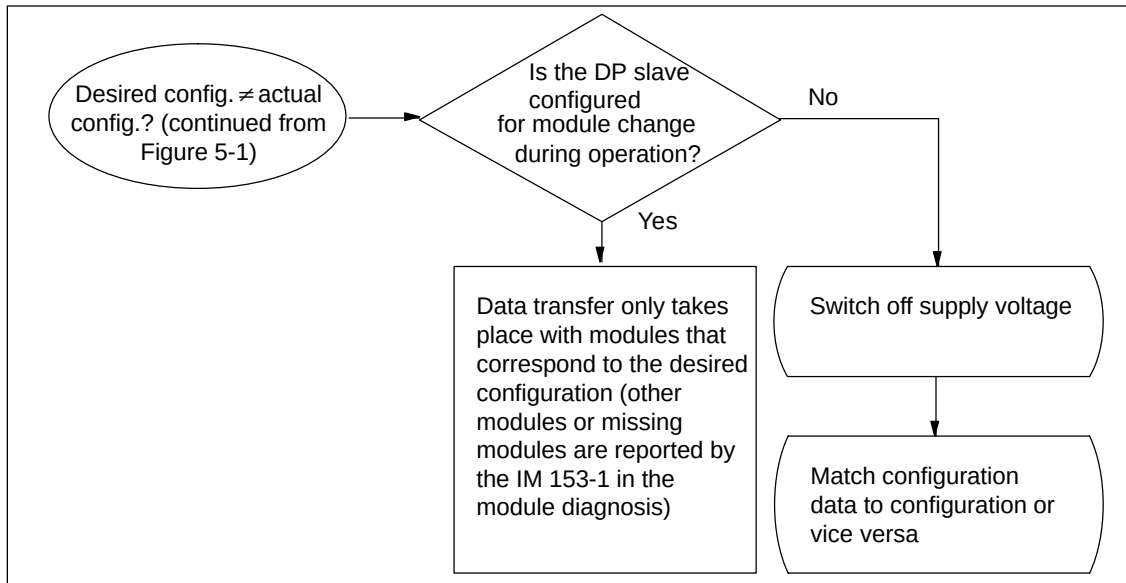


Figure 5-2 Startup Behavior in the case of module change during operation

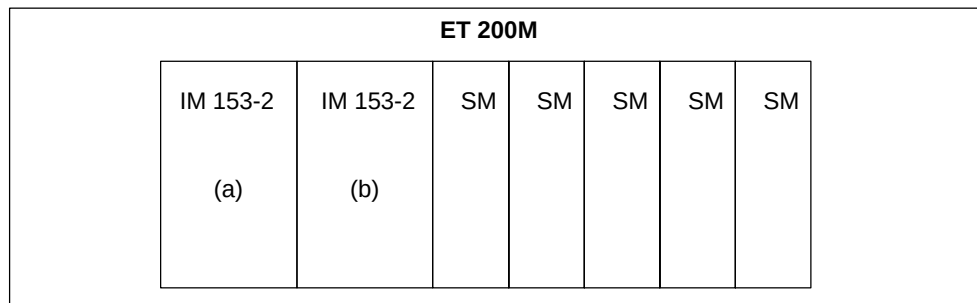
5.1.3 Startup of the IM 153-2/153-2 FO

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 5-3 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.



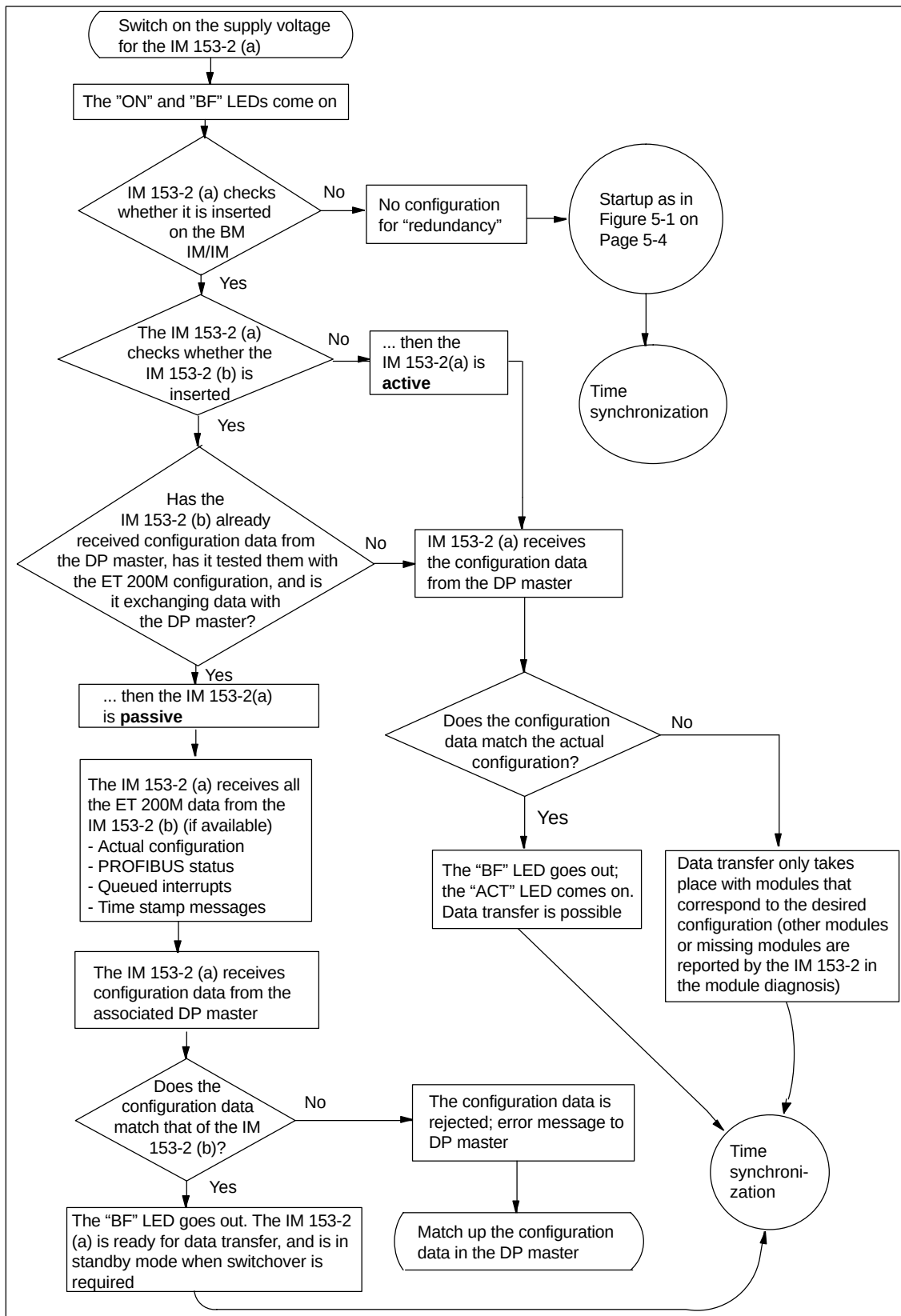


Figure 5-3 Startup of the IM 153-2

Startup for Time Synchronization/Time Stamping of Signal Changes

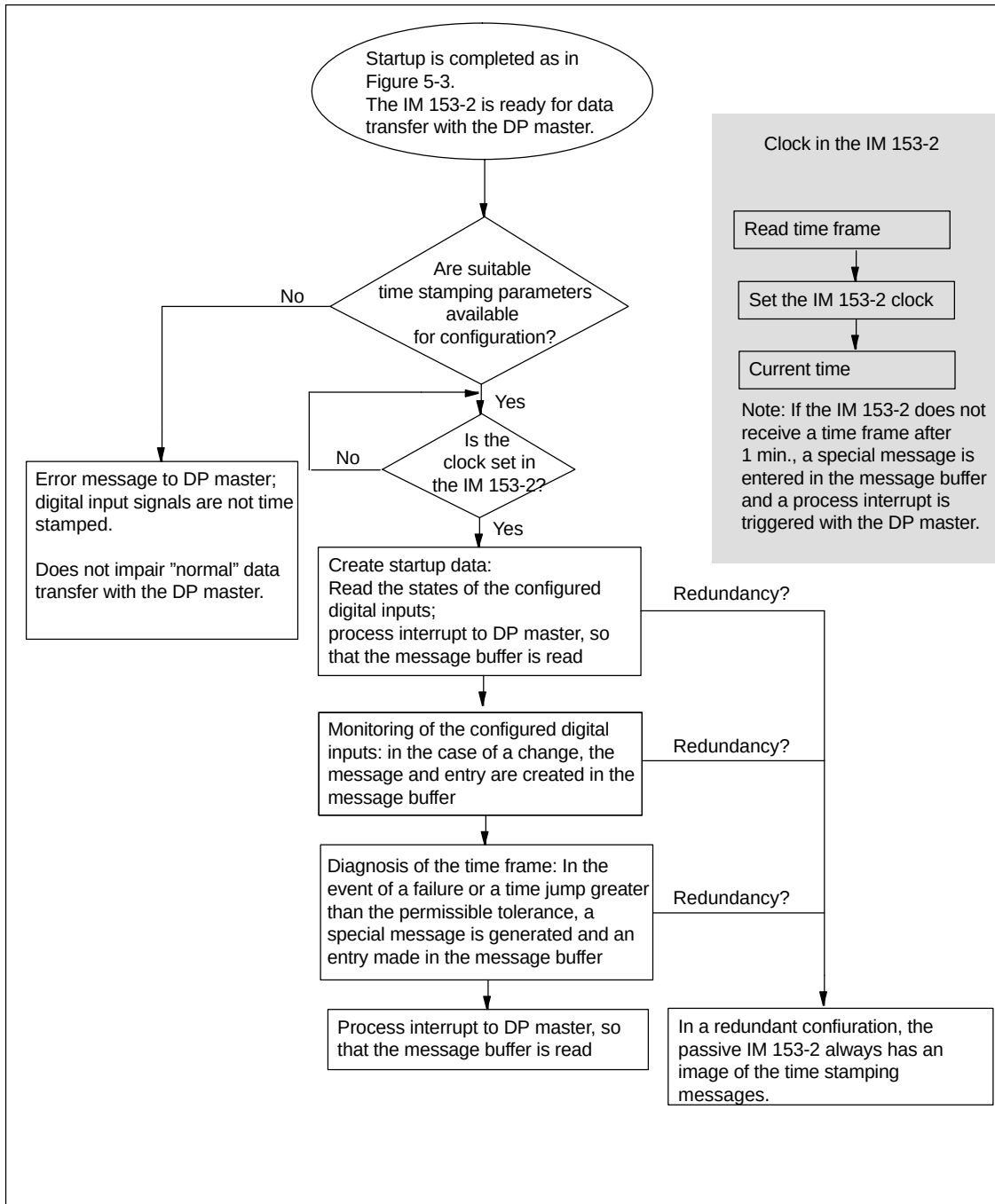


Figure 5-4 Startup for Time Synchronization/Time Stamping

5.1.4 Startup of the IM 153-3

During startup both PROFIBUS modules are addressed independently of one another:

- Each DP master configures and parameterizes its PROFIBUS module (independently of the other DP master)
- The first DP master to configure and parameterize its PROFIBUS module without errors starts data transfer with the I/Os.
- As soon as the other DP master has also configured and parameterized its PROFIBUS module without errors, the PROFIBUS module with the redundant data stored in its memory is made available.

Figure 5-5 shows the mutually independent startups of the two PROFIBUS modules of the IM 153-3.

In the example we are assuming that PROFIBUS module 2 is the first one to be configured and parameterized.

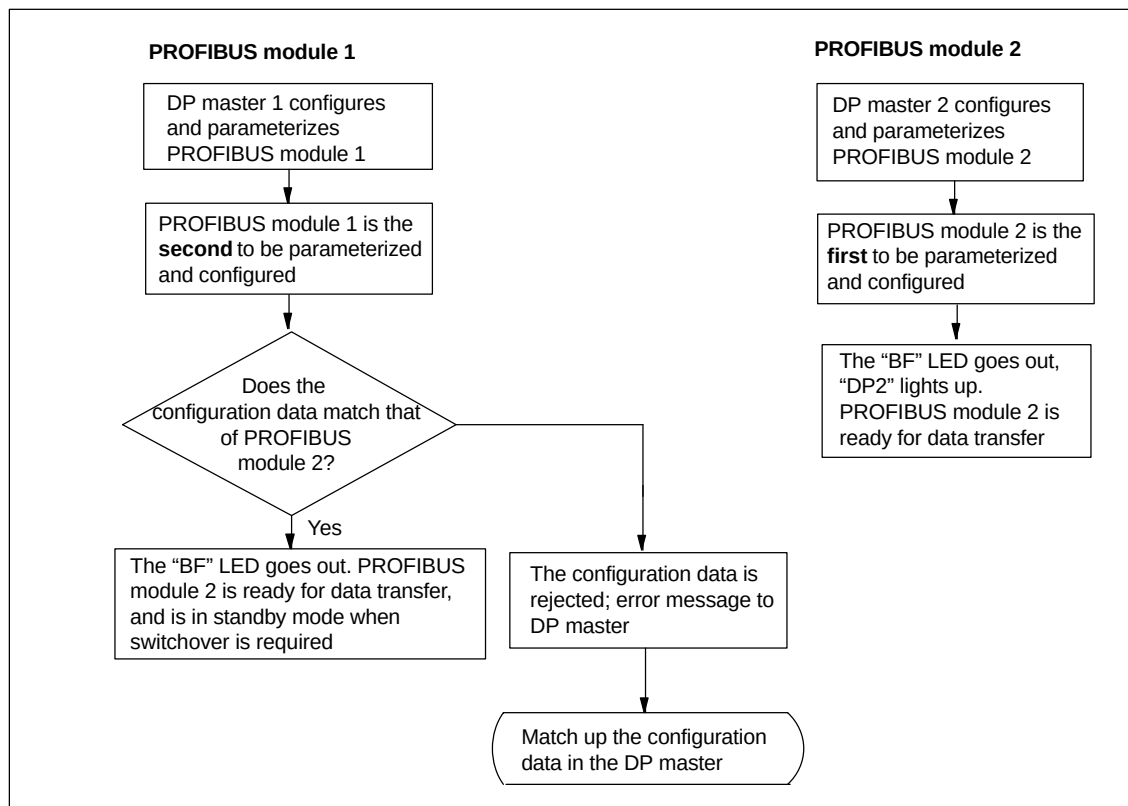


Figure 5-5 Startup of the Two PROFIBUS Modules of the IM 153-3

5.2 Diagnostics Using LEDs

IM 153-1

Table 5-4 Status and Error LEDs on the IM 153-1

			SF: red BF: red ON: 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. Cause: Configured and set PROFIBUS address is incorrect	- Check the IM 153-1. - Check the configuration and parameter assignment. - Check the PROFIBUS address.
*	On	On	No connection to the DP master (transmission 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 <i>COM PROFIBUS</i> or <i>STEP 7</i>).
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 IM153-1 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

IM 153-2

Table 5-5 Status and Error Messages of the IM 153-2

SF		SF:	red
BF		BF:	red
ACT		ACT:	yellow (only relevant in a redundant configuration)
ON		ON:	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.	–
*	Flashes	Off	On	The IM 153-2 is incorrectly parameterized – there is no data transfer between the DP master and the IM 153-2. Cause: The PROFIBUS address is incorrect	• Check the IM 153-2. • Check the configuration and parameter assignment. • Check the PROFIBUS address.
*	On	Off	On	No connection to the DP master (transmission 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 <i>COM PROFIBUS</i> or <i>STEP 7</i>).
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.	–

Table 5-5 Status and Error Messages of the IM 153-2, continued

SF		SF: red
BF		BF: red
ACT		ACT: yellow (only relevant in a redundant configuration)
ON		ON: green

LEDs				Meaning	What to Do
SF	BF	ACT	ON		
*	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.

IM 153-3

Table 5-6 Status and Error Messages of the IM 153-3

SF BF1 DP1 BF2 DP2 ON Module 1 Module 2 SF: red BF1/2: red DP1/2: yellow ON: green					
LEDs				Meaning	What to Do
SF	BF1/2	DP1/2	ON		
Off	Off	Off	Off	There is no voltage applied to the IM 153-3, or the IM 153-3 has a hardware defect.	Switch on the power supply module or change the PROFIBUS module or IM 153-3.
*	*	*	On	There is voltage applied to the IM 153-3.	–
*	Flashes	Off	On	The IM 153-3 is incorrectly parameterized – there is no data transfer between the DP master and the IM 153-3. Cause: The PROFIBUS address is incorrect	- Check the IM 153-3. - Check the configuration and parameter assignment. - Check the PROFIBUS address.
*	On	Off	On	The PROFIBUS module has no connection to the DP master (transmission rate detection) Causes: The bus communication via PROFIBUS-DP to the PROFIBUS module has been interrupted.	Check the bus setup. - Check whether the PROFIBUS module or 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 ET 200M configuration to find out if a module is missing or defective or whether an unconfigured module is plugged in. Check the configuration (for example, with <i>COM PROFIBUS</i> or <i>STEP 7</i>). Check whether the two PROFIBUS modules are identically configured.
On	Off	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 153-3 is defective.	Set a valid PROFIBUS address (1 to 125) on the IM 153-3. Check the SM/FM with the diagnosis. Change the S7-300 module or the IM 153-3 or contact your Siemens partner.

Table 5-6 Status and Error Messages of the IM 153-3, continued

SF  BF1  DP1  } Module 1 BF2  DP2  } Module 2 ON  SF: red BF1/2: red DP1/2: yellow ON: green					
LEDs				Meaning	What to Do
SF	BF1/2	DP1/2	ON		
*	Off	On	On	There is data exchange between the DP master and the active PROFIBUS module. The PROFIBUS module is active and data is exchanged with the DP master. The desired configuration matches the actual configuration of the ET 200M.	–
*	Off	Off	On	The PROFIBUS module is passive. The desired configuration matches the actual configuration of the ET 200M.	–
*	On	Flashes 0.5 s	On	The DP LED flashes slowly (0.5 s on/off) The PROFIBUS module is not inserted.	Insert a PROFIBUS module.
*	On	Flashes 0.1 s	On	The DP LED flashes briefly (0.1 s on/ 0.9 s off) The PROFIBUS module is defective	Change the PROFIBUS module.

* Not applicable

5.3 Diagnostics Using STEP 7 and STEP 5

Slave Diagnostics

The slave diagnosis complies with the EN 50170, Volume 2, PROFIBUS standard. Depending on the DP master, it can be displayed with *STEP 7* or *STEP 5* for all DP slaves complying with the standard.

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

Options for Displaying the Diagnosis

Table 5-7 Displaying the Diagnosis Using STEP *STEP 7* and *STEP 5*

Programmable Logic Controller with DP Master	Block or Register in STEP 7	Application	See ...
SIMATIC S7/M7	DP slave diagnostics register	Display slave diagnostics as plain text on the <i>STEP 7</i> user interface	The section on hardware diagnostics in the <i>STEP 7</i> online help system
	SFC 13 "DPNRM_DG"	Display slave diagnosis (store in data area of the user program)	For the structure see section; 5.4 for the SFC see <i>System and Standard Functions Reference Manual</i>
	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)	For the structure see section; 5.4 for the FB see the <i>ET200 Distributed I/O Device manual</i>
SIMATIC S5 with S5-95U as DP master	FB230 "S_DIAG"	Note: not for enhanced diagnosis	

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

Example of Displaying the Slave Diagnosis with FB 192 “IM 308C”

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 26 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

5.4 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 2, DDB version V1.18;

IM 153-1 as of 153-1AA83, version 1, DDB version V1.18;

IM 153-2 as of 153-2AA02, version > 6, DDB version V1.9;

IM 153-2 FO as of 153-2AB01, version > 5, DDB version V1.5

You can find detailed information in the diagnostic frame in the form of the module status and channel-specific diagnoses (see Figure 5-6 on Page 5-20).

Section	Subject	Page
5.4.1	Structure of the Slave Diagnosis	5-19
5.4.2	Station Statuses 1 to 3	5-21
5.4.3	Master PROFIBUS Address	5-23
5.4.4	Manufacturer ID	5-23
5.4.5	Module Diagnosis	5-24
5.4.6	Module Status	5-25
5.4.7	H Status (only with S7-400H)	5-26
5.4.8	Channel-Specific Diagnosis	5-27
5.4.9	Interrupts	5-31
5.4.10	Evaluating Interrupts from the Device-Specific Diagnosis	5-41

5.4.1 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.

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.

Structure of the Slave Diagnosis

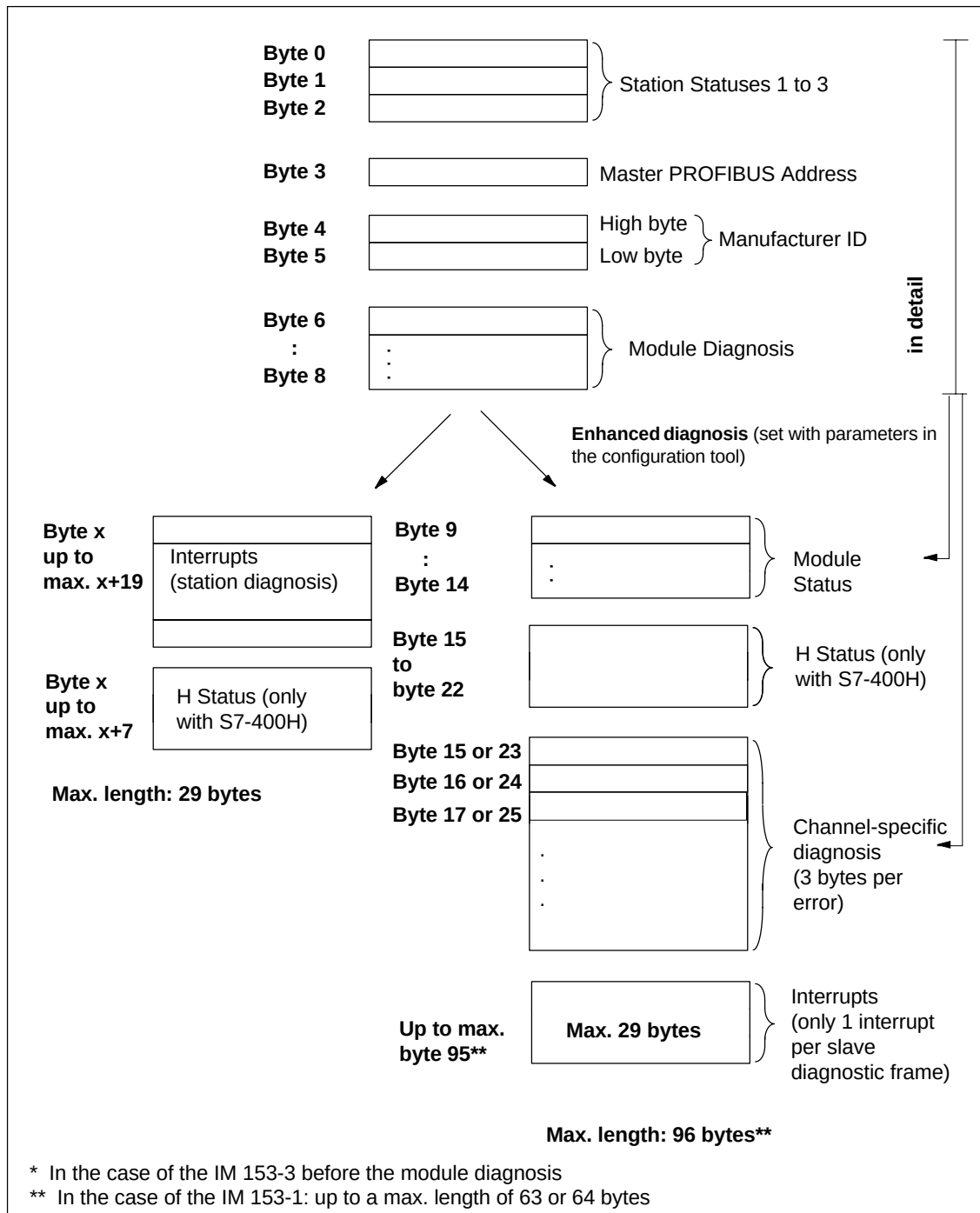


Figure 5-6 Structure of the Slave Diagnosis

5.4.2 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 5-8 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, is the bit at "1"? The DP master cannot interpret the response of the DP slave.

Table 5-8 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 5-9 Structure of Station Status 2 (Byte 1)

Bit	Meaning
0	1: New parameters have to be assigned to the DP slave.
1	1: A diagnostic message has been issued. The DP slave will not work until the fault has been corrected (static diagnostic message).
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 at "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 5-10 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.

5.4.3 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.

5.4.4 Manufacturer ID

Definition

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

Manufacturer ID

Table 5-11 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
80 _H	53 _H	IM 153-3

5.4.5 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:

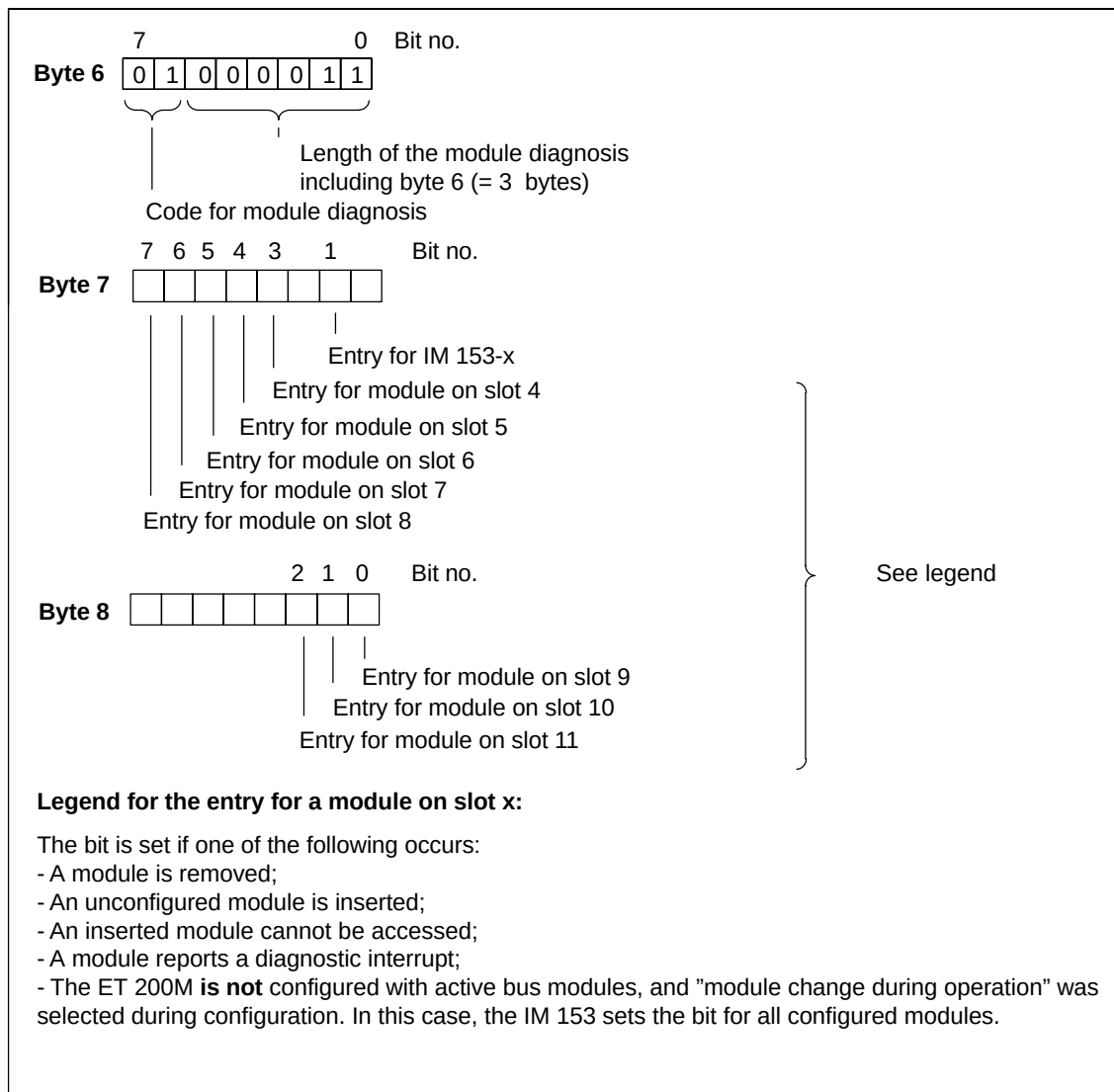


Figure 5-7 Structure of the Module Diagnosis

5.4.6 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:

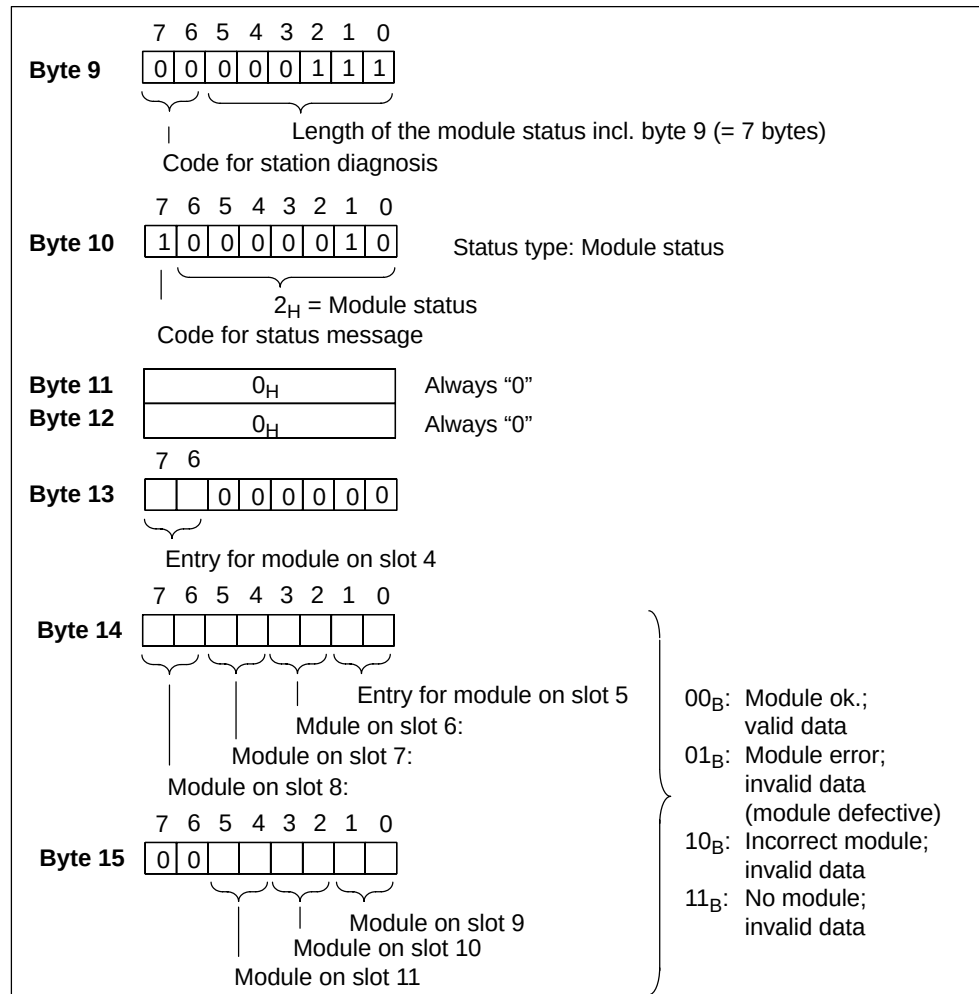


Figure 5-8 Structure of the Module Status for the ET 200M

5.4.7 H Status (only in S7-400H)

The IM 153-2/-3 only delivers the H status when it is operating on an S7-400H DP master.

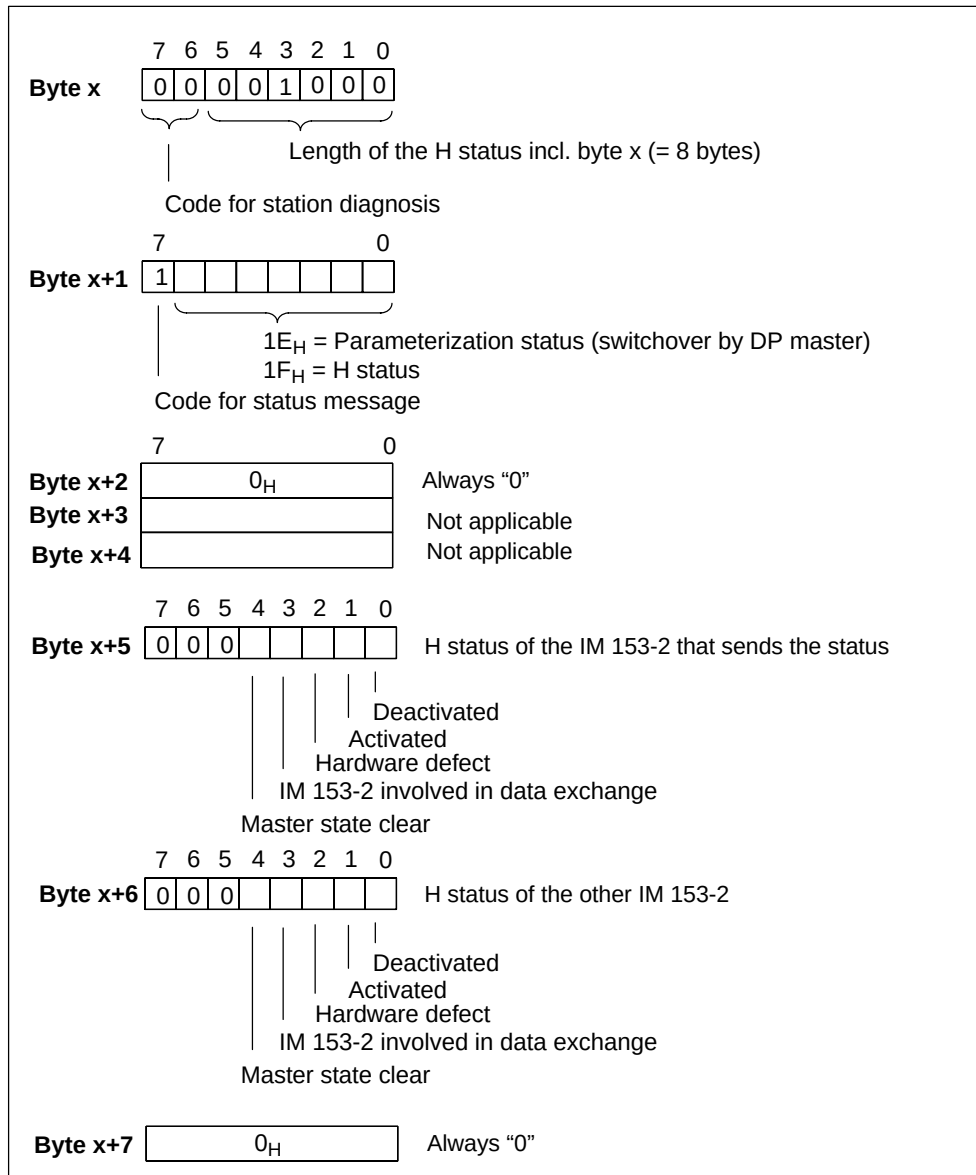


Figure 5-9 Structure of the H Status of the IM 153-2 (only for S7-400H)

5.4.8 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.

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 5-6 on Page 5-20).

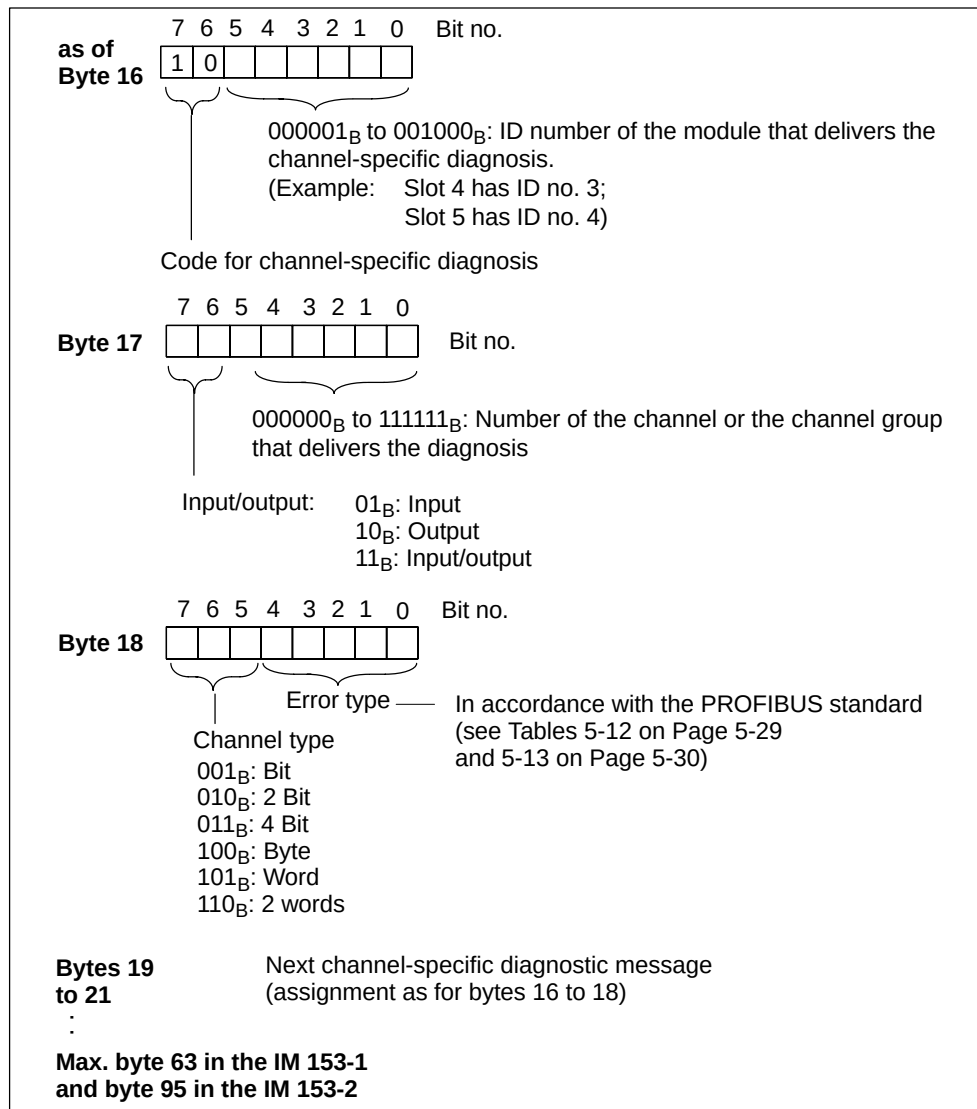


Figure 5-10 Structure of the Channel-Specific Diagnosis

Channel-Specific Error Messages

Table 5-12 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.

Table 5-13 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-related 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

5.4.9 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 5-6 on Page 5-20):

- No enhanced diagnosis: always as of byte 9 after the module diagnosis.
- Enhanced diagnosis: after the channel-specific diagnoses.

For example: if there are 3 channel-specific diagnoses, the interrupt section begins as of byte 24.

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 (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 5-13 to 5-16 (pages 5-35 to 5-38).

In the case of **process interrupts**, the additional interrupt information is 4 bytes long. You can find out what these bytes mean in Figures 5-17 and 5-18 (pages 5-39 and 5-39).

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 5-19 (on page 5-40).

Removal and Insertion Interrupts

To remove and insert modules during operation, you must configure the ET 200M with active bus modules (see Section 3.1.4 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 8.1 and 8.2 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 5-12 on Page 5-34). The entry is made in this case even if you have not enabled the diagnosis for channel/channel group 0 of the module.

Interrupts

The interrupt section for the ET 200M is structure as follows (in the IM 153-x without an enhanced diagnosis byte x = byte 9):

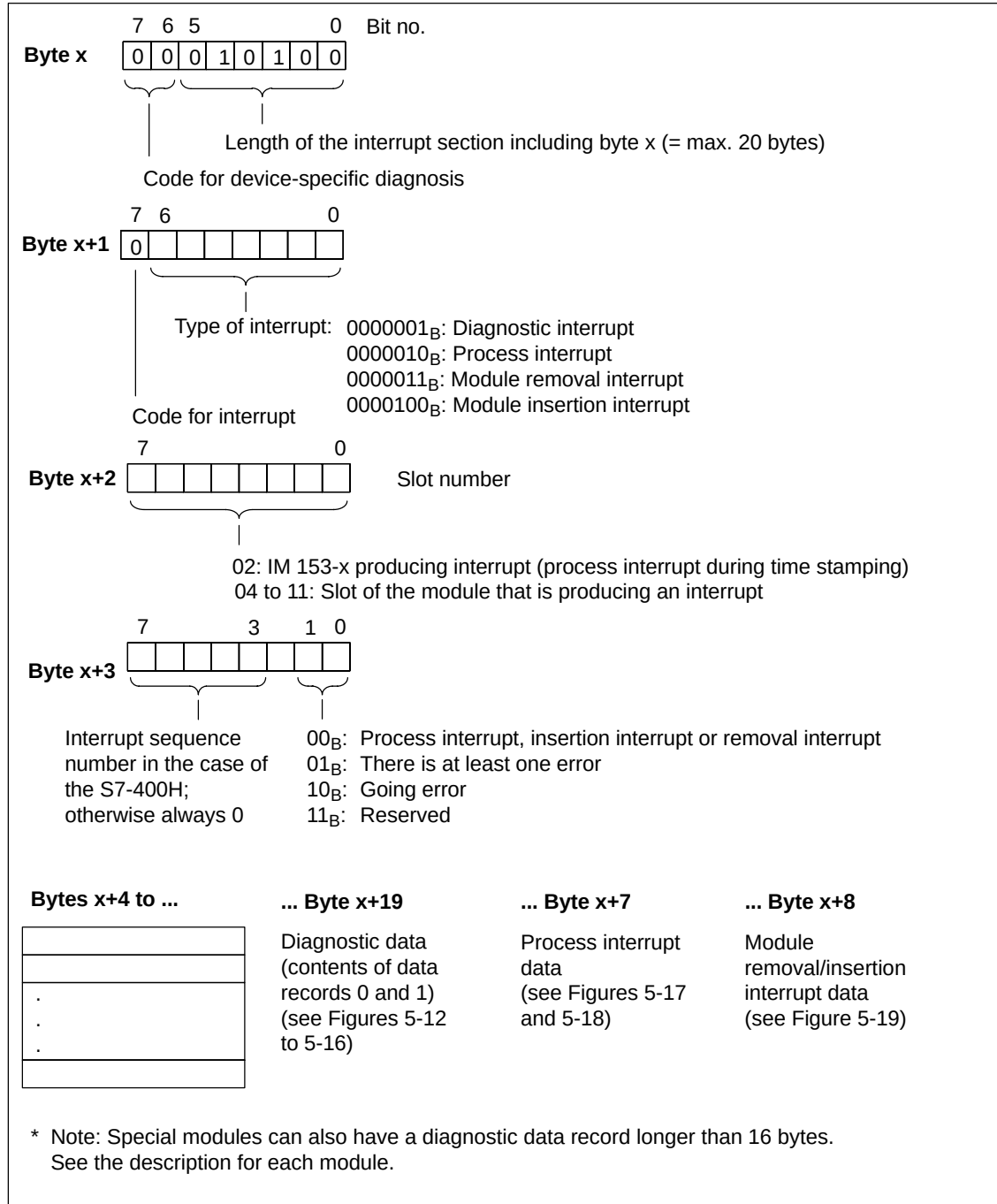


Figure 5-11 Structure of the Interrupt Status of the Interrupt Section

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*.

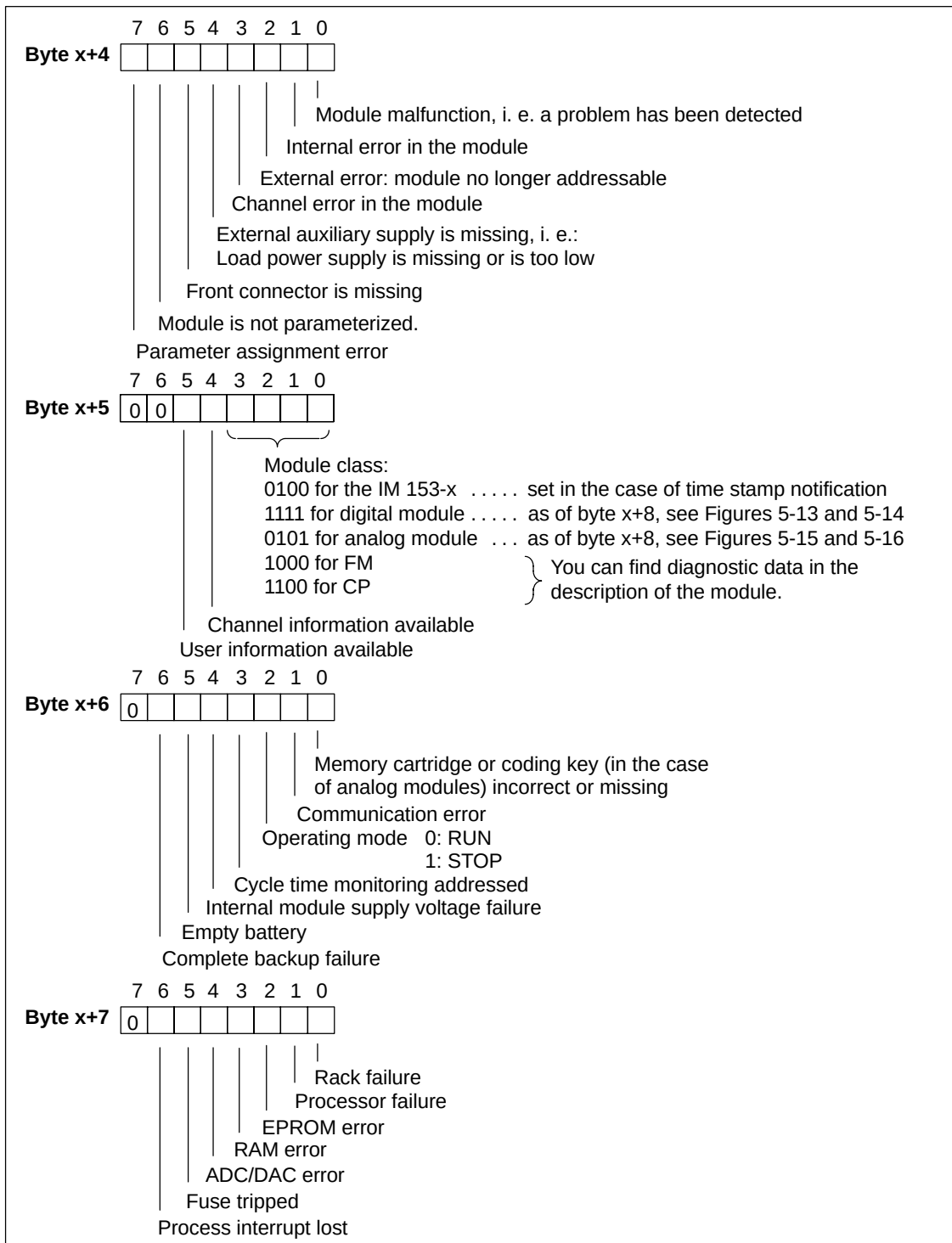


Figure 5-12 Structure of Bytes x+4 to x+7 for Diagnostic Interrupt (Digital and Analog Modules)

Diagnostic Interrupt of Modules with Digital Inputs

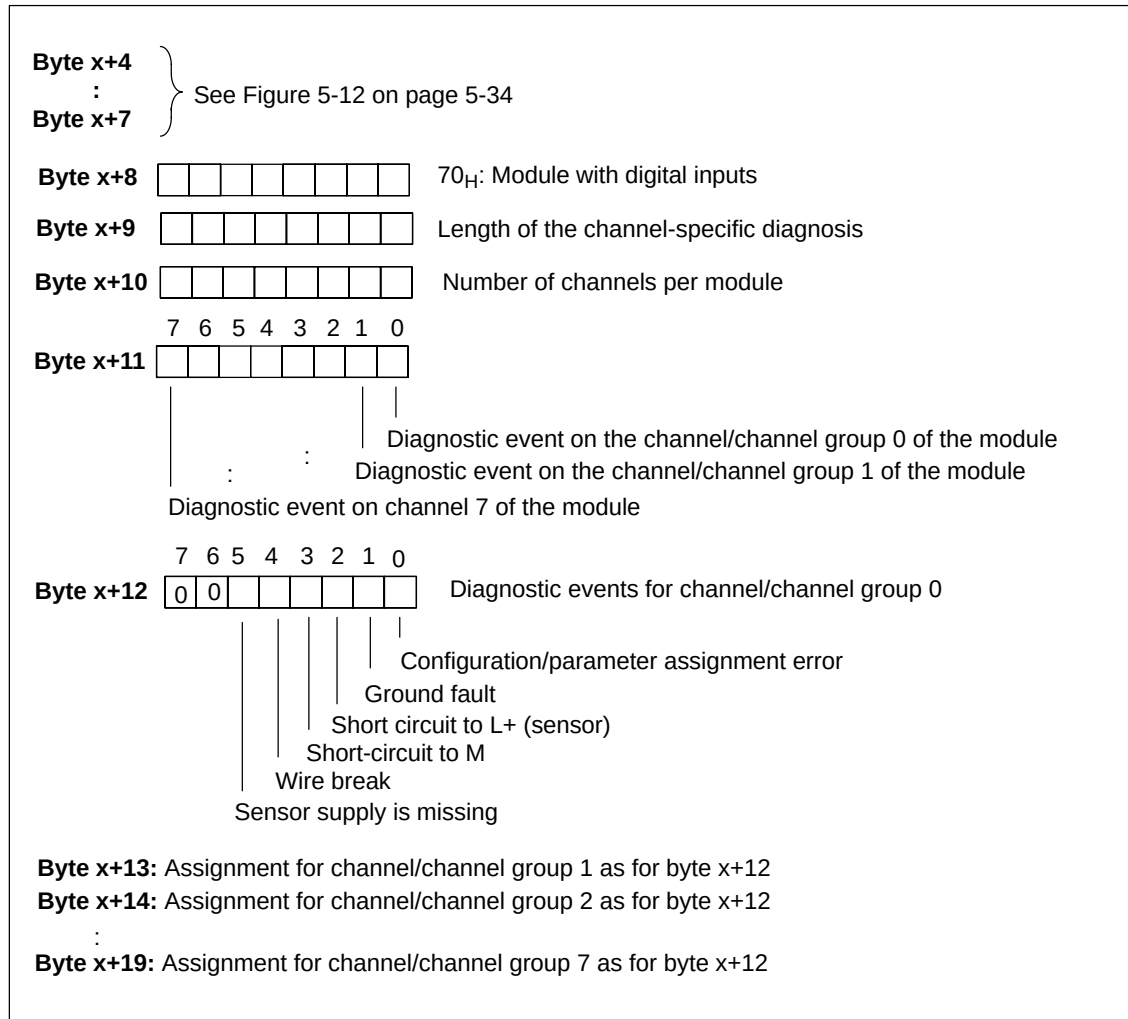


Figure 5-13 Structure as of Byte x+8 for Diagnostic Interrupt (Digital Inputs)

Diagnostic Interrupt of Modules with Digital Outputs

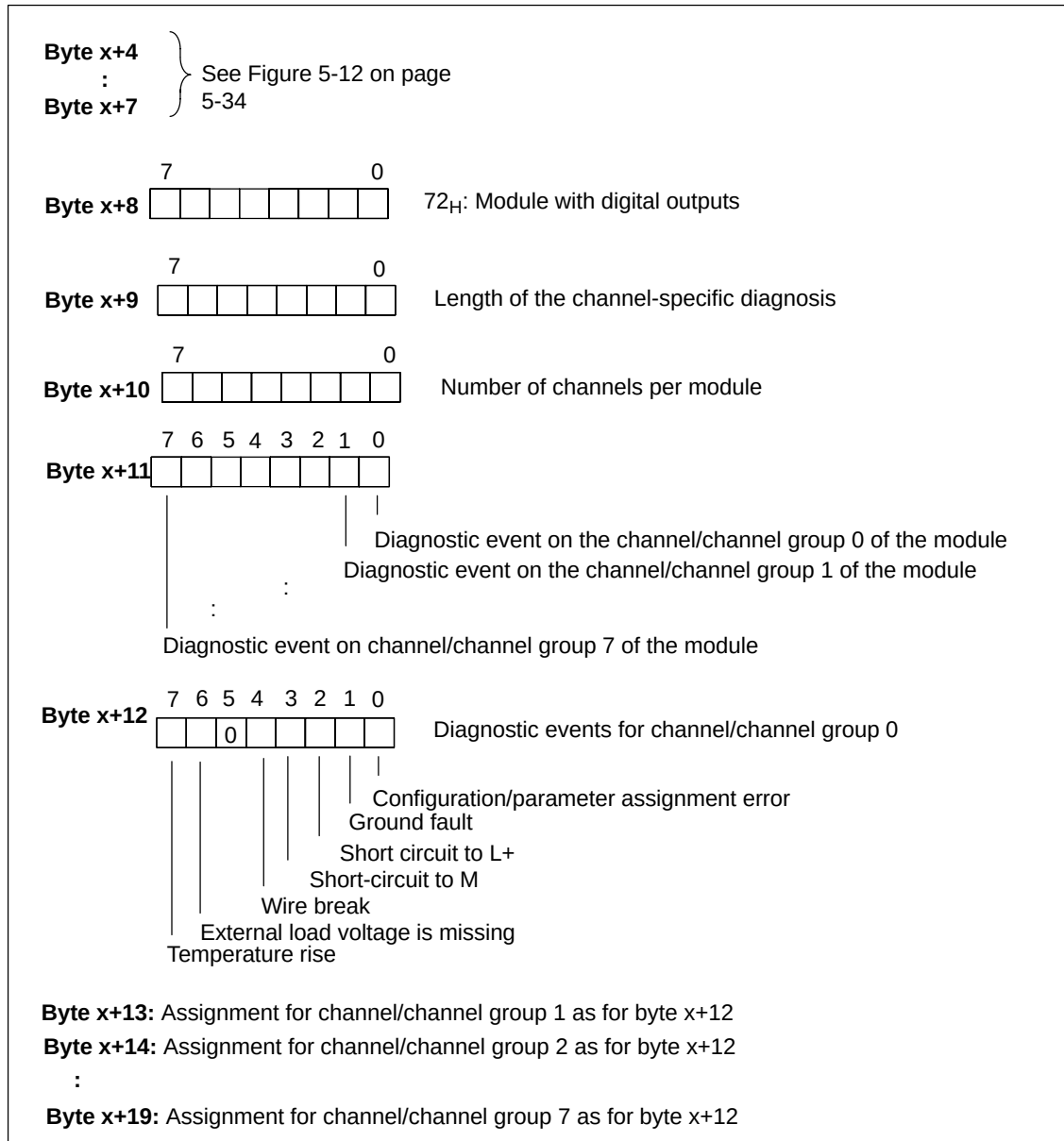


Figure 5-14 Structure as of Byte x+8 for Diagnostic Interrupt (Digital Outputs)

Diagnostic Interrupt of Modules with Analog Inputs

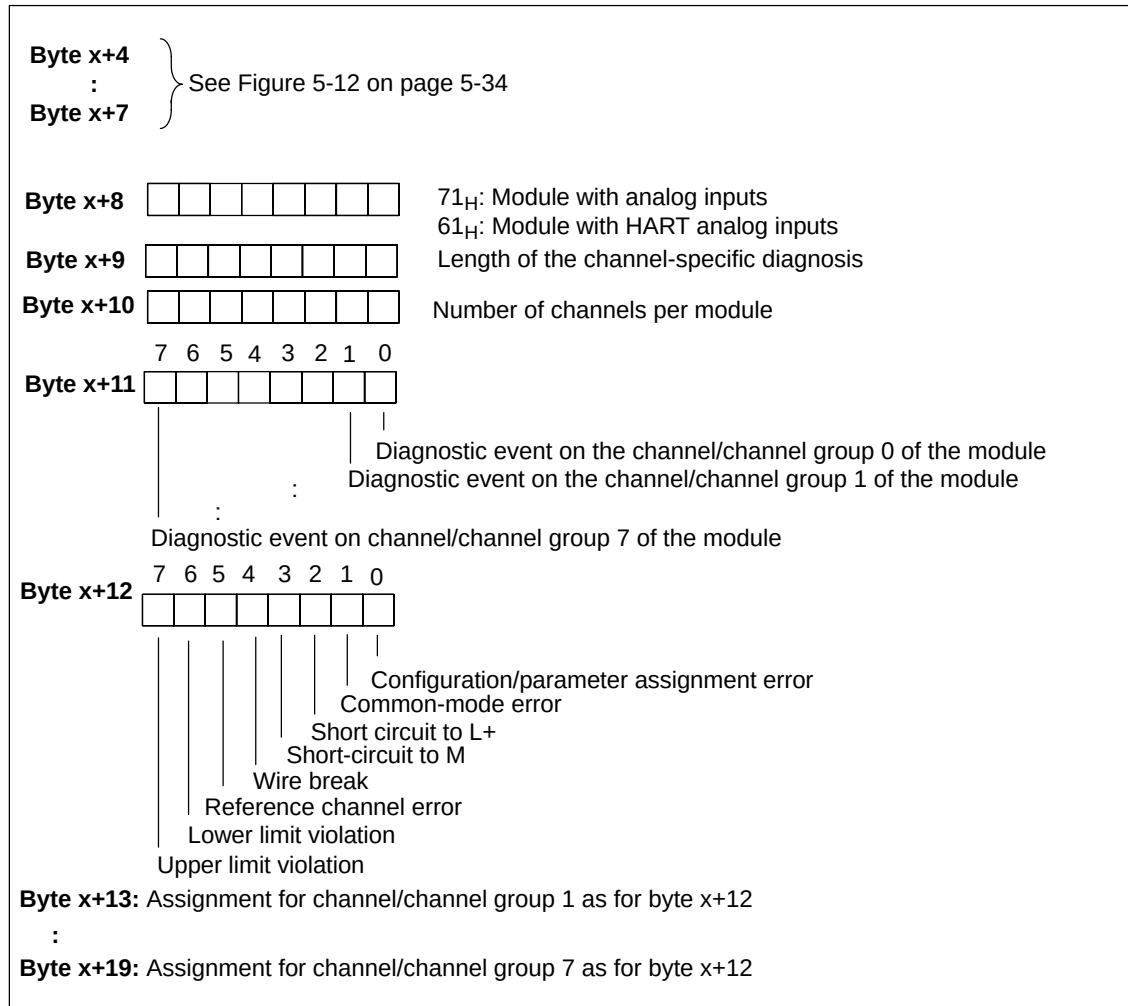


Figure 5-15 Structure as of Byte x+8 for Diagnostic Interrupt (Analog Inputs)

Diagnostic Interrupt of Modules with Analog Outputs

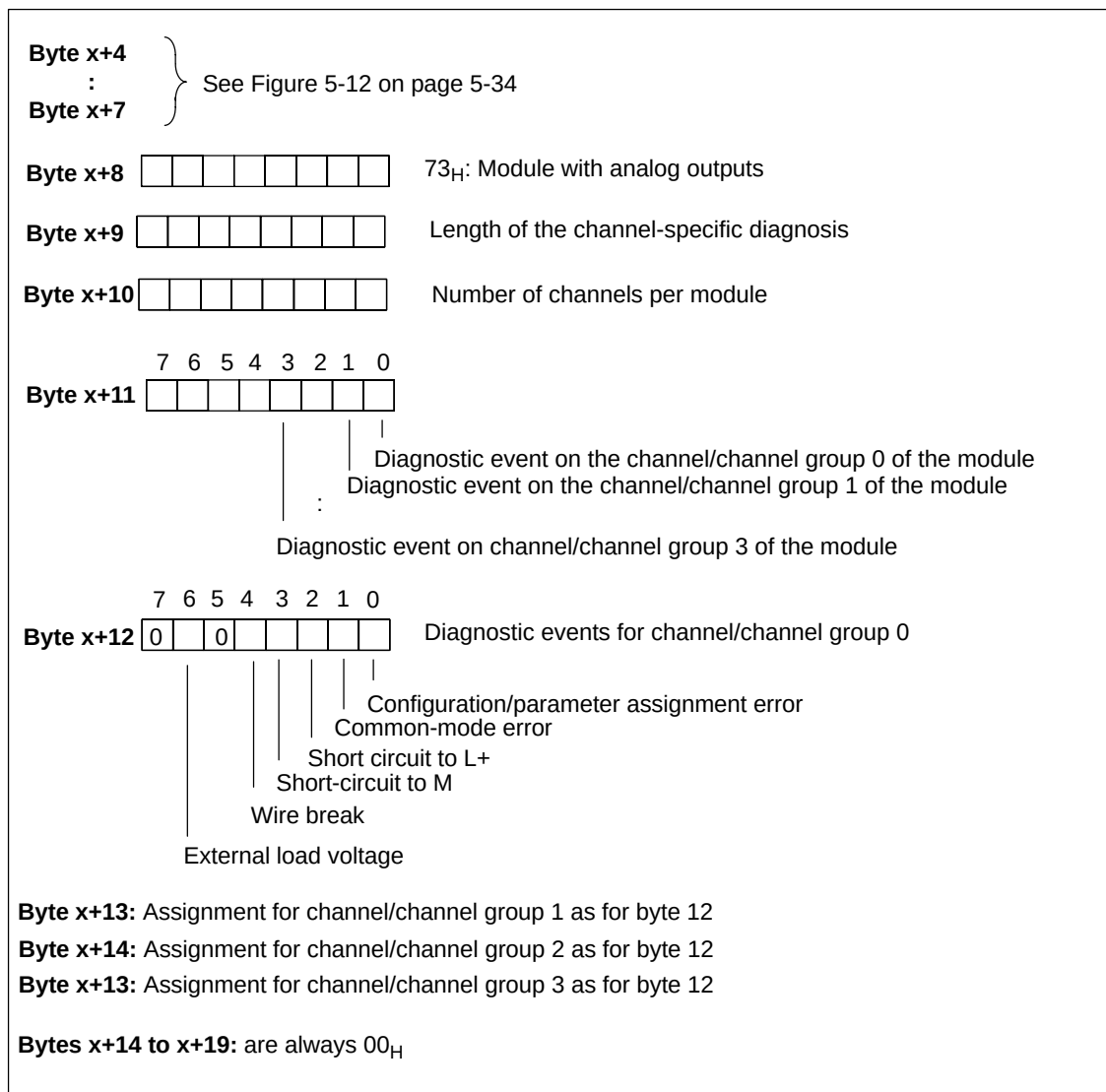


Figure 5-16 Structure as of Byte x+8 for Diagnostic Interrupt (Analog Outputs)

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).

Process Interrupt of Analog Input Modules

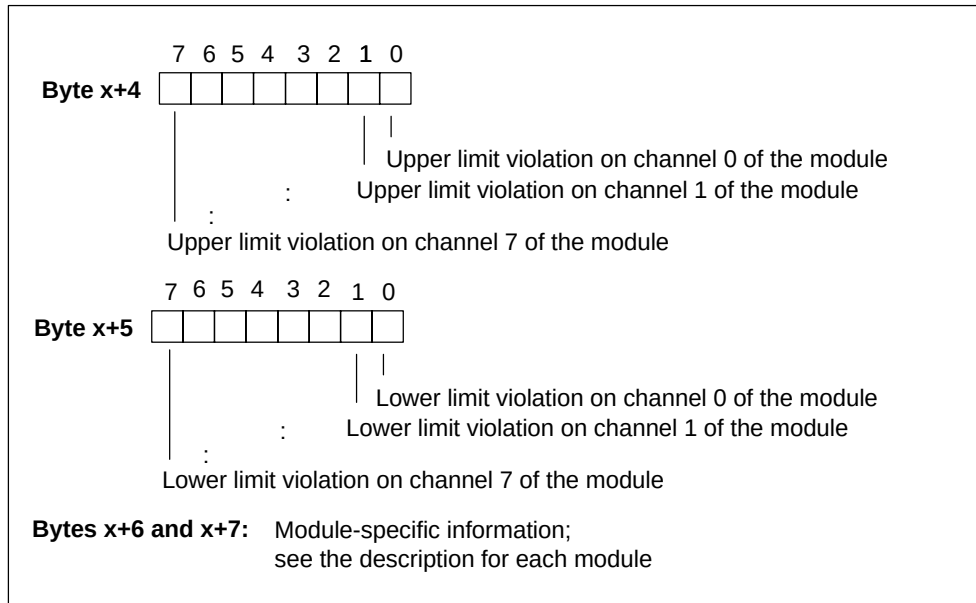


Figure 5-17 Structure as of Byte x+4 for Process Interrupt (Analog Inputs)

Process Interrupt of Digital Input Modules

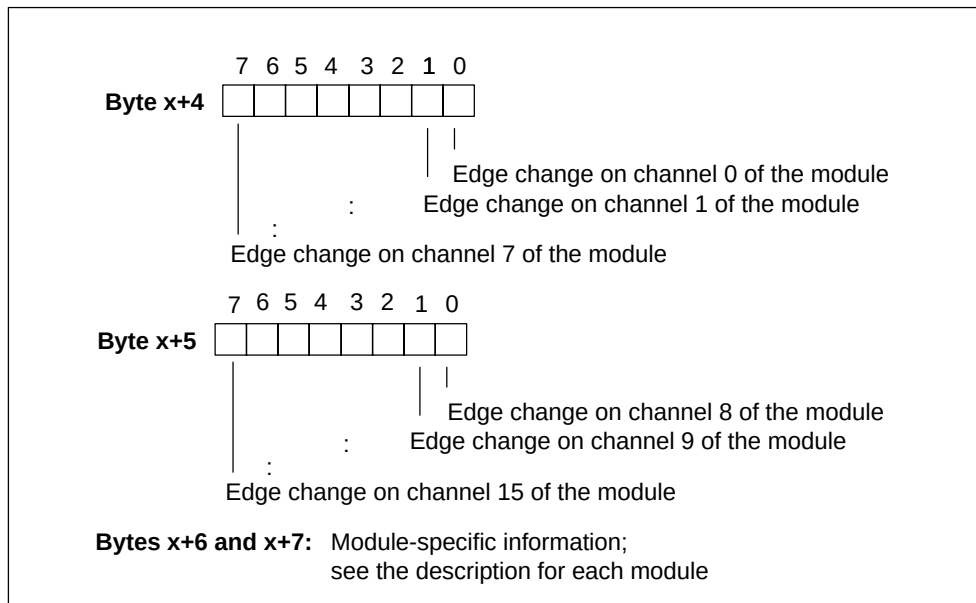


Figure 5-18 Structure as of Byte x+4 for Process Interrupt (Digital Inputs)

Module Removal/Insertion Interrupt

The module ID that was removed or inserted is in byte x+4 to x+7. 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 5-8, on Page 5-25).

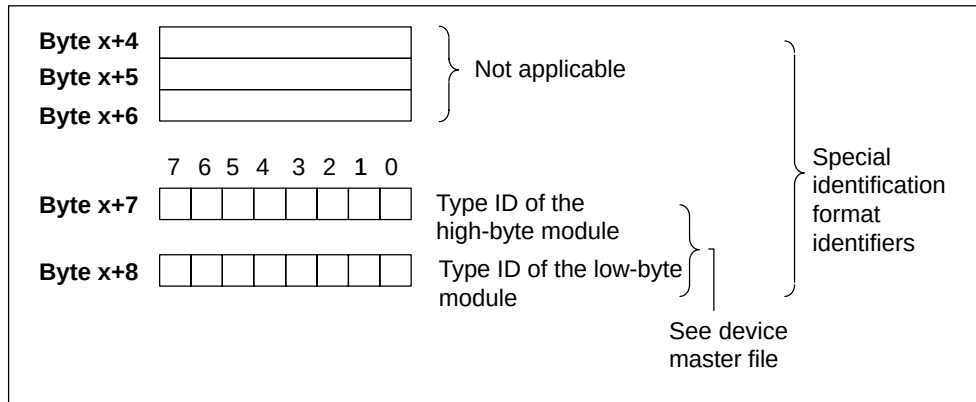


Figure 5-19 Structure as of Byte x+4 for Module Removal/Insertion Interrupt

5.4.10 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 5.4.9.

Interrupts with the S7/M7 DP 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. In the case of an interrupt, interrupt OBs run automatically in the CPU (see the *System Software for S7-300/S7-400, Program Design*) Program Manual.

Removal/Insertion Interrupt with the S7/M7 DP Master

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

- When a module is removed, the IM 153-x reports a module removal alarm 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 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 that configured:
 - The IM 153-x reports a module insertion interrupt to the DP master, 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 5.4.5).
 - 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.

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.

Maintenance

Maintenance

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

In This Chapter

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

Section	Subject	Page
6.1	Replacing the Power Supply Module	6-1
6.2	Replacing the IM 153-1	6-3
6.3	Replacing the IM 153-2 or IM 153-2 FO	6-4
6.4	IM 153-3: Replacing the PROFIBUS Module	6-8
6.5	Replacing Modules Without the "Module Change During Operation" Function	6-10
6.6	Replacing Modules With the "Module Change During Operation" Function	6-12
6.7	Replacing the Bus Module	6-15
6.8	Replacing Fuses in the Case of Digital Output Modules	6-16

6.1 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.

Removing the Power Supply Module

To remove the power supply module, proceed as follows:

1. Operate the supply isolating switch in order to deenergize 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 voltage selector.
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*.

6.2 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.

Disconnecting 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.

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*.

6.3 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.

IM 153-2: Removing 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.

In the Case of Redundancy:

Note

Only replace the IM 153-2/-2 FO in a deenergized 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 deenergized! Switch off the associated power supply module or disconnect it from the IM 153-2/-2 FO.
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.
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 5-5 on page 5-11).

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 contact.	

6.4 IM 153-3: Replacing the PROFIBUS Module

Initial Situation

It is possible to replace PROFIBUS modules while the ET 200M is in operation. The IM 153-3 is installed and both PROFIBUS modules are inserted. Data transfer occurs via at least one of the two PROFIBUS modules to the associated DP master.

What to Look Out for Beforehand:

Are you replacing a defective PROFIBUS module? If so, then data transfer will continue via the active PROFIBUS module.

Are you replacing an active PROFIBUS module, and the passive PROFIBUS module is OK? If so, the IM 153-3 switches from the active PROFIBUS module to the passive one when the module is replaced.

Are you replacing an active PROFIBUS module, and the passive PROFIBUS module is defective? If so, you must interrupt data transfer to the DP master!

You can tell whether the PROFIBUS module is active or passive by the status indicators of the IM 153-3 (see Section 5.2).

Removing the PROFIBUS Module

To remove one of the two PROFIBUS modules, proceed as follows:

1. Remove the bus connector.
2. Undo the lower fixing screw of the PROFIBUS module.
3. Push the front cover of the PROFIBUS module down using both of the handles.
4. Undo the upper fixing screw of the PROFIBUS module.
5. Remove the PROFIBUS module from the IM 153-3.

Inserting a PROFIBUS Module.

To insert a PROFIBUS module, proceed as follows:

1. Push the PROFIBUS module into the IM 153-3.
2. Tighten the upper fixing screw of the PROFIBUS module (with a torque of 50 Ncm).
3. Push the front cover of the PROFIBUS module upwards.
4. You can now tighten the lower fixing screw of the PROFIBUS module (with a torque of 50 Ncm).
5. Insert the bus connector and screw it tight.

Response of the IM 153-3 After Replacement of the PROFIBUS Module

After the PROFIBUS module is replaced, the associated DP master resumes data transfer. The setting of the outputs and reading of the inputs continues via the other PROFIBUS module.

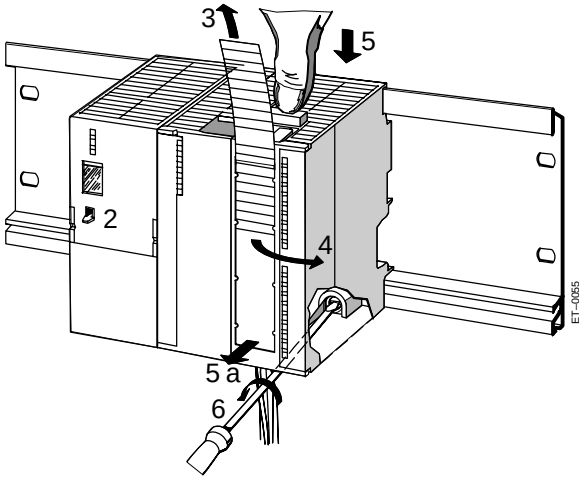
If there is an error, you can evaluate the error displays of the IM 153-3 and the diagnosis (see Section 5.2 and 5.3).

6.5 Replacing Modules Without the "Module Change During Operation" Function

Removing a Module

Table 6-1 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.	



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 6-1).

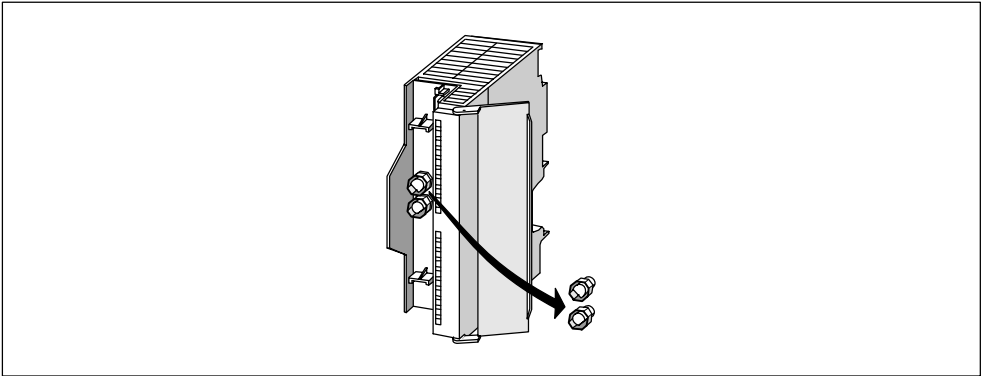


Figure 6-1 Removing the Front Connector Coding Key

Installing a New Module

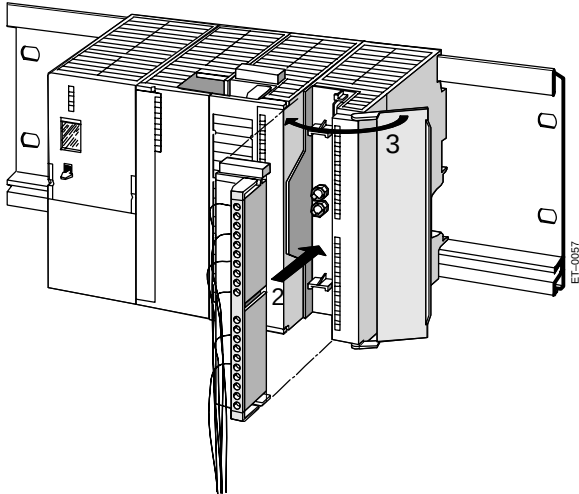
Table 6-2 Installing New Modules

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 6-3 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*

6.6 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 6-4 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 6-1 on page 6-10). 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.	

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 6-1 on page 6-11).

Installing a New Module

Table 6-5 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 6-6 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 5.4.9). The IM 153-x also enters the removal of the module in the module diagnosis (see Chapter 5.4.5).
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 5.4.9). 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 5.4.9). The entry concerning the removal of the module remains in the module diagnosis.

6.7 Replacing the Bus Module

Removing the Bus Module

Only remove bus modules if they are deenergized!

Table 6-7 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.

The diagram shows three bus modules mounted on a rail. The modules are labeled BM 1M/PS, BM 2x40, and BM 1x80. Arrows point to the locks holding the modules together and the lock holding the module to the rail.

Installing a New Bus Module

Install the new bus module as described in Section 3.2.3.

6.8 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 × AC120V digital output module
- SM 322 DO 8 × AC120/230V

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 6-2 shows you where to find the fuses on the digital output modules.

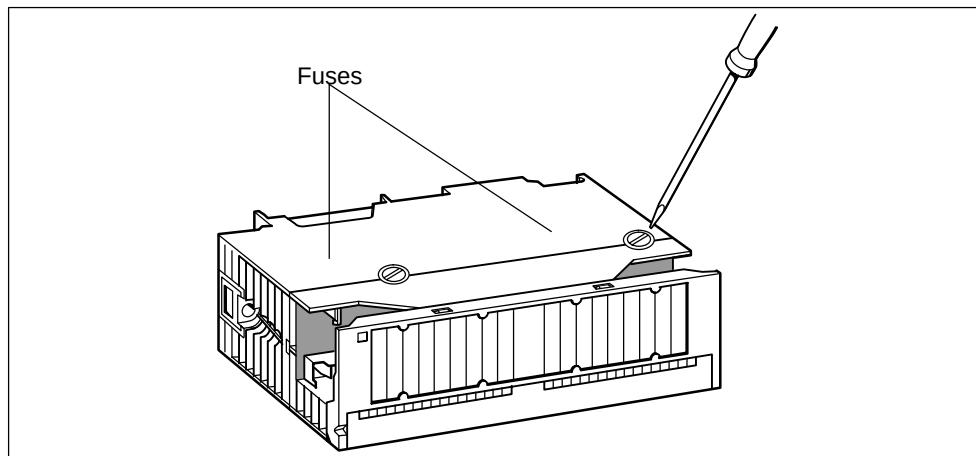


Figure 6-2 Location of the Fuses on Digital Output Modules

Changing Fuses

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

1. Remove the digital output module as described in Section 6.5
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 6.5).

Technical Specifications

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 signal 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").

In This Chapter

This chapter deals with the following topics:

Section	Subject	Page
7.1	Standards, Certificates and Approvals	7-2
7.2	Parameters of the IM 153-x	7-4
7.3	Technical Specifications	7-5
7.4	Time Delay of the ET 200M	7-9

7.1 Standards, Certificates and Approvals

IEC 1131

The ET 200M distributed I/O device fulfills the requirements and criteria of IEC 1131, Part 2.

PROFIBUS DP

The ET 200M distributed I/O device fulfills the requirements and criteria of EN 50 170, Volume 2, PROFIBUS bus system.

CE Symbol

Our products meet the requirements and protection objectives of the following EC Directives and comply with the harmonized European Standards (EN) that have been published in the Official Gazettes of the European Community for programmable logic controllers:

- 89/336/EEC "Electromagnetic Compatibility" (EMC Directive)
- 73/23/EEC "Electrical Equipment for Use Within Fixed Voltage Ranges" (Low-Voltage Directive)

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

Siemens Aktiengesellschaft
Automation Environment
A & D AS E 14
Postfach 1963
D-92209 Amberg

PNO

PNO Certificate No.:

IM 153	Certificate Number
IM 153-1	Z00577
IM 153-2	Z00289
IM 153-2 FO	Z00289
IM 153-3	Z00341

UL Recognition

UL Recognition Mark
Underwriters Laboratories (UL) to
UL standard 508, Report 116536

CSA Certification

CSA Certification Mark
Canadian Standard Association (CSA) to
Standard C22.2 No. 142, File No. LR 48323

FM Approval

FM Approval to Factory Mutual Approval Standard Class Number 3611, Class I,
Division 2, Group A, B, C, D.



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 deenergize the ET 200M in hazardous areas before disconnecting plug and socket connections.

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

7.2 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 7-1 Parameters of the IM 153-x

Parameters	Value Range	Default	Applicability
Startup if preset configuration $\neq$ 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
Analog-value format	SIMATIC S 7/ SIMATIC S 5	SIMATIC S7	ET 200M
Enhanced diagnostics (only via the device database file)	Yes/no	No	ET 200M Configuration: see Section 5.4.1 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

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 7-2 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

7.3 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-x for the extended range of environmental conditions ("outdoor") (order number 6ES7 153-xAx8x-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 1-8 the version as of which your IM 153-x offers this function.

Technical Specifications	IM 153-1	IM 153-2	IM 153-2 F0	IM 153-3
Manufacturer ID	801D _H	801E _H	8071 _H	8053 _H
Device master file	SIEM801D.GSD	SIEM801E.GSD	SIEM8071.GSD	SIEM8053.GSD
Dimensions and Weight				
Dimensions W × H × D (mm)	40 × 125 × 130			80 × 125 × 130
Weight	360 g			480 g
PROFIBUS-DP interface				
Transmission rates	Up to 12 Mbps		9.6; 19.2; 45.45 93.75; 187.5; 500 kbps; 1.5; 12 Mbps	Up to 12 Mbps
Transmission rate detection	Yes	Yes	Yes	Yes
Interface	RS 485		FO	RS 485
FREEZE compatibility	Yes	No		
SYNC compatibility	Yes	No		
PROFIBUS addresses	1 to 125 permissible			1 to 125 (the same for both PROFIBUS modules or m+1 for PROFIBUS module 2)

Technical Specifications	IM 153-1	IM 153-2	IM 153-2 F0	IM 153-3
Time Synchronization/Time Stamping	No	Yes		No
• Accuracy class	—	10 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 stamp	—	• 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. 650 mA	Max. 650 mA	Max. 500 mA	Max. 500 mA
Inrush current	10 A	10 A	3.5 A	3.5 A
I²t	0.1 A²s	0.1 A²s	0.1 A²s	0.1 A²s
Recommended external fusing for supply lines	Circuit breaker; 2 A, type B or C			
Power losses	6 W (typical)	6 W (typical)	4.5 W (typical)	4.5 W (typical)

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*.

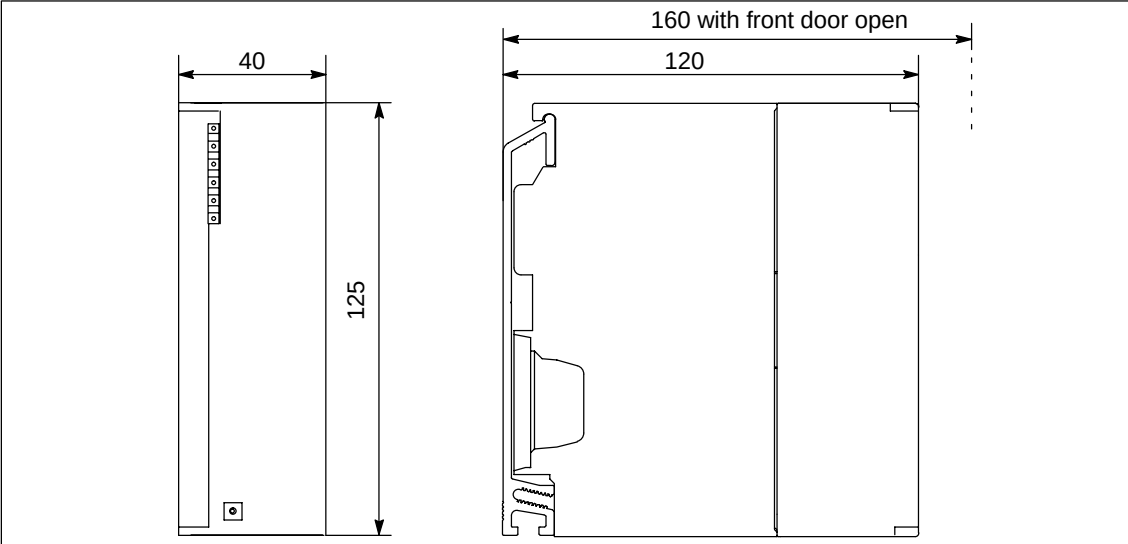


Figure 7-1 Dimensioned Drawing of the IM 153-1 and IM 153-2

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

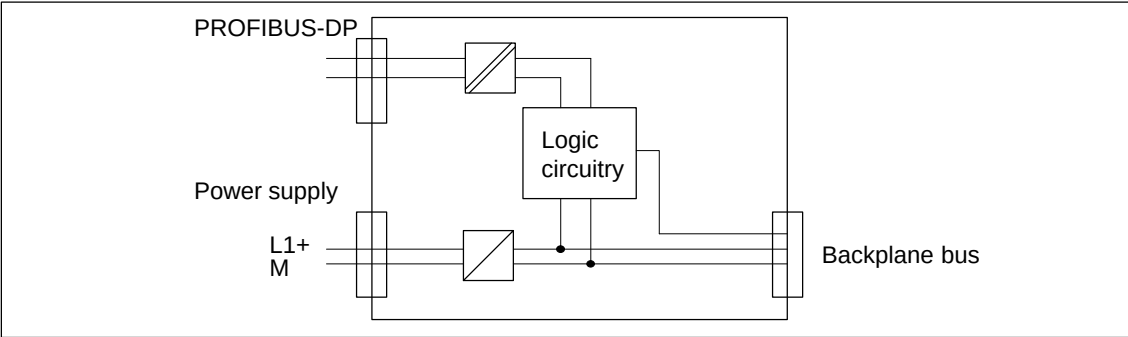


Figure 7-2 Basic Circuit Diagram of the IM 153-1 and IM 153-2

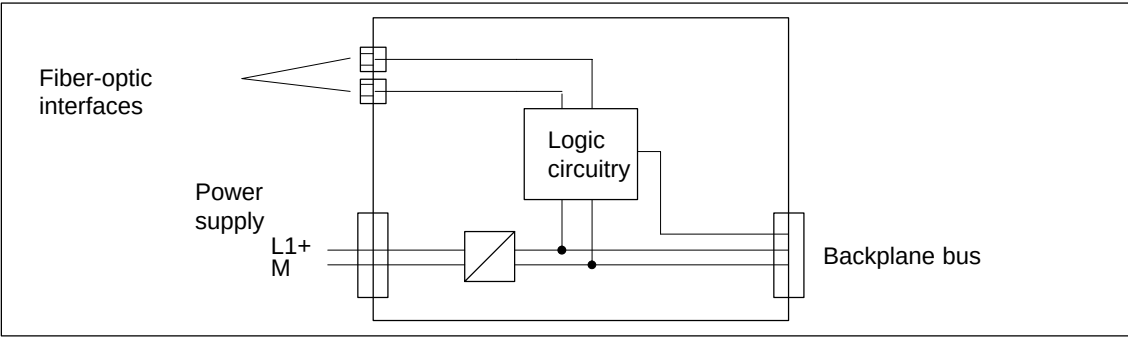


Figure 7-3 Basic Circuit Diagram of the IM 153-2 FO

Dimensioned Drawing of the IM 153-3

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

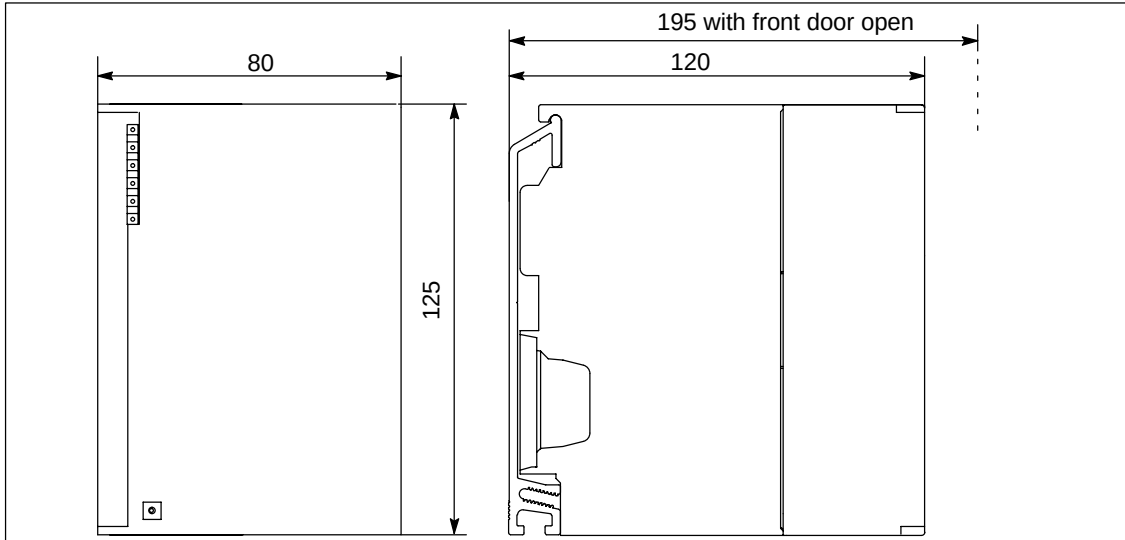


Figure 7-4 Dimensioned Drawing of the IM 153-3

Basic Circuit Diagram of the IM 153-3

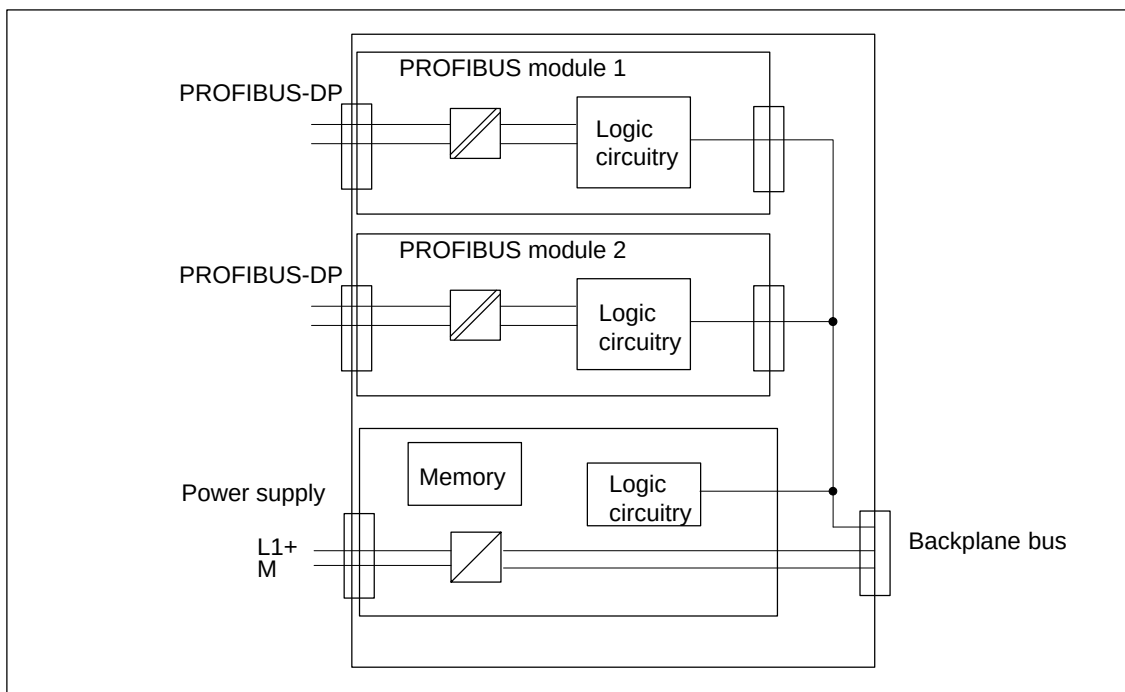


Figure 7-5 Basic Circuit Diagram of the IM 153-3

7.4 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.

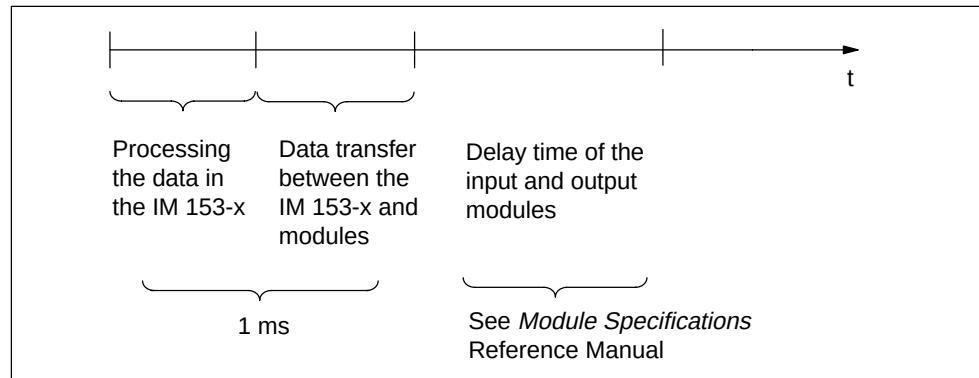


Figure 7-6 Response Time of the ET 200M

Switchover Time in the Case of Redundancy

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

DP Master System	Switchover Time	Configuration
S7-400H	70 ms	Any configuration
	30 ms	... without F, FM or HART modules or similar
S7 software redundancy S5-115H/155H	70 ms + 2 DP cycles	Any configuration
	30 ms + 2 DP cycles	... 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.

Compatibility Between the IM 153-x Modules

8

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.

Contents

Section	Subject	Page
8.1	Compatibility Between the Versions of the IM 153 and IM 153-1	8-2
8.2	Compatibility Between the Versions of the IM 153-2/-2 FO	8-5
8.3	Compatibility Between the Versions of the IM 153-3	8-8
8.4	Changing from the IM 153-3 to the 2 × IM 153-2	8-9
8.5	Exceptions for Configuring the "Module Change During Operation" Function	8-10
8.6	RC Network with 1 MΩ for a Configuration with Ungrounded Reference Potential	8-11

8.1 Compatibility Between the Versions of the IM 153 and IM 153-1

The Versions of the IM 153-1

Table 8-1 IM 153-1: Features and Variants 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	–	–	–	×	–	×
Extended range of environmental conditions (outdoors)	–	–	–	–	×	×
RC network with 10 MΩ for ungrounded configuration (see Sections 4.1.3 and 8.6)	– (1 MΩ)	– (1 MΩ)	as of E07	×	as of E07	×

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 8-1).

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 contact.

Response to the removal/insertion interrupt

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.

Module change during operation

You can find a list in Table 8-5 on page 8-10 of the modules you **cannot** use for the “module change during operation” function.

Startup Characteristics When Response Monitoring is Switched Off

The IM 153-1 **as of** 6ES7 153-1AA02-0XB0, 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.

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!

8.2 Compatibility Between the Versions of the IM 153-2/-2 FO

The Versions of the IM 153-2/-2 FO

Tabelle 8-2 Features and Variants of the IM 153-2

Functions/ Features	Interface Module and Order Number 6ES7 ...				
	153-2AA..			153-2AB.. (FO)	
	00	01	02	00	01
RS 485 interface	×	×	×	–	–
Fiber-optic interface	–	–	–	×	×
Module change during operation	×	×	×	×	×
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	–	–	×	–	×
Direct Communication	–	–	×	–	×
Enhanced diagnostics • 96-byte diagnostic frame	–	–	×	–	×
			as of E07		as of E06
Extended range of environmental conditions (outdoors)	–	–	–	–	–
RC network with 10 MΩ for ungrounded configuration (see Sections 4.1.3 and 8.6)	– (1 MΩ)	as of E07	×	×	×

E Version

Upgrading

You can upgrade the IM 153-2 (order number 6ES7 153-2AA02-0XB0; version 6) to version 7 for a charge.

You can upgrade the IM 153-2 FO (order number 6ES7 153-2AB01-0XB0, version 5) to version 6 for a charge.

For more information, get in touch with your Siemens contact.

Response to the Removal/Insertion Interrupt

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. Removing or inserting a module will result 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 indicated in the diagnosis.

Module change during operation

You can find a list in Table 8-5 on page 8-10 of the modules you **cannot** use for the “module change during operation” function.

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 8-3 (CPU 316-2 DP, for example) as of the first version.

Table 8-3 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	02	01
	6ES7 414-2XJ00-0AB0	04	03
CPU 416-2 DP	6ES7 416-2XK00-0AB0	04	03
	6ES7 416-2XL00-0AB0	04	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	—

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 7, and 6ES7-2AB01-0XB0, version 6) 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!

8.3 Compatibility Between the Versions of the IM 153-3

The Versions of the IM 153-3

Table 8-4 Using the IM 153-3 on the Following H Systems

H System/Functions	153-3AA00		153-3AA01
	Version 01	As of Version 02	As of Version 01
S5-115H/155H	×	×	×
S7 software redundancy	–	×	×
S7-400H	–	–	×
Module change during operation	×	×	×
Direct Communication	–	–	×

Module change during operation

You can find a list in Table 8-5 on page 8-10 of the modules you **cannot** use for the “module change during operation” function.

8.4 Changing From the IM 153-3 to 2 x IM 153-2

Please note the following:

- You must change the configuration: Replace the IM 153-3 with the IM 153-2!
- An ET 200M with 2 x IM 153-2 for redundancy **must** be configured with active bus modules.
If the ET 200M with the IM 153-3 is already configured with active bus modules, you must also replace the first bus module: Replace the BM PS/IM with a BM IM/IM!
- The passive IM 153-2 sends the I/O input data approximately 10 ms later than the active IM 153-2.

Additional Functions

When you use the IM 153-2, you can use additional functions to those available with the IM 153-3, such as the use of parameterizable FMs on S7 DP masters. You can find a detailed list of the functions in Table 1-2 on page 1-8.

8.5 Exceptions for the "Module Change During Operation" Function

You cannot use all the S7-300 modules for the "module change during operation" function. The following table lists the modules that you cannot use for the "module change during operation" function.

Table 8-5 Modules That Cannot be Used for "Module Change During Operation" in the ET 200M

Module	Order Number
SM 321; DI 16 × 24 V DC SM 321; DI 16 × 120 V AC SM 321; DI 8 × 120/230 V AC	6ES7 321-1BH00-0AA0 6ES7 321-1EH00-0AA0 6ES7 321-1FF00-0AA0
SM 322; DO 8 × 24 V/2 A DC SM 322; DO 16 × 24 V/0.5 A DC SM 322; DO 16 × AC 120 V/0.5 A SM 322; DO 8 × 120/230 V/1 A AC SM 322; DO 8 × Rel. 230 V AC	6ES7 322-1BF00-0AA0 6ES7 322-1BH00-0AA0 6ES7 322-1EH00-0AA0 6ES7 322-1FF00-0AA0 6ES7 322-1HF00-0AA0
SM 374; IN/OUT 16 DM 370	6ES7 374-2XH00-0AA0 6ES7 370-0AA00-0AA0
SM 331; AI 8 × 12 Bit SM 331; AI 2 × 12 Bit	6ES7 331-7KF00-0AB0 6ES7 331-7KB00-0AB0
SM 332; AO 4 × 12 Bit SM 332; AO 2 × 12 Bit	6ES7 332-5HD00-0AB0 6ES7 332-5HB00-0AB0
SM 334; AI 4/AO 2 × 8/8 Bit SM 335; AI 4/AO 4 × 12/14 Bit	6ES7 334-0CE00-0AB0 6ES7 335-7HG00-0AB0
FM 350 Counter FM 351 Position. FM 352 Cam	6ES7 350-1AH00-0AE0 6ES7 351-1AH00-0AE0 6ES7 352-1AH00-0AE0

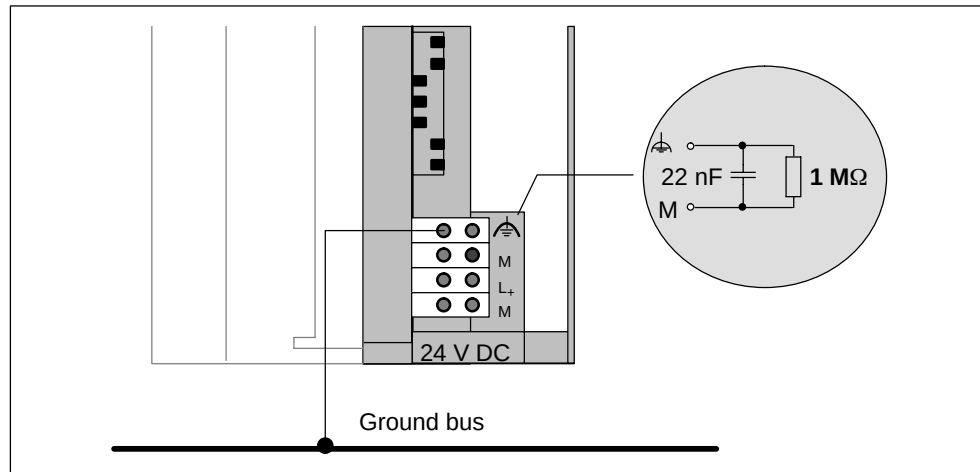
TIP: The above modules support the "module change during operation" function as of order number ...-xx01.

8.6 RC Network with 1 M Ω for a Configuration with Ungrounded Reference Potential

For more on the principle behind this, please read Section 4.1.3.

The following IM 153-x modules have a resistance of 1 M Ω in the RC network:

- IM 153-1 up to and including 153-1AA02, version 7
153-1AA82, version 6
- IM 153-2 up to and including 153-2AA01, version 2



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.

Order Numbers for the ET 200M

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 153-2/-2 FO	6ES7 195-7HD00-0XA0
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 Mbps without programming port	6ES7 972-0BA40-0XA0
with programming port	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)	6XV1821-2AN50

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 - SIMATIC NET PROFIBUS PCF Fiber Optic, standard cable different lengths from 50 m to 300 m	6XV1821-0AH10 6XV1821-0AN50 6XV1821-0AT10 6XV1821-1Cxxx
Connectors for fiber-optic cables	
- Packet of 100 Simplex connectors and 5 polishing sets - Packet of 50 plug-in adapters	6GK1901-0FB00-0AA0 6ES7 195-1BE00-0XA0
PROFIBUS module for the IM 153-3	6ES7 195-7BA00-0XB0
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, Hardware and Installation	Among other things: - Description of the PROFIBUS-DP interface of the CPU 31x-2 DP - Installing a PROFIBUS-DP network - Bus connector and RS 485 repeater
M7-300 Programmable Controller, Hardware and Installation	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, Hardware and 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

Table A-2 STEP 7 and SIMATIC S7 Manuals

Manual	Contents
System Software for S7-300 and S7-400 System and Standard Functions Reference Manual	Description of the SFCs in STEP 7
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 998-3ES.2).

Table A-3 Manual for the ET 200 in SIMATIC S5

Manual	Contents
<i>ET 200 Distributed I/O System</i>	• 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
<i>COM PROFIBUS</i> Manual	• Handling COM PROFIBUS Electronic manual on CD ROM and part of <i>COM PROFIBUS</i> (as of version 5.x)

Books

Table A-4 Technical Literature

Technical guide	Contents
<i>Decentralizing with PROFIBUS-DP</i> – 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.
<i>Plastic Fiber-Optic Cables Fundamentals, Components, Installation</i> 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.

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.

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

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.

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.

CPU

Central processing unit of the S7 programmable controller with open and closed-loop control systems, memory, operating system and interface for programming device.

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 EN 50170, Volume 2, PROFIBUS standard.

Diagnostics

Diagnostics is the detection and localizing of errors. The structure of a diagnosis is defined in EN 50170, Volume 2, PROFIBUS. The diagnosis of the ET 200M is in keeping with the 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.

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 that behaves in accordance with EN 50170, Volume 2, PROFIBUS is referred to as a DP master.

DP Slave

A → slave run on the PROFIBUS bus system with the PROFIBUS-DP protocol and performing to the EN 50170, Volume 2, PROFIBUS standard is referred to as a DP slave.

DP Standard

The DP standard is the bus protocol of the ET 200 distributed I/O system based on EN 50170, Volume 2, PROFIBUS 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.

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.

I/O bus

The I/O bus is part of the → 7-300 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.

IP20

Degree of protection to DIN 40050: Protection against contact with fingers and against foreign bodies longer than 12 mm Ø.

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 logic controller

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, a German process and field bus standard defined in the PROFIBUS standard (EN 50170). 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.

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 device is based on the EN 50 170, Volume 2, PROFIBUS 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.

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.

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 stamping

This is the date and time specified for a message.

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.

Transmission rate

The transmission rate of a data transfer is measured in bits transmitted per second (transmission rate = bit rate).

In the case of the ET 200, transmission rates of 9.6 kbps to 12 Mbps are possible.

Ungrounded

Without a conductive connection to the → ground.

Varistor

This is a voltage-dependent resistor

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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