SIEMENS

SIMATIC

ET 200MP
IM 155-5 DP ST interface module
(6ES7155-5BA00-0AB0)

Manual

08/2013
A5E32346748-AA

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

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Preface

Purpose of the documentation

This technical manual supplements the ET 200MP distributed I/O system (http://support.automation.siemens.com/WW/view/en/59193214) system manual. Functions that generally relate to the system are described in this manual.

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

Conventions

Please also observe notes marked as follows:

Note

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

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Table of contents

Documentation guide 1

Introduction

This modular documentation of the SIMATIC products covers diverse topics concerning your automation system.

The complete documentation for the ET 200MP distributed I/O system consists of a system manual, function manuals and product manuals.

The STEP 7 information system (Online Help) also helps you configure and program your automation system.

Overview of the documentation for the IM 155-5 DP ST interface module

Table 1- 1   Documentation for the IM 155-5 DP ST interface module

Topic	Documentation	Most important contents
System description	System manual ET 200MP distributed I/O system (http://support.automation.siemens.com/WW/view/en/59193214)	• Application planning • Installation • Wiring • Commissioning • Maintenance
Communication	Function manual: PROFIBUS with STEP 7 V12 (http://support.automation.siemens.com/WW/view/en/59193579)	• PROFIBUS basics • PROFIBUS functions • PROFIBUS diagnostics

SIMATIC manuals

All current manuals for the SIMATIC products are available for download free of charge from the Internet (http://www.siemens.com/automation/service&support).

Product overview

2.1   Properties

Order number

6ES7155-5BA00-0AB0

View of the module
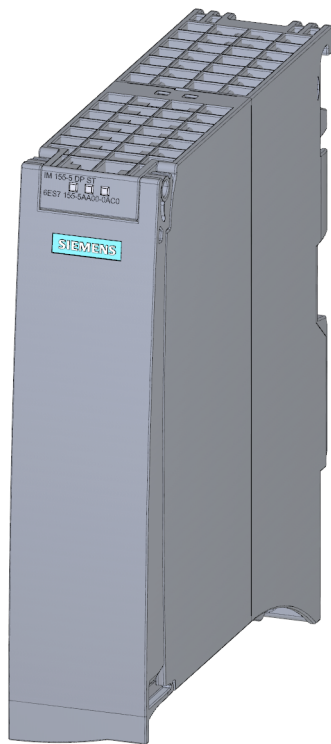
Figure 2-1   View of the IM 155-5 DP ST interface module

Properties

- Technical properties
  - Connects the ET 200MP distributed I/O system with PROFIBUS DP
  - Bus connection via RS485 interface
  - 24V DC power supply (SELV/PELV)
  - Supports ET 200MP I/O modules
- Supported system functions
  - PROFIBUS DP
  - Identification data I&M 0 to 3
  - Operation as DPV1 slave
  - Firmware update via PROFIBUS DP. You can find additional information in the ET 200MP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/59193214) system manual.

Maximum configuration

- 244 bytes I/O data per station
- The integrated power supply of the interface module feeds 14 W into the backplane bus. The interface module can supply up to 12 I/O modules. The exact number of operable modules is determined by the power budget (see relevant section in the ET 200MP distributed I/O system (http://support.automation.siemens.com/WW/view/en/59193214) system manual).

PROFIBUS connector

The 9-pin sub D PROFIBUS connector is included in the product package of the IM 155-5 DP ST interface module and available as accessory.

You can find additional information in the function manual, Designing interference-free controllers (http://support.automation.siemens.com/WW/view/en/59193566) in the section Connecting the bus shield for bus cables.

See also

GSD file (http://support.automation.siemens.com/WW/view/en/10805317/133300)
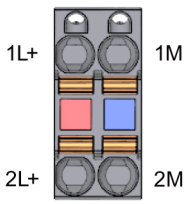
Wiring 3

3.1 Terminal assignment

24V DC power supply

Table 3- 1   Terminal assignment 24V DC power supply

View	Signal name[1)	Designation
1L+ 1M 2L+ 2M	1L+	24 V DC
	2L+	24V DC (for looping through)[2)
	1M	Ground
	2M	Ground (for looping through)[2)
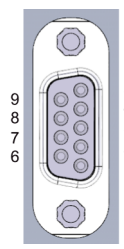
[1)   1L+and 2L+, as well as 1Mand 2Mare bridged internally.

[2)   Permitted value 10 A

PROFIBUS DP with RS485 interface

The following table shows the signal names and the designations of the terminal assignment for the PROFIBUS DP interface.

Table 3- 2   Terminal assignment PROFIBUS DP with RS485 interface

View		Signal name	Designation
9 8 7 6 5 4 3 2 1	1	-	-
	2	-	-
	3	RxD/TxD-P	Data line B
	4	RTS	Request To Send
	5	M5V2	Ground (from station)
	6	P5V2	Supply plus (from station)
	7	-	-
	8	RxD/TxD-N	Data line A
	9	-	-

Additional information

You can find additional information on connecting the interface module and on the accessories in the ET 200MP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/59193214) system manual.

3.2 Block diagram

Block diagram
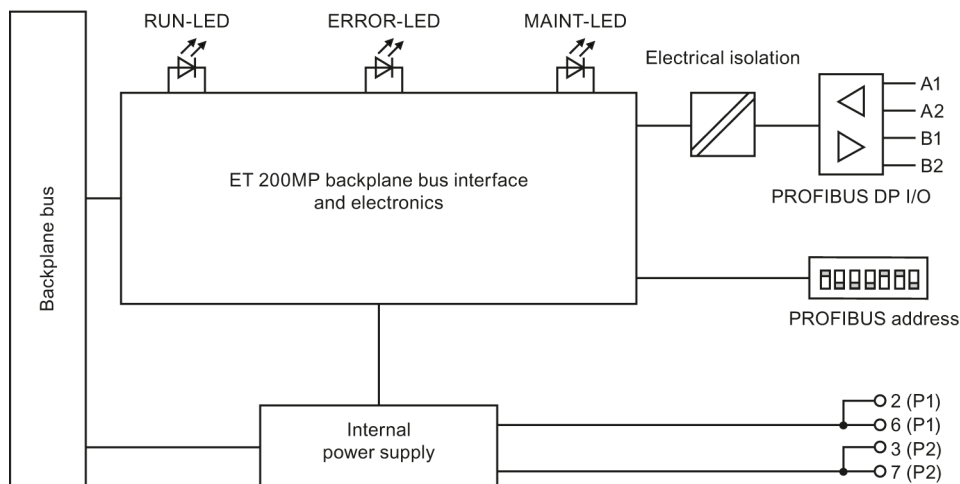
Figure 3-1   Block diagram of the IM155-5 DP ST interface module

3.3 Setting the PROFIBUS DP address

Introduction

Set the PROFIBUS DP address for the PROFIBUS DP on the IM 155-5 DP ST interface module. By setting the PROFIBUS DP address, you specify where the ET 200MP is to be addressed on the PROFIBUS DP.

Requirements

- Valid PROFIBUS DP addresses are 1 to 125.
- Each PROFIBUS DP address may be assigned only once on the PROFIBUS DP.
- The set PROFIBUS DP address must match the PROFIBUS DP address specified for the ET 200MP in the configuration software.

Required tools

Screwdriver 3 - 3.5 mm

Setting the PROFIBUS DP address

1. Open the front cover of the interface module.

2. Use a screwdriver to set the required PROFIBUS address via the DIP switch.

3. Close the front cover.
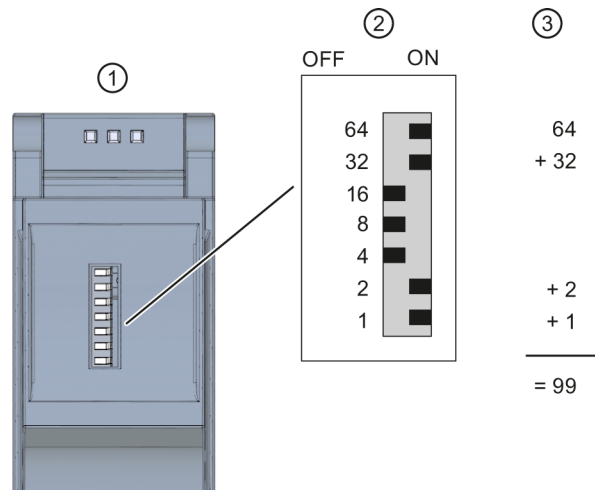
①   Interface module IM 155-5 DP ST
②   PROFIBUS DP address
③   Example: PROFIBUS DP address

Figure 3-2   Setting the PROFIBUS DP address

Note

Validity of the PROFIBUS DP address

The IM 155-5 DP ST interface module does not apply a configured PROFIBUS DP address until after a POWER OFF/POWER ON transition.

Changing the PROFIBUS DP address

You can change the PROFIBUS DP address in exactly the same way as you set it. A change to the PROFIBUS DP address only takes effect for the ET 200MP after a POWER OFF/POWER ON transition on the interface module.

Interrupts, diagnostics, error and system messages

4

4.1 Diagnostics via LED display

Introduction

Diagnostics by means of LED display is an initial tool for error localization. In order to localize errors still further, you usually need to evaluate the display of the module status in STEP 7 or the diagnostics buffer of the CPU. The diagnostics buffer contains plain text information on the error that has occurred. For example, you can find the number of the relevant error OB in the plain text information.

LED display

The figure below shows the LED display on the interface module.
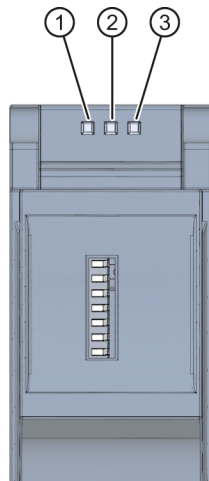
①   RUN (green)
②   ERROR (red)
③   MAINT (yellow)

Figure 4-1   LED display on the interface module

Meaning of the RUN/ERROR/MAINT LED displays on the interface module

Table 4- 1   Meaning of the RUN/ERROR/MAINT LED displays on the interface module

LEDs			Meaning	Remedy
RUN	ERROR	MAINT		
□ Off	□ Off	□ Off	Supply voltage at interface module missing or too low	Check the supply voltage or switch it on on the interface module.
■ On	■ On	■ On	Test of LEDs during startup: The three LEDs light up simultaneously for approximately 0.25 s.	-
☼ Flashes	□ Off	□ Off	Interface module is deactivated.	Activate the interface module with the configuration software or the user program.
			Interface module is not configured.	Configure the interface module with the configuration software.
			ET 200MP starts up.	-
			ET 200MP is configured.	
■ On	Not relevant	Not relevant	ET 200MP is currently exchanging data with the DP master.	-
Not relevant	☼ Flashes	Not relevant	Group error and group error channels	Evaluate the diagnostics data and correct the error.
			The set configuration does not correspond to the actual configuration of the ET 200MP.	Check the configuration of the ET 200MP to determine whether a module is missing or faulty, or whether a non-configured module has been plugged in.
			Invalid configuration states	See section Invalid configuration states of the ET 200MP on PROFINET DP (Page 24).
■ On	■ On	□ Off	Invalid PROFIBUS address (0,126,127)	Set the configured PROFIBUS address at the DIP switch and then switch on the interface module again.

Note

Parameter assignment error in the I/O module

If incorrect parameters are assigned for an I/O module (for example, substitute value outside the value range), the I/O module switches to non-configured state. The RUN LED (green) flashes on the I/O module.

The IM 155-5 DP ST interface module does not indicate a parameter assignment error in the I/O module.

4.2 Alarms

4.2.1 Diagnostics alarms

Actions after a diagnostics alarm in DPV1 mode

The error is entered in the channel diagnostics in the diagnostics frame:

● In DPV1 mode, diagnostics can be reported as diagnostic interrupts.

● After a diagnostics alarm, this is

   – Entered as diagnostic interrupt block in the diagnostics frame.

   – Stored in the diagnostics buffer of the CPU.

● The ERROR LED of the interface module flashes.

● The diagnostic interrupt OB (OB 82) is called, if available.

● Acknowledgment of diagnostic interrupt (a new interrupt is then possible)

Maximum length of the diagnostics frame

The maximum frame length for the ET 200MP distributed I/O system with IM155-5 DP ST interface module (DPV1 mode) is 244 bytes.

Reading out the diagnostics data

Table 4- 2   Reading out the diagnostics data with STEP 7

Automation system with DP master	Application	See...
SIMATIC S7	Slave diagnostics data as plain text in the "DP slave diagnostics" tab in the STEP 7 user interface	"Diagnosing hardware" in the STEP 7 online help
	Instruction "DP NRM_DG" (SFC 13) Reading out slave diagnostics (store in the data area of the user program)	SFC, see STEP 7 online help
	Instruction "RD_REC" (SFC 59) Reading out data records of the S7 diagnostics data (store in the data area of the user program)	See System and Standard Functions reference manual
	Instruction "RDREC" (SFB 52) Reading data records from the DP slave	SFB, see STEP 7 online help (system functions/function blocks)
	Instruction "RALRM" (SFB 54) Receiving interrupts from the interrupt OBs	SFB, see STEP 7 online help (system functions/function blocks)

4.2.2 Slave diagnostics

The figure below shows the structure of the slave diagnostics.

Note

The length of the diagnostics frame for the IM 155-5 DP ST varies between 6 and 244 bytes, depending on the number of diagnostic entries actually present.

You can identify the length of the last received diagnostics frame in STEP 7 by referring to the RET_VAL parameter of the SFC 13.

IM 155-5 DP ST interface module
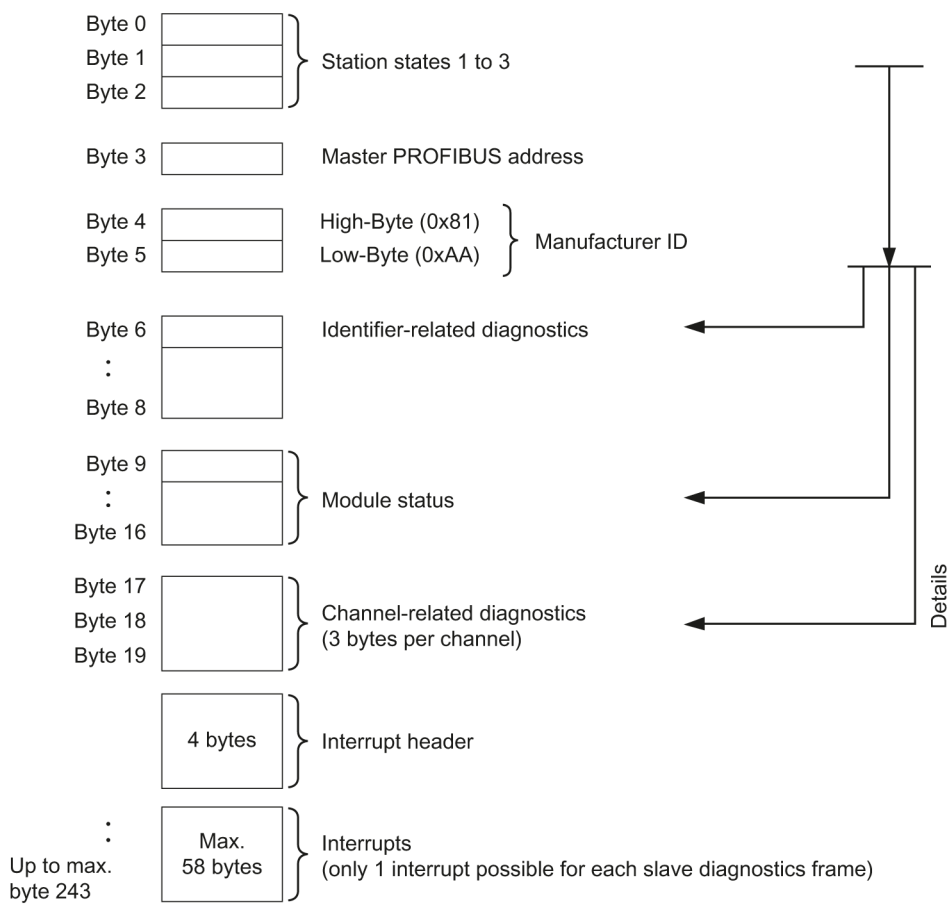
Figure 4-2   Configuration of the slave diagnostics DP

4.2.3 Station statuses 1 to 3

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

Structure of station status 1 (byte 0)

Table 4- 3   Structure of station status 1 (byte 0)

Bit	Meaning	Cause/Remedy
0	1: The DP slave is not responding to the DP master.	• Is the correct PROFIBUS address set on the DP slave? • Is the bus connector plugged in? • Is the DP slave connected to the voltage supply? • Is the RS485 repeater properly configured?
1	1: The DP slave is not yet ready to exchange data.	• Wait, the DP slave is currently starting up.
2	1: The configuration data transferred from the DP master to the DP slave does not match the DP slave configuration.	• Has the correct station type or the correct DP slave configuration been entered in the configuration software?
3	1: External diagnostics is available. (Group diagnostics display)	• Evaluate the ID-specific diagnostics, the module status, and/or the channel diagnostics. As soon as all errors have been eliminated, bit 3 is reset. The bit is set again when there is a new diagnostics alarm in the bytes of the above-mentioned diagnostics.
4	1: The required function is not supported by the DP slave (for example, changing the PROFIBUS address via software).	• Check the configuration.
5	1: The DP master cannot interpret the response of the DP slave.	• Check the bus configuration.
6	1: The DP slave type does not match the software configuration.	• Has the correct station type been specified in the configuration software?
7	1: Parameters have been assigned to the DP slave by a different DP master (not the one that currently has access to the DP slave).	• The bit is always 1, for example, if you access the DP slave with the programming device or another DP master. • The "master PROFIBUS address" diagnostic byte contains the PROFIBUS address of the DP master that assigned parameters to the DP slave.

Structure of station status 2 (byte 1)

Table 4- 4   Structure of station status 2 (byte 1)

Bit		Meaning
0	1:	The DP slave parameters need to be reassigned.
1	1:	A diagnostics alarm is present. The DP slave cannot operate until the problem is eliminated (static diagnostics alarm).
2	1:	The bit on the DP slave is always "1".
3	1:	The watchdog is activated for this DP slave.
4	1:	The DP slave has received the "FREEZE" control command.[1]
5	1:	The DP slave has received the "SYNC" control command.[1]
6	0:	Bit is always "0".
7	1:	The DP slave is disabled, that is, it has been removed from the processing in progress.
[1] The bit is updated only if another diagnostics alarm changes also.		

Structure of station status 3 (byte 2)

Table 4- 5   Structure of station status 3 (byte 2)

Bit		Meaning
0 to 6	0:	Bits are always set to "0".
7	1:	• There are more diagnostic alarms pending than the DP slave is able to store. • The DP master cannot enter all the diagnostics alarms sent by the DP slave in its (channel) diagnostics buffer.

4.2.4   Master PROFIBUS address

The master PROFIBUS address diagnostics byte contains the PROFIBUS address of the DP master:

● That assigned parameters to the DP slave

● That has read and write access to the DP slave

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

If the DP slave parameters were not assigned by the DP master, the master PROFIBUS diagnostic byte address contains "0xFF".

4.2.5 Identifier-related diagnostics

The identifier-related diagnostics indicates whether or not modules of the ET 200MP distributed I/O system have errors. Identifier-related diagnostics starts at byte 6 and comprises 3 bytes.

The following figure shows the structure of the identifier-rated diagnostics of the IM 155-5 DP ST: interface module

```
           7  6  5           0   Bit no.
Byte 6 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
         └──┬──┘ └────────┬────────┘
            │        Length of the identifier-related diagnostics including byte 6 (= 3 bytes)
            │
     Code for identifier-related diagnostics


           7  6  5  4  3  2  1  0   Bit no.
Byte 7 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |   Module: 1 to 8      Events on the corresponding module are
Byte 8 | * | * |14 |13 |12 |11 |10 | 9 |   Module: 9 to 14     signaled by set bits.
         * Always "0"
```
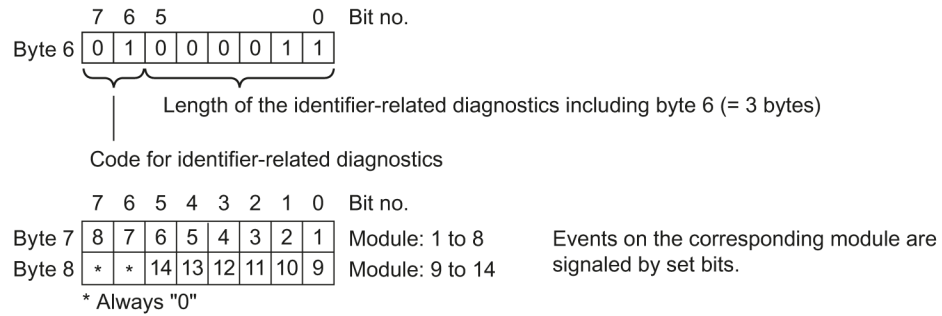
Figure 4-3   Structure of the identifier-related diagnostics

4.2.6 Module status

The module status indicates the status of the configured modules and provides more information on the identifier-related diagnostics with respect to the configuration. The module status begins after the identifier-related diagnostics and comprises 8 bytes.

The following figure shows the structure of the module status of the IM 155-5 DP ST interface module

```
                7  6  5  4  3  2  1  0     Bit no.
        Byte 9  0  0  0  0  1  0  0  0
                                          Length of the module status including byte 9 (= 8 bytes)
                                          Code for module status

                7                    0
        Byte 10         82H                Status type: Module status

                7                    0
        Byte 11         0H                 Not relevant

        Byte 12         0H                 Not relevant

                7  6  5  4  3  2  1  0     Bit no.
        Byte 13   4     3     2     1      Module: 1 to 4
        Byte 14   8     7     6     5      Module: 5 to 8
        Byte 15  12    11    10     9      Module: 9 to 12
        Byte 16   *     *    14    13      Module: 13 to 14

              * Always "00"                00B: Module OK; valid user data
                                           01B: Module fault; invalid user data
                                           10B: Wrong module; invalid user data
                                           11B: No module (or failure of the module); invalid user data
```

Figure 4-4   Module status structure

4.2.7 Channel-specific diagnostics

Channel-related diagnostics provide information about channel errors in modules and details of the identifier-related diagnostics. Channel-related diagnostic data starts after the module status. Channel-related diagnostics do not affect the module status.

The following figure shows the structure of the identifier-rated diagnostics of the IM 155-5 DP ST interface module

```
                    7  6  5  4  3  2  1  0    Bit no.
       Byte 17     │1 │0 │  │  │  │  │  │  │
                    ╰┬╯ ╰────────┬────────╯
                     │           Slot of the module that supplies the channel-related diagnostics.
                     Code for channel-related diagnostics


                    7  6  5  4  3  2  1  0    Bit no.
       Byte 18     │  │  │  │  │  │  │  │  │
                    ╰─┬─╯ ╰───────┬───────╯
                      │           Number of the channel that supplies diagnostics.
       Channel type:   01_B: Input
                       10_B: Output
                       11_B: Input/output


                    7  6  5  4  3  2  1  0    Bit no.
       Byte 19     │  │  │  │  │  │  │  │  │
                    ╰──┬──╯ ╰──────┬──────╯
                       │           Error type (see manual of the corresponding module)
       Channel resolution:  000_B: Permissible for diagnostics that are mapped to
                                   a module proxy instead of an individual channel
                            001_B: 1 bit
                            010_B: 2 bits
                            011_B: 4 bits
                            100_B: 1 byte
                            101_B: 1 word
                            110_B: 2 words
```

Bytes 20 to 22   Next channel-related diagnostics message (assignment like bytes 17 to 19)

Max. byte 181

Figure 4-5   Structure of the channel diagnostics

4.2.8 Invalid configuration states of the ET 200MP on PROFIBUS DP

Invalid configuration states

The following tables shows invalid configuration states of the ET 200MP distributed I/O system. The incorrect configuration states lead to the failure of the interface module or prevent the exchange of user data with the I/O modules. Invalid configuration states are mapped to the module status of slot 1 (power status) or slot 2 (interface module).

Table 4- 6   Invalid configuration states on the ET 200MP

Invalid configuration states	Signaling	
	Module status	Slot
Power budget fault (overload)	Module fault (01)	Slot 1 (power status)
Power supply module detected	Wrong module (10)	Slot 1 (power status)
Permitted number of I/O modules exceeded	Module fault (01)	Slot 2 (interface module)
No U connector detected on an IM port	Module fault (01)	Slot 2 (interface module)
More than one bus master module (IM/CPU) detected	Module fault (01)	Slot 2 (interface module)
Communication has failed with slot x	Module fault (01)	Slot 2 (interface module)

You can find additional information on the module status in the section Module status (Page 22).

Additional information

You can find additional information on maximum configuration and on power budget in the ET 200MP Distributed I/O System (http://support.automation.siemens.com/WW/view/en/59193214) system manual.

4.3   Interrupts

Definition

The interrupt section of the slave diagnostic information indicates the interrupt type and the event that led to an interrupt being triggered. The interrupt section comprises a maximum 58 bytes.

Position in the diagnostic frame

The interrupt section is located after the channel diagnostics (only in DPV1 mode).

Example: If 3 channel-related diagnostic entries are pending, the interrupt section starts at byte 26.

Data record

The diagnostics data of a module can be up to 58 bytes in length and is located in data records 0 and 1:

● Data record 0 contains 4 bytes of diagnostic data describing the current state of an automation system. DS0 is part of the header information of OB 82 (local data bytes 8 to 11).

● Data record 1 contains the 4 bytes of diagnostic data that are also contained in data record 0, and additional 6 bytes DS1, and up to 8 channel diagnostic entries, each of which comprises 6 bytes in Siemens S7+ format.

DS0 and DS1 can be read with SFC 59 (RD_REC) or SFB 52 (RDREC).

List of Contents

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

● For diagnostic interrupts, diagnostic data record 1 (up to 58 bytes) is sent as interrupt status information (starting at byte x+4).

● The status interruption for hardware interrupts is 4 bytes in length.

Structure of interrupts

The interrupt section for the ET 200MP distributed I/O system is structured as follows:

Interrupt header

```
          7  6  5  4  3  2  1  0
Byte x   │ 0│ 0│  │  │  │  │  │  │
```
Length of the interrupt section including byte x (= max. 62 bytes)
Code for channel-related diagnostics

```
          7  6  5  4  3  2  1  0
Byte x+1 │ 0│  │  │  │  │  │  │  │
```
Interrupt type:
0000001_B: Diagnostic interrupt
0000010_B: Hardware interrupt
0000011_B: Pull interrupt
0000100_B: Plug interrupt

```
          7  6  5  4  3  2  1  0
Byte x+2 │ 0│ 0│ 0│ 1│ 0│ 0│ 0│ 0│
```
Slot number

00: Interrupts 01 to 63:
Slot of the module that supplies interrupt

```
          7  6  5  4  3  2  1  0
Byte x+3 │  │  │  │  │  │ 0│  │  │
```
Diagnostic interrupt:
01_B: At least one error is present
10_B: Outgoing error
11_B: Reserved

Plug interrupt:
10_B: Correct module plugged
11_B: Wrong module plugged

Interrupt sequence number (1 to 31) only when operated downstream from a Y-link, otherwise the value is 0

Interrupt

Bytes x+4 to ...   ... byte x+n   ... byte x+7

Diagnostic data   Hardware interrupt data
(content of the data record
1)

Byte x+4 to byte x+7*
Byte x+8 to byte x+13*
From byte x+14 to byte x+n*

Byte x+4 to byte x+7*

* Explanation provided in the graphics below

Figure 4-6   Structure of the interrupt status of the interrupt section

Diagnostic interrupt, byte x+4 to x+7 (DS 0)

```
                7  6  5  4  3  2  1  0
Byte x+4   [        0  0            ]   Incoming diagnostics: 1101_B
                                        Outgoing diagnostics: 0000_B
                                  └── Module fault, i.e. an error was detected
                               └───── Internal error in module
                            └──────── External error: Module no longer responds
                         └─────────── Channel error in the module
                   └───────────────── Module parameters not assigned
                └──────────────────── Maintenance demanded
```

```
                7  6  5  4  3  2  1  0
Byte x+5   [ 0  0                    ]
                         └───────── Module class:
                                    0011_B "distributed" DP Slave in S7
                      └──────────── Channel information present (always "1")
                   └─────────────── User information present (always "1")
```

```
                7  6  5  4  3  2  1  0
Byte x+6   [ 0  0  0  0  0  0        ]
                                  └── Wrong module or no module
                               └───── Communication error of the module
```

```
                7                    0
Byte x+7   [                         ]   Always "0"
```

Figure 4-7   Structure of bytes x+4 to x+7 for diagnostic interrupt (DS 0)

Diagnostic interrupt from the modules, starting at byte x+8


```
                    7              0
        Byte x+8   [            ]        Channel type always "0x0F"

                    7              0
        Byte x+9   [            ]        Channel length information always "0x00"

                    7              0
        Byte x+10  [            ]        Channel length error always "0x00"

                    7              0
        Byte x+11  [            ]        Channel error entry

                                         "0x00 - 0x08" Number of channel error entries
                                         "0x09 - 0xFE" reserved
                                         "0xFF" Overflow*

                    7              0
        Byte x+12  [            ]        User structure identification

                    15             8
        Byte x+13  [            ]        "8000" Channel diagnostics
                                         "8002" Extended channel diagnostics
```
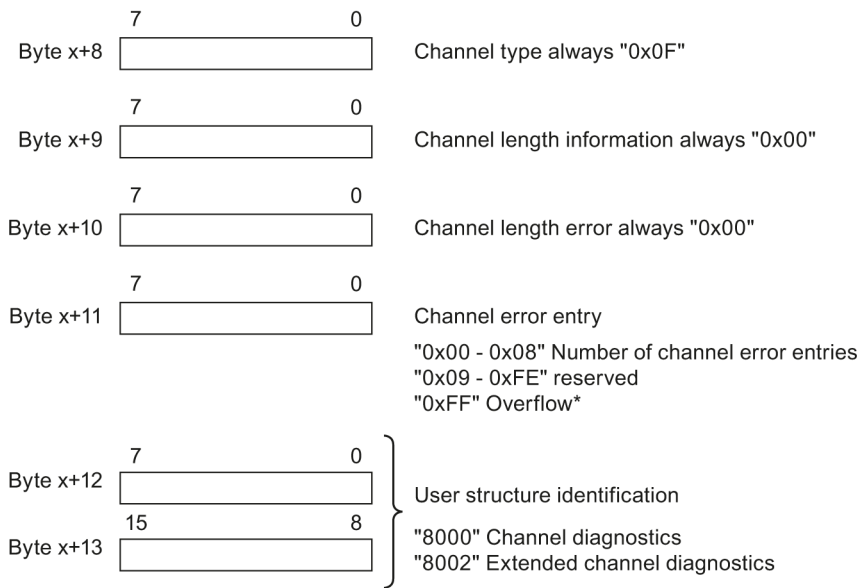
* The number of pending channel errors in greater than 8.

Figure 4-8   Structure starting at byte x+8

Diagnostic interrupt from the modules, starting at byte x+14

The channel error entries start at byte x+14. A channel error entry is 6 bytes long and can occur up to 8 times starting at byte x+14.
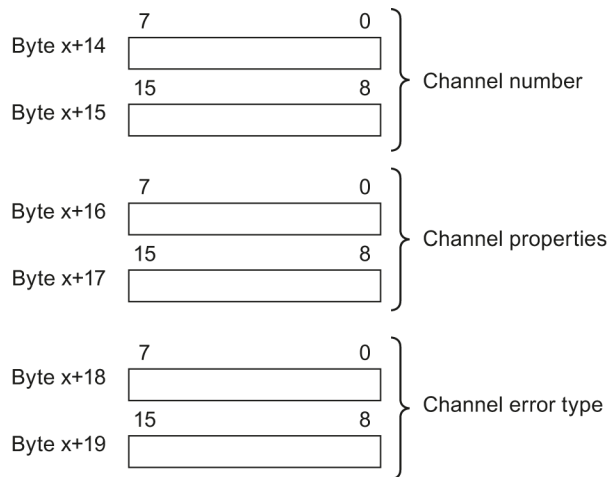

Figure 4-9   Structure starting at byte x+14

The following table explains the channel error entries.

	Description	
Channel number	0 to 0x7FFF: Channel number for channel error 0x8000: Entire submodule	
Channel properties	Bit 0 to 7	00_H: Free data type 01_H: bit 02_H: 2 bit 03_H: 4 bit 04_H: byte 05_H: word 06_H: Double word 07_H: 2 double word 08_H to FF_H: Reserve
	Bit 8	0_B: Single channel 1_B: Channel group
	Bit 9, 10	00_H: Diagnostics 01_H: Maintenance demanded 02_H: Maintenance required 03_H: Reserve
	Bit 11, 12	00_H: Channel error-free 01_H: Incoming diagnostics 02_H: Outgoing diagnostics 03_H: Outgoing diagnostics, but other diagnostics are also pending on this channel
	Bit 13 to 15	00_H: Reserve 01_H: Input channel 02_H: Output channel 03_H: Input/output channel
Channel error type	Refer to respective manual for explanation.	

Example of a Diagnostic Interrupt

Example:
The electronics module 16DI reports the diagnostic interrupt "Short circuit" on channel 2

```
           7  6  5  4  3  2  1  0
Byte x    | 0| 0| 1| 1| 0| 0| 1| 1|
                   └────┬────┘
                        └──────────── Length of the interrupt section = 20 bytes

           7  6  5  4  3  2  1  0
Byte x+1  | 0| 0| 0| 0| 0| 0| 0| 1|
                              └────── Diagnostic interrupt

           7  6  5  4  3  2  1  0
Byte x+2  | 0| 0| 0| 0| 1| 0| 1| 0|
                      └──┬──┘
                         └─────────── Slot number 10

           7  6  5  4  3  2  1  0
Byte x+3  | 0| 0| 0| 0| 1| 0| 0| 1|
                      |        └───── At least 1 error is present
                      └────────────── Interrupt sequence number = 1

           7  6  5  4  3  2  1  0
Byte x+4  | 0| 0| 0| 0| 1| 0| 0| 0|
                      └────────────── Channel error is present in module

           7  6  5  4  3  2  1  0
Byte x+5  | 0| 0| 0| 1| 1| 0| 0| 1|
                   |  └──┬──┘
                   |     └─────────── Digital electronic module
                   └──────────────── Channel information present
```

Byte x+6 and x+7 always "0"

```
           7  6  5  4  3  2  1  0
Byte x + 8 | 0| 0| 0| 0| 1| 1| 1| 1|

           7  6  5  4  3  2  1  0
Byte x+9  | 0| 0| 0| 0| 0| 0| 0| 0|

           7  6  5  4  3  2  1  0
Byte x+10 | 0| 0| 0| 0| 0| 0| 0| 0|

           7  6  5  4  3  2  1  0
Byte x+11 | 0| 0| 0| 0| 0| 0| 0| 1|       1 channel error entry
```

Byte x+12 to x+13 user identification
Byte x+14, x+15 channel number
Byte x+16, x+17 channel properties
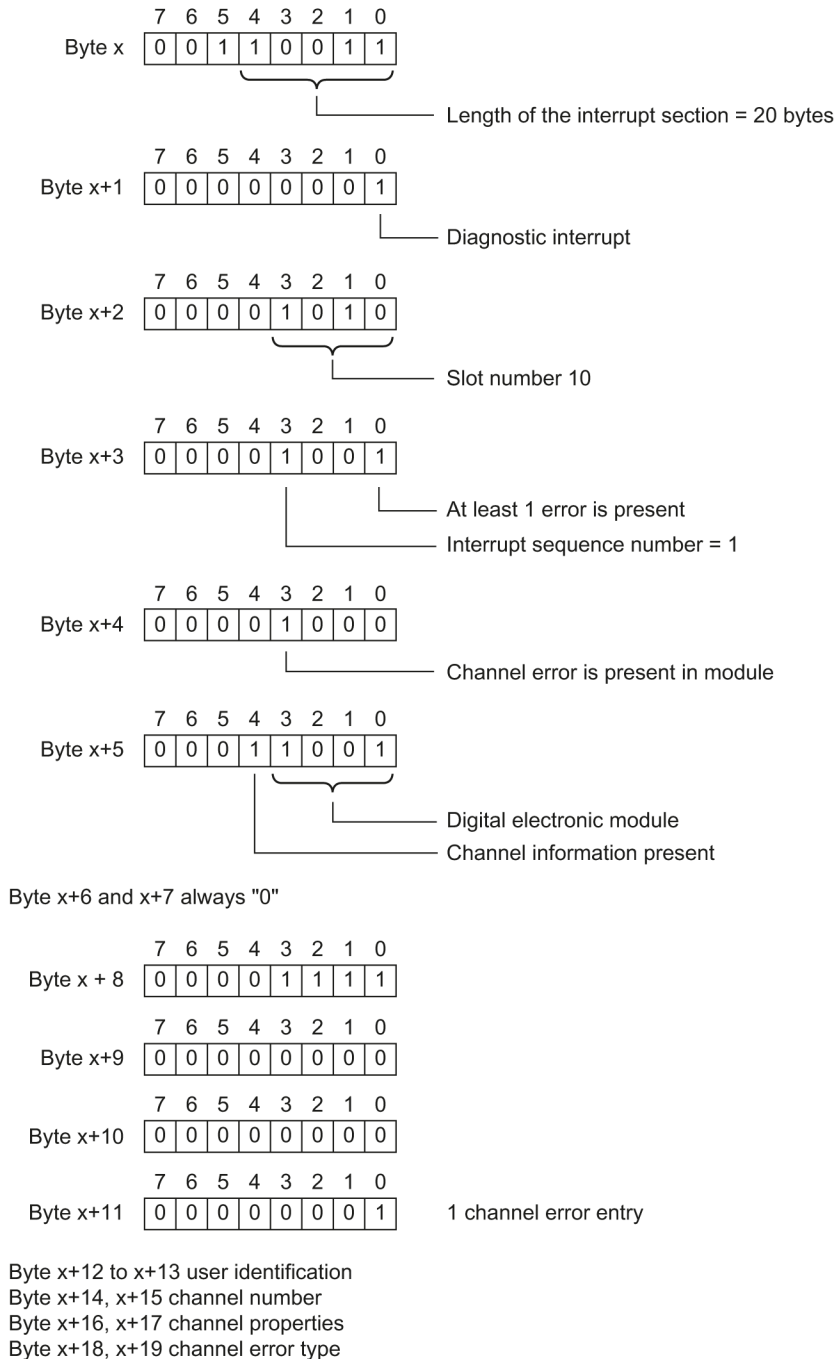Byte x+18, x+19 channel error type

Figure 4-10   Example of a Diagnostic Interrupt

Hardware interrupt of digital and analog input modules
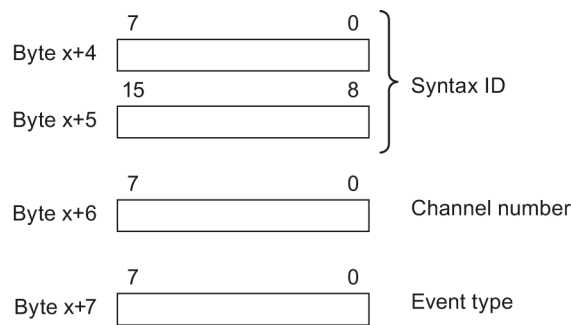

Figure 4-11   Structure as of Byte x+4 for hardware interrupt

4.3.1   Evaluating interrupts of ET 200MP

Introduction

With certain process states/errors, the DP slave in each case creates an interrupt block with the corresponding information in the diagnostics frame (DPV1 interrupt mechanism). Regardless of this, the diagnostic status of the DP slave is displayed in the identifier-related diagnostics, in the module status, and in the channel diagnostics.

Interrupts in DPV1 mode

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

* Diagnostic interrupts
* Hardware interrupts

4.3.2   Triggering of a diagnostic interrupt

Triggering a diagnostic interrupt

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

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

4.3.3 Triggering of a hardware interrupt

Triggering a hardware interrupt

When a hardware interrupt occurs, the CPU interrupts user program execution and processes the hardware interrupt block OB, e.g., OB 40. The event that triggered the interrupt is added to the start information of the hardware interrupt OB.

Note

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

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

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

Technical specifications

5

5.1 Technical specifications

Technical specifications of the IM 155-5 DP ST

	6ES7155-5BA00-0AB0
General information	
Hardware version	01
Firmware version	V1.0.0
Vendor identifier (VendorID)	81AAh
Product function	
I&M data	Yes; IM0 to IM3
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V12.0 SP1
STEP 7 can be configured/integrated as of version	as of V5.5 SP3 / -
PROFIBUS as of GSD version/GSD revision	V1.0 / 5.1
Supply voltage	
Type of supply voltage	DC
Rated value (DC)	24 V
Valid range low limit (DC)	20.4 V
Valid range high limit (DC)	28.8 V
Reverse polarity protection	Yes
Power and voltage failure backup	
Power/voltage failure backup time	5 ms
Input current	
Current consumption (rated value)	0.2 A; at 24 V DC and without load
Current consumption, max.	1.2 A; at 20.4 V DC and max. load
Inrush current, max.	4 A
I²t	0.09 A²s
Power	
Incoming power to the backplane bus	14 W
Power loss	
Power loss, typ.	4 W; typical
Address area	
Address space per module	
Address space per module, max.	128 byte; per input/output
Address space per station	
Address space per station, max.	244 byte; per input/output

	6ES7155-5BA00-0AB0
Hardware configuration	
System power supply can be plugged in to left of IM	No
Number of permissible power segments	1
Modules per rack, max.	12; I/O modules
Interfaces	
Number of PROFIBUS interfaces	1
1. Interface	
Protocols	
• PROFIBUS DP slave	Yes
Interface hardware	
RS 485	
Transmission rate, max.	12 Mbps
Protocols	
PROFIBUS	
Services	
• SYNC capability	Yes
• FREECE capability	Yes
• DPV1	Yes
Interrupts/diagnostics/status information	
Status display	Yes
Interrupts	
Interrupts	Yes
Diagnostic alarms	
Diagnostic functions	Yes
Diagnostic indicator LED	
RUN LED	Yes; green LED
ERROR LED	Yes; red LED
MAINT LED	Yes; yellow LED
Electrical isolation	
between backplane bus and electronics	No
between PROFIBUS DP and all other circuit components	Yes
between supply and all other circuits	No
Permitted potential difference	
Between different circuits	75 V DC / 60 V AC
Insulation	
Insulation tested with	707 V DC (type test)

	6ES7155-5BA00-0AB0
Ambient conditions	
Operating temperature	
Horizontal installation, min.	0 °C
Horizontal installation, max.	60 °C
Vertical installation, min.	0 °C
Vertical installation, max.	40 °C
Dimensions	
Width	35 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	360 g

Dimension drawing

A

A.1　　Dimension drawing IM 155-5 DP ST

The dimensional drawing of the module on the mounting rail, as well as a dimensional drawing with open front panel, are provided in the appendix. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

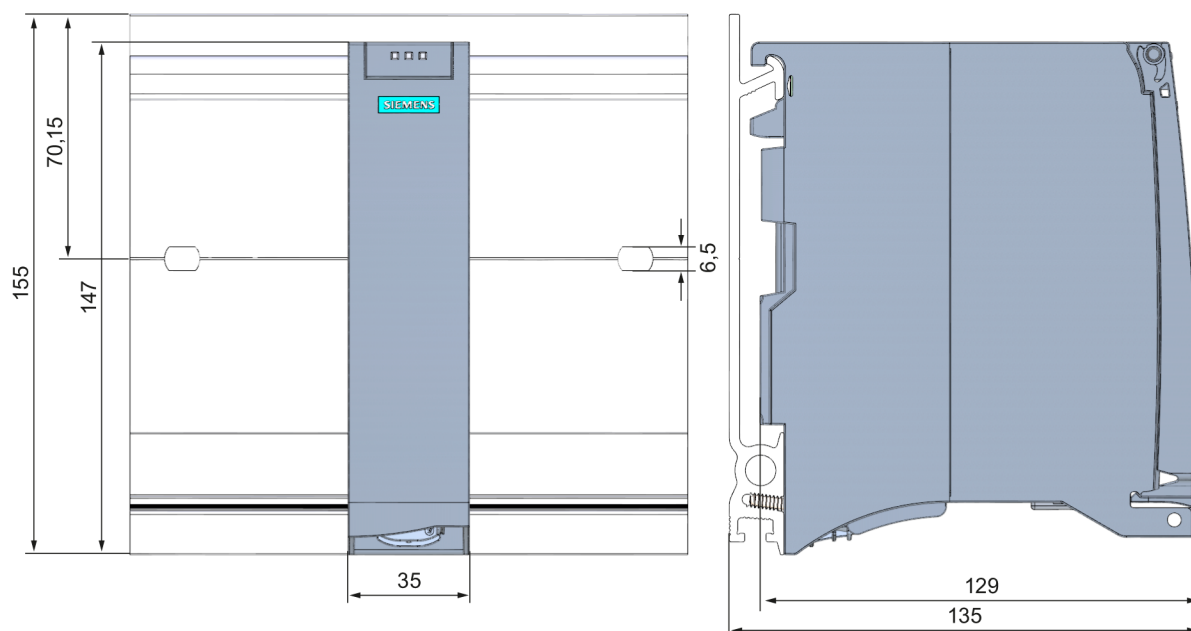**Dimensional drawings of the IM 155-5 DP ST interface module**

Figure A-1　　Dimensional drawing of the IM 155-5 DP ST interface module, front and side views

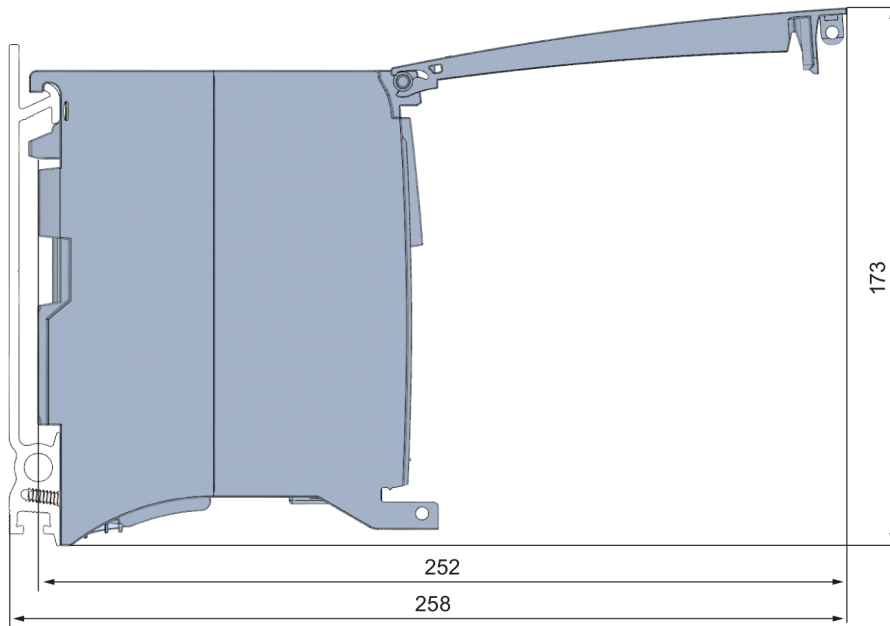**Dimensional drawing of the IM 155-5 DP ST interface module, side view with open front cover**

Figure A-2   Dimensional drawing of the IM 155-5 DP ST interface module, side view with open front cover

Response times

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

B.1 Response times of the ET 200MP

Introduction

The response time of the IM 155-5 DP ST is made up of:

- The minimum slave interval for the IM

plus

- The backplane bus cycle time.

Backplane bus cycle time

The backplane bus cycle time is the time the interface module requires to output new output data, read new input data and then copy it to the PROFIBUS send buffer.

The backplane bus cycle time in µs is made up as follows:

- (amount of output data in bytes) x 1.6958 + 77.786 (rounded)

plus

- (amount of input data in bytes) x 0.3481 + 33.587 (rounded)

plus

- Operating system processing time (500 µs).

Example configuration for the calculation of the backplane bus cycle time

The following are used in the example:

Table B- 1   Example configuration for the calculation of the backplane bus cycle time

I/O module	Output data in bytes	Input data in bytes
Analog output module AQ 4xU/I ST	8	-
Analog output module AQ 4xU/I ST with value status	8	1
Digital output module DQ 32x24VDC/0.5A ST with value status	4	4
Digital input module DI 32x24VDC HF	-	4
Analog input module AI 8xU/I/RTD/TC ST	-	16
Sum	20	25

Example calculation of the backplane bus cycle time

Backplane bus cycle time in µs:

- 20 x 1.6958 + 77.786 = 111.70 ≈ 112 µs (rounded)

plus

- 25 x 0.3481 + 33.587 = 42.289 ≈ 43 µs (rounded)

plus

- Operating system processing time 500 µs

Result of backplane bus cycle time

Backplane bus cycle time = 655 µs

Calculating the response time

It is necessary to differentiate between two cases when calculating the response time of the IM 155-5 DP ST:

- Case 1: The minimum slave interval is greater than / equal to the backplane bus cycle time.

  Then:

  Response time in µs = backplane bus cycle time + minimum slave interval

- Case 2: The minimum slave interval is less than the backplane bus cycle time.

  Then:

  Response time in µs = backplane bus cycle time + (minimum slave interval x backplane bus cycle time / minimum slave interval)).

  If the division backplane cycle time / configured update time does not return an integer without remainder, an additional configured update time must be added next to the integer in the bracket.

Example calculation Case 1: The minimum slave interval is greater than / equal to the backplane bus cycle time.

- Minimum slave interval, for example, 1000 µs
- Backplane bus cycle time = 655 µs

Result of case 1

Response time of the IM 155-5 DP ST = 1000 µs + 655 µs = **1655 µs**

Example calculation Case 2: The minimum slave interval is less than the backplane bus cycle time.

- Minimum slave interval, for example, 500 µs
- Backplane bus cycle time = 655 µs

Result of case 2

Response time of the IM 155-5 DP ST = 655 µs + (500 µs x (655 µs / 500 µs) + 500 µs)) = 655 µs + (500 µs x 1 + 500 µs) = 655 µs + 1000 µs = **1655 µs**