5.3.2 General Information on Slave Diagnostics, Operation with S7/M7 DP Masters (STEP 7) or Other PROFIBUS-DP Masters

Diagnostics with S7/M7 DP Masters

If you operate the ET 200B as a DP slave with a **SIMATIC S7/M7** DP master, the ET 200B modules function like central S7-300 I/O modules.

You read out diagnostics (data records 0 and 1) with SFC 13 ”DPNRM_DG”. For information on requesting diagnostics data, see the manual *STEP 7 Standard and System Functions*.

Diagnostics with Other PROFIBUS-DP Masters

If you operate ET 200B as DP slave with DP masters from Siemens that do not belong to the SIMATIC S5/S7/M7 automation system or with other-vendor DP masters, see the documentation on the DP master for information on how to request slave diagnostics.

Diagnostic Alarm and Process Alarm

The analog modules of ET 200B support the following alarms:

- Diagnostics alarm
- Process alarm

You can evaluate these alarms with an S7/M7 DP master. In the event of an alarm, alarm OBs are automatically run in the CPU (see the programming manual *System Software for S7-300/S7-400, Program Design*).

Note

If you want to evaluate diagnostics alarms and process alarms via the device-related diagnostics with other than PROFIBUS-DP masters, you must bear the following in mind:

- The DP master should be able to store the diagnostics messages, i.e. the diagnostics messages should be placed in a ring buffer in the DP master. If the DP master cannot store diagnostics messages, only the most recently received diagnostics message will be available.
- In your application program you must regularly query the corresponding bits in the device-related diagnostics. With regard to the bus runtime for the PROFIBUS-DP you must allow for the fact that the bits are queried at least once parallel to the bus runtime.

Structure of Slave Diagnostics

The structure of slave diagnostics for operation with S7/M7 DP masters (STEP 7) or other PROFIBUS-DP masters is described in Sections 5.3.3 to 5.3.8.

5.3.3 Structure of Slave Diagnostics

Introduction

A certain number of bytes is reserved per slave for slave diagnostics: the precise number of bytes reserved depends on the station type.

Diagnostics of the ET 200B distributed I/O station is in compliance with EN 50170, Part 3. The basic structure of slave diagnostics is described below.

Digital ET 200B

The figure below shows the structure of slave diagnostics for digital ET 200B modules:

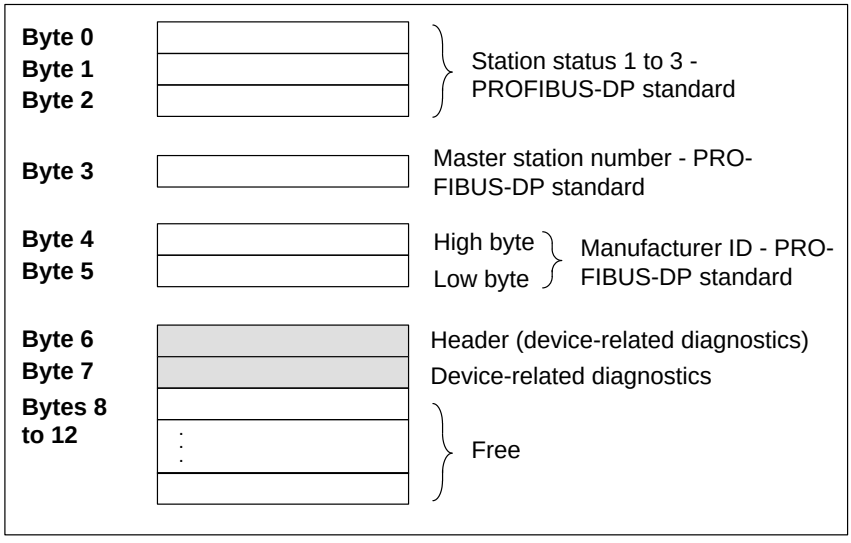

Figure 5-1 Structure of Slave Diagnostics for Digital ET 200B

Analog ET 200B

The figure below shows the structure of slave diagnostics for for analog ET 200B modules:

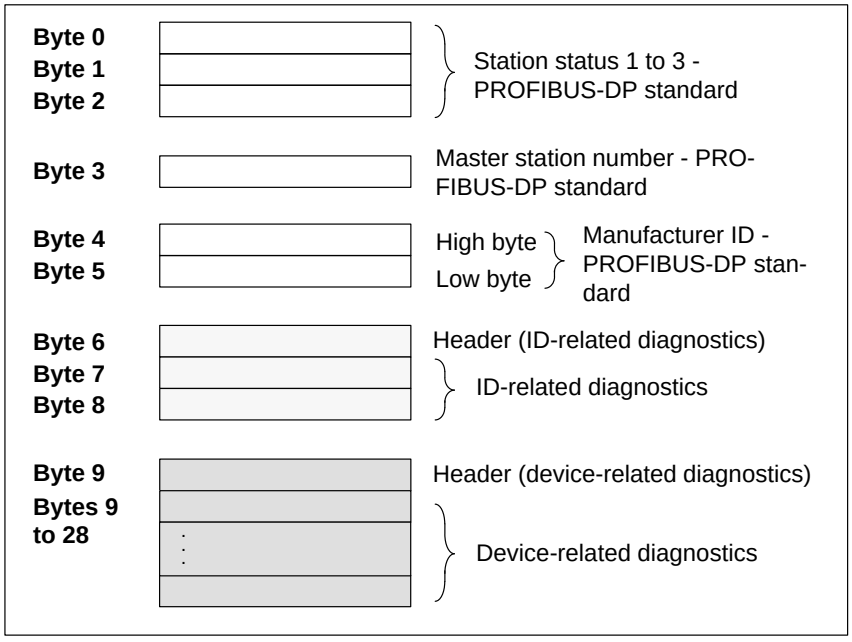

Figure 5-2 Structure of Slave Diagnostics for Analog ET 200B

Requesting Slave Diagnostics

You can request slave diagnostics with the following function blocks:

Table 5-3 Function Blocks for Slave Diagnostics

PLC Family	Number	Name
SIMATIC S5 with IM 308-C	FB 192	FB IM308C
SIMATIC S7/M7	SFC 13	SFC “DPNRM_DG”

5.3.4 Structure of Station Status 1 to 3

Introduction

Station status 1 ... 3 provides an overview of the status of the ET 200B (see Figures 5-1 and 5-2, bytes 0 to 2).

Station Status 1 (Byte 0)

The table below shows the structure of station status 1:

Table 5-4 Structure of Station Status 1 (Byte 0)

Bit	Meaning
0	1: DP slave cannot be addressed by DP master.
1	1: DP slave not yet ready for data exchange.
2	1: Configuration data sent by DP master to DP slave does not match the structure of the DP slave.
3	1: Device-related diagnostics data is waiting.
4	1: Requested function is not supported by DP slave.
5	1: Implausible answer received from DP slave.
6	1: parameterization telegram is errored.
7	1: DP slave was parameterized by a DP master not the DP master which currently has access to the DP slave.

Station Status 2 (Byte 1)

The table below shows the structure of station status 2:

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

Bit	Meaning
0	1: DP slave must be reparameterized.
1	1: A diagnostics message is waiting. The DP slave cannot resume operation until the error has been rectified (static diagnostics message).
2	1: Bit is always ”1” if DP slave having this station number exists.
3	1: Response monitoring is activated for this slave.
4	1: DP slave has received a ”FREEZE” control command.[1]
5	1: DP slave has received a ”SYNC” control command.[1]
6	0: Bit is always ”0”.

Table 5-5 Structure of Station Status 2 (Byte 1), continued

Bit	Meaning
7	1: DP slave is deactivated, i.e. slave has been removed from current processing.

[1] Bit is not updated unless an extra diagnostics message changes.

Station Status 3 (Byte 2)

Station status 3 is reserved and is not relevant as regards diagnostics of the DP slave. Its value is always 00_H.

5.3.5 Structure of the Master Station Number and the Manufacturer ID

Introduction

The ”Master station number” diagnostics byte contains the station number of the DP master which parameterized the ET 200B. The ”Manufacturer ID” diagnostics byte describes the type of the ET 200B.

Master Station Number (Byte 3)

The master station number consists of one byte (see Figures 5-1 and 5-2):

Table 5-6 Structure of the Master Station Number (Byte 3)

Bit	Meaning
0 to 7	Station number of the DP master which parameterized the DP slave and which has read and write access to the DP slave.

Manufacturer ID (Bytes 4, 5)

The manufacturer ID consists of two bytes (see Figures 5-1 and 5-2):

Table 5-7 Structure of the Manufacturer ID (Bytes 4, 5)

Byte 4	Byte 5	Manufacturer ID for	
00_H	01_H	ET 200B-16DI	6ES7 131-0BH00-0XB0
00_H	02_H	ET 200B-16DO	6ES7 132-0BH01-0XB0
00_H	03_H	ET 200B-8RO	6ES7 132-0GF00-0XB0
00_H	04_H	ET 200B-32DI	6ES7 131-0BL00-0XB0
00_H	05_H	ET 200B-16DO/2A	6ES7 131-0BH11-0XB0
00_H	$0A_H$	ET 200B-16DI/16DO	6ES7 133-0BL00-0XB0
00_H	$0B_H$	ET 200B-8DI/8DO	6ES7 133-0BH01-0XB0
00_H	$0C_H$	ET 200B-32DI 0.2ms	6ES7 131-0BL10-0XB0
00_H	$0D_H$	ET 200B-32DO	6ES7 132-0BL01-0XB0
00_H	$0E_H$	ET 200B-24DI/8DO 0.2ms	6ES7 133-0BN11-0XB0
00_H	$0F_H$	ET 200B-24DI/8DO	6ES7 133-0BN01-0XB0
00_H	10_H	ET 200B-8DI/8DO HWA	6ES7 133-0BH10-0XB0
00_H	19_H	ET 200B-16DI-AC	6ES7 131-0HF00-0XB0
00_H	$1A_H$	ET 200B-16DO-AC	6ES7 132-0HF00-0XB0
00_H	$1C_H$	ET 200B-16RO-AC	6ES7 132-0HH00-0XB0
00_H	$1D_H$	ET 200B-8DI/8RO-AC	6ES7 133-0HH00-0XB0
80_H	18_H	ET 200B-4AO	6ES7 135-0HF01-0XB0
80_H	19_H	ET 200B-4AI	6ES7 134-0HF01-0XB0
80_H	$1A_H$	ET 200B-4/8AI	6ES7 134-0KH01-0XB0

5.3.6 Structure of Device-Related Diagnostics (Digital ET 200B)

Introduction

The device-related diagnostics for digital ET 200B modules indicate whether inputs or outputs are defective. The header indicates the length of the device-related diagnostics. (see Figure 5-1, bytes 6 and 7)

Note

Device-related diagnostics requires an ET 200B station with diagnostics capability.

ET 200B stations which do **not** have diagnostics capability have the value "07_H" in the header and the remaining bytes are reserved.

Header (Byte 6)

Digital ET 200B modules have the value 07_H in the "Header (device-related diagnostics)" byte.

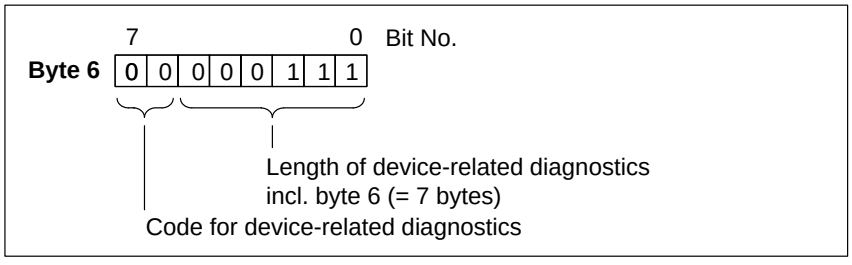

Figure 5-3 Structure of the Header (Device-Related Diagnostics) for Digital ET 200B (Byte 6)

Device-Related Diagnostics (Byte 7)

The device-related diagnostics of digital ET 200B modules with diagnostics capability consists of one byte (see Figure 5-1):

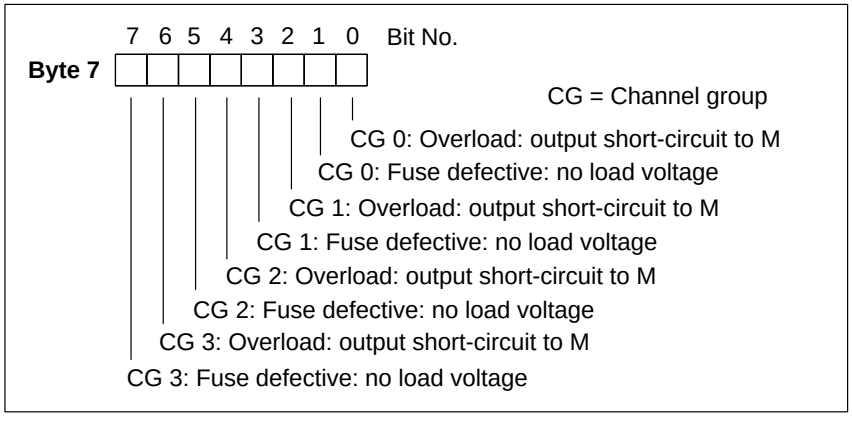

Figure 5-4 Structure of Device-Related Diagnostics for Digital ET 200B (Byte 7)

Channel Group

Note the following as regards evaluation of device-related diagnostics:

Note

The channel group of an ET 200B digital module always takes up one byte in the S5 address space of the CPU (corresponding to 8 inputs or 8 outputs), irrespective of the galvanic isolation of the module (grouping).

Example: ET 200B-16DO/2A (galvanic isolation in groups of 4)

Channel group 0 corresponds to Q0: outputs .0 ... .7.

Potential group 0 corresponds to Q0: outputs .0 ... .3.

5.3.7 Structure of ID-related Diagnostics (Analog ET 200B)

Introduction

ID-related diagnostics shows which module in which slot is defective. The header indicate the length of ID-related diagnostics. (see Figure 5-2, bytes 6 to 8)

Header (Byte 6)

Analog ET 200B modules have the value 43_H in the ”Header (ID-related diagnostics)” byte.

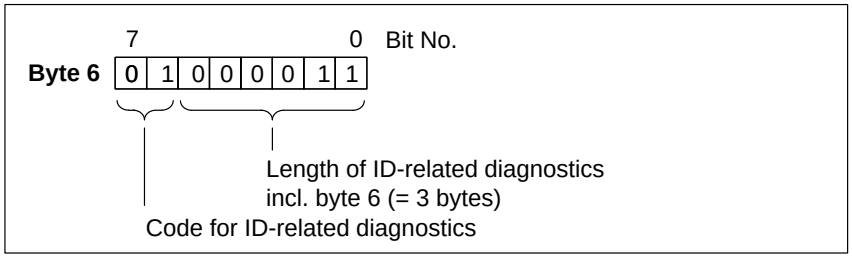

Figure 5-5 Structure of the Header (ID-related Diagnostics) for Analog ET 200B (Byte 6)

ID-related Diagnostics (Bytes 7, 8)

The ID-related diagnostics of analog ET 200B modules consists of two bytes (see Figure 5-2):

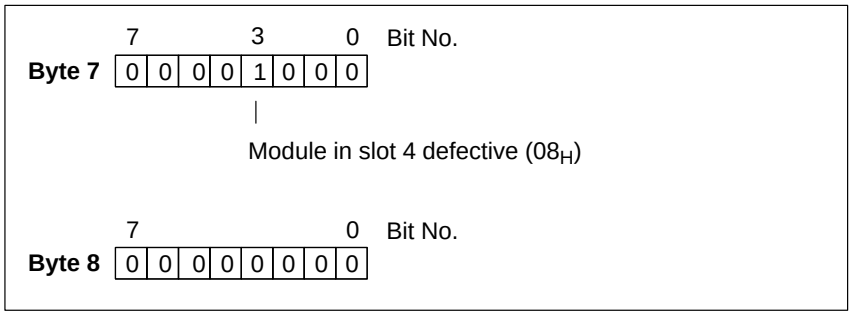

Figure 5-6 Structure of ID-related Diagnostics for Analog ET 200B (Bytes 7, 8)

Note

Irrespective of the configuration of the analog ET 200B module (slots 4 to 11), slot 4 is always flagged as defective in a diagnostics message!

Configuration Error

If a configuration telegram contains an error, only the 3-byte ID-related diagnostics (bytes 6, 7, 8) is returned and **no** device-related diagnostics.

If the configuration telegram contains an error, the structure of ID-related diagnostics is as follows:

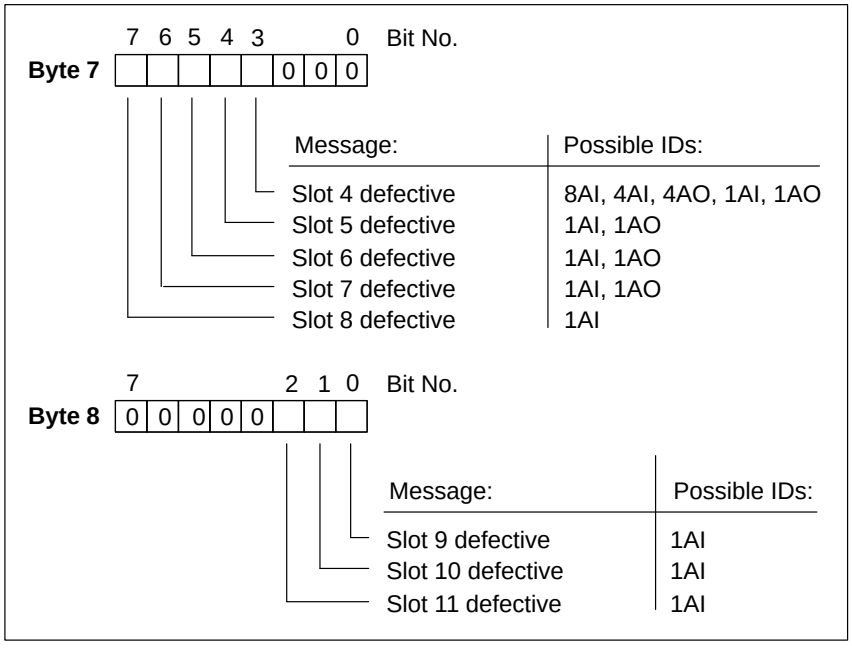

Figure 5-7 Structure of ID-related Diagnostics for Analog ET 200B (Bytes 7, 8) in the Event of an Error in the Configuration Telegram

Note

If there is an error in the configuration telegram, the configured slots of the analog ET 200B module the configurations of which are errored are shown.

If the error in the configuration telegram is general (e.g. wrong length), the value FF_H is returned for bytes 7 and 8.

5.3.8 Structure of Device-Related Diagnostics (Analog ET 200B)

Introduction

The device-related diagnostics for an analog ET 200B shows you the error reported by the ET 200B. The header indicates the length of device-related diagnostics. (see Figure 5-2, bytes 9 to 28)

Note

Chapter 8 contains a discussion of ”Supplementary Bits” in the section dealing with analog value representation: these bits contain additional diagnostics information.

The structure of the device-related diagnostics for configuration of analog modules with the latest type file version **SIxxxxBE.200** is described below. If you configure with the type file SIxxxxAE.200, please turn to Appendix E.2.

Header (Byte 9)

The analog ET 200B modules contain the following information in the ”Header (device-related diagnostics)” byte:

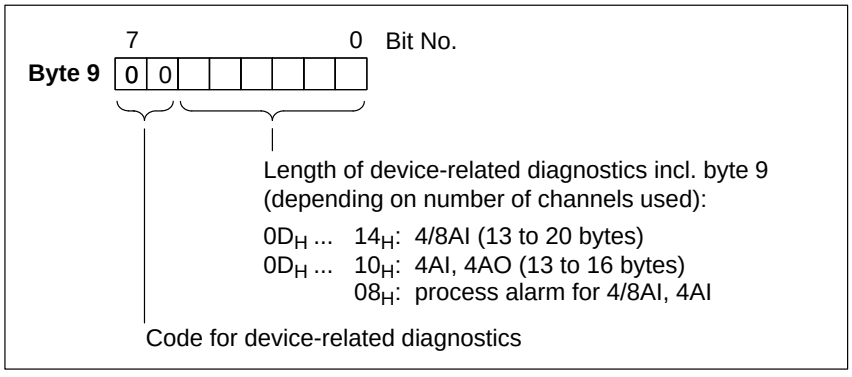

Figure 5-8 Structure of the Header (Device-Related Diagnostics) for Analog ET 200B (Byte 9)

Device-Related Diagnostics

Device-related diagnostics of the analog ET 200B modules comprises a maximum of 19 bytes:

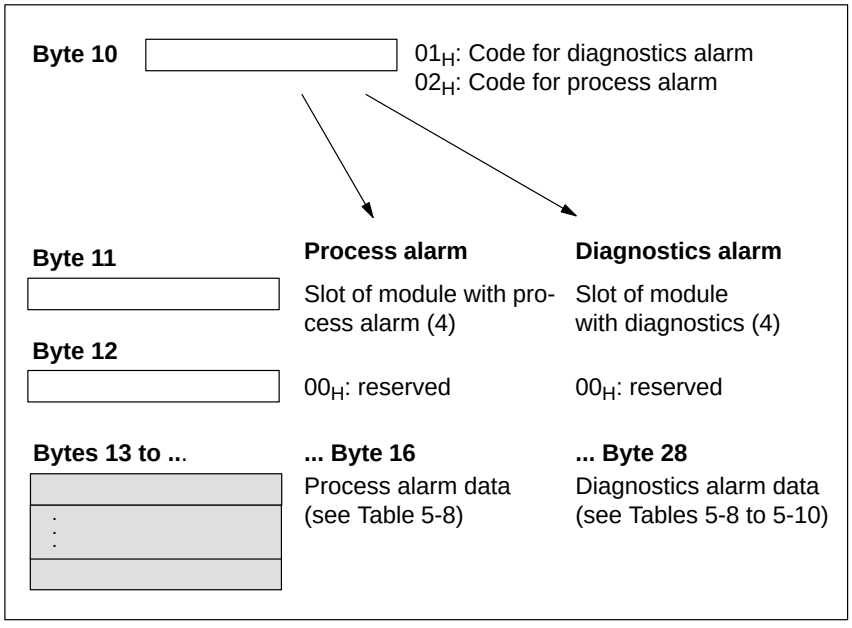

Figure 5-9 Structure of Device-Related Diagnostics for Analog ET 200B (Bytes 10 to 28)

Bytes 13 to 16

Table 5-8 shows the structure and contents of bytes 13 to 16.

Table 5-8 Bytes 13 to 16 for Diagnostics and Process Alarms

Byte	Bit	Byte 10 = 01_H (Diagnostics Alarm)	Byte 10 = 02_H (Process Alarm)		
13 (→ Tab. 5-9)	0	Module defect	Channel 0	Upper limit value overshoot (4/8AI, 4AI)	FF_H: End-of-cycle alarm (4/8AI)
	1	Internal error	Channel 1	Upper limit value overshoot (4/8AI[1])	
	2	External error	Channel 2	Upper limit value overshoot (4/8AI[1], 4AI)	
	3	Channel error	Channel 3	Reserved	
	4	Reserved	Channel 4	Reserved	
	5	Reserved	Channel 5	Reserved	
	6	Parameterization missing	Channel 6	Reserved	
	7	Incorrect parameters in module	Channel 7	Reserved	

1 For the ET 200B-4/8AI, only the combination of single channel addressing **and** parameterization of channel group 0 for resistance measurement (Pt 100, Ni 100, R) entails display of "Upper/lower limit value overshoot" for channel 1. In all other cases (i.e. module addressing and single channel addressing **and** parameterization of channel group 0 for other than resistance measurement (Pt 100, Ni 100, R), "Upper/lower limit value overshoot" is displayed for channel 2.

Table 5-8 Bytes 13 to 16 for Diagnostics and Process Alarms, continued

Byte	Bit	Byte 10 = 01_H (Diagnostics Alarm)			Byte 10 = 02_H (Process Alarm)		
14	0 to 3	Module class	0101	Analog module	Channel 0	Lower limit value overshoot (4/8AI, 4AI)	00_H: Reserved
					Channel 1	Lower limit value overshoot (4/8AI[1])	
					Channel 2	Lower limit value overshoot (4/8AI[1], 4AI)	
					Channel 3	Reserved	
	4	Channel information available			Channel 4	Reserved	
	5	Reserved			Channel 5	Reserved	
	6	Reserved			Channel 6	Reserved	
	7	Reserved			Channel 7	Reserved	
15	0	Wrong ET 200B station type			00_H: Reserved		00_H: Reserved
	1	Reserved					
	2	Reserved					
	3	Reserved					
	4	Reserved					
	5	Reserved					
	6	Reserved					
	7	Reserved					
16	0	Reserved			00_H: Reserved		00_H: Reserved
	1	Reserved					
	2	EPROM error (4AI)					
	3	Reserved					
	4	ADC/DAC error (4AO)					
	5	Reserved					
	6	Process alarm lost (4/8AI, 4AI)					
	7	Reserved					

Possible Values, Byte 13

In a diagnostics alarm the possible values of byte 13 are as follows:

Table 5-9 Possible Values for Byte 13 in Diagnostics Alarm

Value	Bit 3	Bit 2	Bit 1	Bit 0	Meaning
00_H	0	0	0	0	No error
03_H (83_H)	0	0	1	1	Internal error, no channel error; (incorrect parameters in the module)
$0B_H$ ($8B_H$)	1	0	1	1	Internal error, channel error; (incorrect parameters in the module)
$0D_H$	1	1	0	1	External error, channel error
$0F_H$ ($8F_H$)	1	1	1	1	Summation error of all above errors; (incorrect parameters in the module)

Bytes 17 to 28 (Diagnostics Alarm)

Table 5-10 shows the structure and contents of bytes 17 to 28 (for diagnostics alarm only).

Table 5-10 Bytes 17 to 28 for Diagnostics Alarm

Byte	Bit	Meaning	Remark	
17	0 to 7	Channel type	71_H 73_H	4/8AI, 4AI 4AO
18	0 to 7	Number of diagnostics bits output per channel by a module.	08_H	4/8AI, 4AI, 4AO
19	0 to 7	Number of channels of a module.	01_H to 04_H 01_H to 08_H	4AI, 4AO 4/8AI
20	**Channel error vector:**			
	0	Channel error, channel 0	4/8AI, 4AI, 4AO	
	1	Channel error, channel 1	4/8AI, 4AI, 4AO	
	2	Channel error, channel 2	4/8AI, 4AI, 4AO	
	3	Channel error, channel 3	4/8AI, 4AI, 4AO	
	4	Channel error, channel 4	4/8AI	
	5	Channel error, channel 5	4/8AI	
	6	Channel error, channel 6	4/8AI	
	7	Channel error, channel 7	4/8AI	
21 to 28[1]	-	Channel-specific errors	See Table 5-11	

[1] The number of bytes depends on the number of channels in the module.

Analog Channel

Table 5-11 shows the assignment of the diagnostics byte for an analog input or analog output channel.

Table 5-11 Diagnostics Byte for an Analog Input/Analog Output Channel

Byte	Bit	Analog Input Channel (4/8AI, 4AI)	Analog Output Channel (4AO)
≧ 21	0	Configuration/parameterization error	
	1	Common-mode error (4/8AI only)	”0” (reserved)
	2	”0” (reserved)	
	3	”0” (reserved)	Ground short-circuit
	4	Wire-break/feed-current monitoring: meas. transducer/Pt 100/Ni 100/R[1]	
	5	”0” (reserved)	”0” (reserved)
	6	Measuring range overshoot	”0” (reserved)
	7	Measuring range overshoot	”0” (reserved)

[1] In the case of the ET 200B-4/8AI, a ”wire break” error is superimposed on common-mode and measuring-range errors occurring at the same time (common-mode and measuring-range errors are not signaled).