SIEMENS

SIMATIC

ET 200S distributed I/O IM151-1 FO STANDARD interface module (6ES7151-1AB05-0AB0)

Manual

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Order numbers A

02/2010
A5E01075965-03

Properties

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Properties

The IM151-1 FO STANDARD interface module has the following features:

- It connects the ET 200S with PROFIBUS DP via the fiber-optic interface.
- Connectable fiber optic cables made from plastic optical fibers (POF) or plastic-coated fibers (PCF)
- On SIMATIC S7 (in DPV1 mode), the maximum parameter length is 240 bytes per slot.
- The maximum address space is 244 bytes for inputs and 244 bytes for outputs.
- Operation as a DPV0 or DPV1 slave
- A maximum of 63 modules can be operated with the IM151-1 FO STANDARD.
- The maximum bus length is 2 m.
- It supports option handling and the status byte for power modules.
- Firmware update over PROFIBUS DP with STEP 7
- Identification data (with DS248 or DS255)
- Direct data exchange (publisher)

The IM151-1 FO STANDARD interface module (6ES7151-1AB05-0AB0) replaces the predecessor interface modules 6ES7151-1AB02-0AB0.

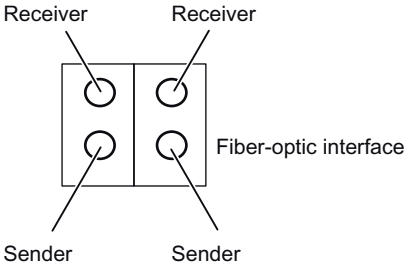
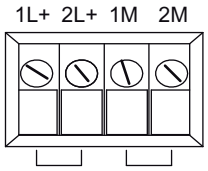
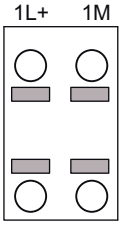
Installation constraints

For every 2DO 24 to 230 V AC electronic module used, the number of connectable I/O modules in this station is reduced by one.

Terminal assignment

The following table shows the terminal assignment of the IM151-1 FO STANDARD interface module for the 24 VDC voltage supply and PROFIBUS DP with fiber-optic interface:

Table 1- 1 Terminal assignment of the IM151-1 FO STANDARD interface module

View	Signal name	Name
		
to 6ES7151-1AB02-0AB0  as of 6ES7151-1AB05-0AB0 	1 L+ 2 L+ 1 M 2 M	24 VDC (for loop through) Chassis ground (for loop through)

Block diagram

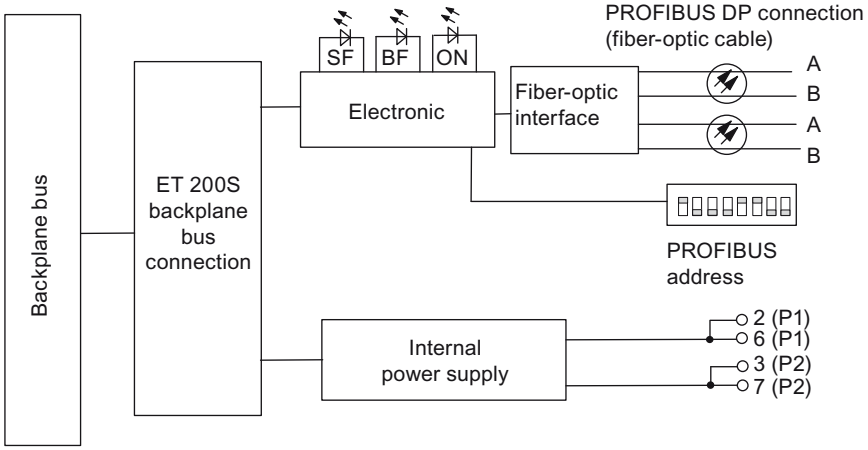


Figure 1-1 Block diagram for the IM151-1 FO STANDARD interface module

Technical data for IM151-1 FO STANDARD (6ES7151-1AB05-0AB0)

Dimensions and weight	
Dimension B (mm)	45
Weight	Approx. 150 g
Module-specific data	
Data transmission rate	9.6; 19.2; 45.45; 93.75; 187.5; 500 kBaud, 1.5;12 Mbit/s
Bus protocol	PROFIBUS DP
Interface	Fiber-optic cable
SYNC capability	yes
FREEZE capability	yes
Manufacturer ID	$806B_H$
Direct data exchange	yes
Cycle synchronization	No
Parameter length	27 bytes
Address space	244 bytes I/O
Option handling	
• With reserve module	Yes
• Without reserve module	yes
I&M data	yes
Firmware update	via PROFIBUS DP with STEP7
Voltages, currents, potentials	
Rated supply voltage of the electronic components (1L+)	24 VDC
• Incorrect polarity protection	yes
• Power failure bypass	Min. 20 ms
Galvanic isolation	
• Between the backplane bus and electronic components	No
• Between the supply voltage and electronic components	No
Permitted potential difference (to the rail)	75 V DC, 60 V AC
Insulation tested with	500 VDC
Current consumption from rated supply voltage (1L+)	Approx. 200 mA
Power dissipation of the module	Typically 3.3 W
Status, interrupts, diagnostics	
Interrupts	yes
Diagnostic function	yes
• Group error	Red "SF" LED
• PROFIBUS DP bus monitoring	Red "BF" LED
• Monitoring of the power supply voltage of the electronics	Green "ON" LED

Acyclic data traffic class 2 services (PG/OP)

The interface module IM 151-1 FO STANDARD supports 3 connections via class 2 services (PG/ OP).

Updating the firmware of the IM151-1 FO STANDARD

The IM151-1 FO STANDARD firmware can be updated starting with *STEP 7* V5.4 (via accessible nodes).

To update the firmware, you receive the *.UPD files containing the current firmware.

The following requirements must be satisfied:

- The IM151-1 FO STANDARD in the station whose firmware is to be updated must be accessible online.
- The files with the current firmware version must be available in the file system of your programming device or PC.

Information regarding the method of procedure can be found in the *STEP 7* online help.

Note

Make sure to use the correct firmware version for the interface module in use during the update process. An interface module with an older order number cannot be updated with the firmware version for an interface module with a more recent order number and vise versa.

Configuration with more than 244 bytes of parameter data

For configurations with *STEP 7* V5.4, it is possible to operate the IM151-1 FO STANDARD from 6ES7151-1AB05-0AB0 in DPV1 mode with more than 244 bytes of parameter data. A configuration based on the GSD file does not offer this possibility.

Note

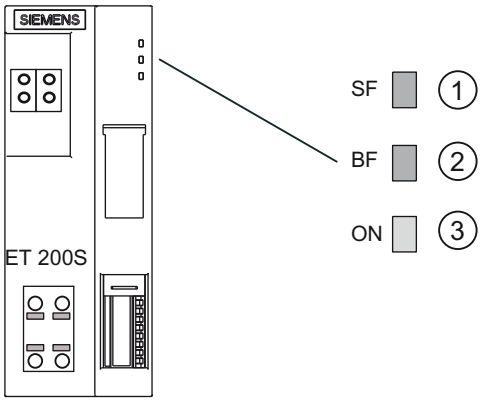
If the parameter length is greater than 244 bytes, an increase in the station startup time is to be expected.

Error and system messages

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4.1 LED displays on the interface module

LED display



① Group error (red)
② Bus fault (red)
③ Supply voltage (green)

Status and error displays

Table 4- 1 Status and error messages of the IM151-1 FO STANDARD

Event (LEDs)			Cause	Remedy
SF	BF	ON		
Off	Off	Off	There is no voltage at the interface module, or the interface module has a hardware defect.	Switch on the 24 V DC supply voltage at the interface module.
*	*	On	There is voltage at the interface module.	---
*	Flashing	On	The interface module is not configured or is configured incorrectly. No data exchange is taking place between the DP master and the interface module. Causes: • The PROFIBUS address is incorrect. • Configuration error • Parameter assignment error	• Check the interface module. • Check the configuration and parameter assignment. • Check the PROFIBUS address.

Event (LEDs)			Cause	Remedy
SF	**BF**	**ON**		
*	On	On	Transmission rate detection, illegal PROFIBUS address, or bottom DIP switch (PROFIBUS address) not in the OFF position. Causes: • The response monitoring interval has elapsed. • Bus communication to the interface module via PROFIBUS DP is interrupted.	Set a valid PROFIBUS address (1 to 125) on the interface module or check the bus configuration. • Check that the bus connector is correctly inserted. • Check whether the connecting cable to the DP master has been disconnected. • Switch the 24 V DC supply voltage on and off again at the interface module.
On	*	On	Parameter "Operation with preset <> actual configuration" enabled: The configured structure of the ET 200S does not match the actual structure of the ET 200S. Parameter "Operation with preset <> actual configuration" disabled: See *LED display of the configuration and parameter assignment errors*	Check the structure of the ET 200S for missing or defective modules or whether an unconfigured module is inserted. Check the configuration (using COM PROFIBUS or STEP 7, for example) and correct the parameter assignment error.
			There is an error in an I/O module, or the interface module is defective.	Replace the interface module, or contact your Siemens representative.
Off	Off	On	Data exchange is taking place between the DP master and the ET 200S. The set configuration and actual configuration of the ET 200S match.	---
* Not relevant				

LED display of the configuration and parameter assignment errors

Properties

The configuration and parameter assignment errors of the ET 200S distributed I/O system are output at the interface module by means of the LEDs group error **SF** (red) and bus error **BF** (red).

Prerequisites

For the IM151-1 FO STANDARD, the function is available as of order number 6ES7151-1AB05-0AB0:

Operating principle

The information about the cause of the problem is determined by means of the LED fault display. After an announcement by means of a flashing signal, the respective error type and after that the error location / error code are displayed.

The LED fault display of the configuration and parameter assignment errors

- Is activated both during POWER ON and during operation.
- Takes precedence over all other states that are displayed by the SF and BF LED.
- Remains activated until the cause of the problem has been eliminated.

After a change in the ET 200S configuration, a POWER-OFF / POWER ON may be required at the interface module.

Sequence		Description
1	LEDs SF and BF flash 3x at 0.5 Hz	Announcement of error type
2	LED BF flashes at 1 Hz	Display of the error type (decimal)
3	LEDs SF and BF flash 3x at 2 Hz	Announcement of the error location / error code
4	LED SF flashes at 1 Hz	Display of the decade (decimal) of the error location / error code
5	LED BF flashes at 1 Hz	Display of the unit position (decimal) of the error location / error code
6	Repetition of 1 - 5 until the cause of the problem has been eliminated.	

Error code

Error type (BF)	Error location (SF/BF)	Cause	Remedy
1	01 to 63 (slot)	**Communication interruption** Displays the first slot at which no I/O module is recognized. • Missing I/O module during POWER ON or several I/O modules are missing during operation. • Interruptions at the rear panel bus • Short-circuit at the rear panel bus ("01" is output as the slot) • Terminating module missing If the termination module is missing, the number of inserted I/O modules + 1 is output (if there is no set configuration)	Check the configuration of the ET 200S.
2	01 to 63 (slot)	**Termination module not recognized** This error type is output if there is a set configuration and the slot at which an I/O module is no longer recognized is equal to (number of modules of the set configuration +1).	Mount the terminating module.
3	01 to 63 (slot)	**I/O module** The configured structure of the ET 200S does not match the actual structure of the ET 200S. The first slot that displays a configuration error (missing module, incorrect module module fault) is displayed. This error is only output if the parameter "Operation at preset <> actual configuration" is locked.	Check the structure or the configuration of the ET 200S, whether a module is missing or defective, or whether an unconfigured module has been inserted.

The following errors can only occur if you have configured the ET 200S at a master from a different supplier or by using the GSD file:

Error type (BF)	Error location, error code (SF/BF)	Cause	Remedy
4	01	**Configuration error at the option handling** Option handling has been configured but no power module was configured for options handling.	Change the configuration.
	02 to 63 (slot)	Option handling has been configured but more than one power module was configured for options handling. The slot of the second power module that has option handling is displayed.	
5 [1]	01	**General parameter assignment error** The number of module parameter blocks in the parameter assignment telegram does not agree with the number of identifiers in the configuration telegram.	Correct the configuration.
	02	The maximum address area (inputs and outputs) of the interface module has been exceeded.	
	03	Incorrect structure of the parameter assignment telegram.	

[1] You prevent this error when configuration is carried out with STEP 7 and it is only possible if other configuration tools are used.

See also

Incorrect module configurations of ET 200S on the PROFIBUS DP (Page 55)

Service & support (http://www.siemens.com/automation/service&support)

4.2 Process interrupt lost

"Process interrupt lost" Diagnostics

Modules with a controller use the "Process interrupt lost" diagnostics.

The "Process interrupt lost" diagnostics are not currently available for the 2DI 24 V DC High Feature and 4DI 24 V DC High Feature modules.

Note

Process interrupts should not be used for technological purposes (e.g. cyclical generation of process interrupts).

If more than approximately 90 process interrupts are generated per second, process interrupts may be lost.

4.3 Diagnostic messages of the electronic modules

Actions following a diagnostic message in DPV0 mode

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

- The SF LED of the interface module lights up.
- Several diagnostic messages can be output simultaneously.
- OB 82 is called. If OB82 is not available, the CPU goes into STOP.

Actions Following a Diagnostic Message in DPV1 mode

Each diagnostic message triggers the following actions:

- Diagnostics can be reported as diagnostic interrupts in DPV1 mode.
- A diagnostic message is
  - Entered in the diagnostic frame as a diagnostic interrupt block (always limited to one interrupt)
  - Written to the diagnostic buffer of the CPU
- The SF LED of the interface module lights up.
- OB 82 is called. If OB82 is not available, the CPU goes into STOP.
- Acknowledgment of the diagnostic interrupt (thereafter a new interrupt is possible).

4.4 Diagnostics with STEP 7

4.4.1 Diagnostics readout

Introduction

The slave diagnostics comply with IEC 61784-1:2002 Ed1 CP 3/1. Depending on the DP master, slave diagnostics can be read out with *STEP 7* for all DP slaves that comply with the standard.

Length of the diagnostics frame

- The maximum frame length for the ET 200S is as follows:
  - IM151-1 FO STANDARD (DPV0 mode): 62 bytes
  - IM151-1 FO STANDARD (DPV1 mode): 110 bytes
- The minimum frame length is
  - 6 bytes (identifier-related diagnostics, module status, and channel-specific diagnostics disabled via parameter assignment).

Options for reading out the diagnostics

The table below shows the options for reading out the diagnostics with *STEP 7* on PROFIBUS DP.

Table 4- 2 Reading out the diagnostics with STEP 7 on PROFIBUS DP

Automation system with DP master	Block or tab in *STEP 7*	Application	Reference
SIMATIC S7/M7	"DP Slave Diagnostics" tab	Slave diagnostics in plain text on the STEP 7 user interface	"Diagnosing hardware" in *STEP 7* Online Help
	SFC 13 "DP NRM_DG"	Reading out slave diagnostics (store in the data area of the user program)	SFC see *STEP 7 Online Help*
	SFC 59 "RD_REC"	Reading out S7 diagnostic data records (save to the data area of the user program)	See "System and Standard Functions" Reference Manual
	SFB 52 "RDREC"	Reading data records from the DP slave	SFB see *STEP 7 online help* (system functions/-function blocks)
	SFB 54 "RALRM"[1]	Receiving interrupts from interrupt OBs	SFB see *STEP 7 online help* (system functions/-function blocks)
[1] only for S7-400 from V3.0 and CPU 318 from V3.0			

Example of reading out S7 diagnostics using SFC 13 "DP NRM_DG"

Here, you will find an example of how to use SFC 13 to read out the slave diagnostics for a DP slave in the STEP 7 user program.

For the purpose of this STEP 7 user program, the following is assumed:

- The diagnostic address of the ET 200S is 1022 ($3FE_H$).
- The slave diagnostics are to be stored in DB 82: Starting from address 0.0, length = 64 bytes.
- The slave diagnostics consist of a maximum of 64 bytes (IM151-1 FO STANDARD in DPV0 mode).

STEP 7 user program

STL		Description
CALL SFC 13		
REQ	:=TRUE	Read request
LADDR	:=W#16#3FE	Diagnostic address of the ET 200S
RET_VAL	:=MW0	RET_VAL of SFC 13
RECORD	:=P#DB82.DBX 0.0 BYTE 64	Data record for the diagnostics in DB 82
BUSY	:=M2.0	The read process runs through several OB 1 cycles

4.4.9 Incorrect module configurations of ET 200S on the PROFIBUS DP

Invalid module configuration states

The following invalid ET 200S module configuration states lead to an ET 200S station failure or prevent entry into data exchange. These responses occur regardless of whether the IM parameters "Operation at set <> actual configuration", "Replace modules during operation", and "Startup at set <> actual configuration" have been enabled.

- Two missing modules
- Terminating module missing
- Number of modules exceeds maximum configuration
- Backplane bus fault (for example, defective terminal module)

Note

The station will not start up if **one** module is missing (gap) and the ET 200S is switched on.

Diagnostics

You can identify any invalid module configuration states on the basis of the following diagnostics:

Identifier-related diagnostics	Module status
All 63 bits set	• 01_B: "Module error; invalid user data" for all modules (slots) until the cause of the error is found • 11_B: "No module; invalid user data" once the cause of the error is found

See also

LED displays on the interface module (Page 33)

4.4.10 DP slave failure

DP slave failure

DP slave failure means data exchange will stop and user data (inputs and outputs) will no longer be exchanged between DP master and DP slave.

Events

A DP slave failure can be triggered by the following events:

- Events from the DP master: e.g. when loading a new configuration, in case of a connection interruption or if the device is switched off
- Events from the DP slave ("DP slave failure"): e.g. wrong disassemble conditions (Page 55)

The DP slave still works and communicates, which means it delivers diagnostics, reacts to events of the I/O modules and can process data records. The cause for the DP slave failure can be determined based on the diagnostics.

4.5 Evaluating the interrupts of the ET 200S

Introduction

In the case of certain process states/errors, the DP slave saves one interrupt block for each process state or error, containing the relevant information, in the diagnostic frame (DPV1 interrupt mechanism). Regardless of this, the diagnostic status of the DP slave is tracked in the identifier-related diagnostics, the module status, and the channel-specific diagnostics.

Interrupts in DPV0 mode

For DPV0 mode, no interrupts are defined in accordance with the PROFIBUS standard. This means that interface modules do not trigger an interrupt in DPV0 mode.

Interrupts in DPV1 mode

The ET 200S supports the following interrupts:

- Diagnostic interrupts
- Process interrupts
- Remove/insert module interrupts

Requirements: Interrupts are only supported when you run the ET 200S with IM151-1 FO STANDARD interface modules (6ES7151-1AB05-0AB0 or higher) in DPV1 mode.

In the event of an interrupt, interrupt OBs are automatically executed in the CPU of the DP master (see information on Program design in the System Software for S7-300/S7-400 Programming Manual (http://support.automation.siemens.com/WW/view/en/1136533)).