Advantys FTB PROFIBUS IP67 Monobloc I/O Splitter box User guide

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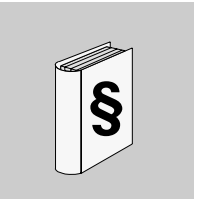
Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation, which, if not avoided, **will result** in death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

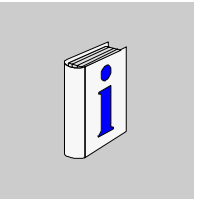
⚠ CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

About the Book



At a Glance

Document Scope

This user guide contains the information required to install an Advantys FTB PROFIBUS monobloc I/O splitter box.

It has been designed to facilitate a rapid familiarization with the system, while optimizing the system's features with the most advanced technology available.

Installing the splitter box requires prior knowledge of the relevant communication protocol and should only be carried out by qualified personnel. Special points and warnings regarding safety are highlighted in the different chapters.

The early chapters provide information for designers and installers on installing the mechanical and electrical elements of the system.

The following chapters, from the section on "Network interface", are specific to the communication protocol. They contain information on specific wiring for the network interface and all information necessary for the software application programmer, and for the end user (diagnostics).

Chapter	Subject covered
Introduction	General presentation of system components
Installation	Dimensions Safe practice for installation
Electrical characteristics and wiring of splitter boxes	Physical and electrical characteristics Wiring information
PROFIBUS network interface	Wiring the splitter box on the network Reminder on the communication protocol
Application functions	I/O and diagnostic channels operation
Software installation	Help for installing the Advantys FTB splitter boxes
Diagnostics	Analysis of the diagnostics display by LED or software
Glossary	Definition of terms and abbreviations used.

Related Documents

Title of Documentation	Reference Number
Instruction sheet	1693626

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

Introduction

1

Presentation

Introduction

This chapter provides a general presentation of the FTB splitter box range.

What's in this Chapter?

This chapter contains the following topics:

Presentation of the FTB I/O Splitter Box Range

The FTB Product Range

The FTB range offers a set of splitter boxes for the following field bus:

- CANopen
- DeviceNet
- PROFIBUS
- InterBus

The Different Units

The FTB splitter boxes are available with a plastic or metal unit (excluding the InterBus).

Configurable Connectors

Each FTB splitter box contains eight connectors for connecting sensors and actuators.

Each of these connectors supports two channels. Depending on the splitter box reference, each channel is either:

- an input channel,
- an output channel,
- a diagnostics channel.

Splitter boxes Inputs and Outputs

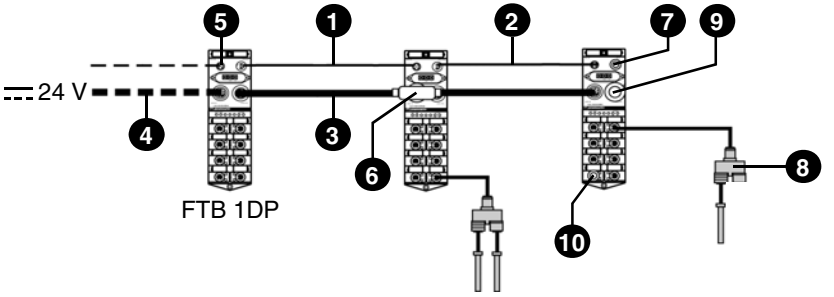
The configuration of the I/O connector channels depends on the model. The table below shows the I/O connector channels available for each model:

Distribution of available inputs/outputs	Unit type	Product reference
8 input / diagnostics channels + 8 output channels	Plastic	FTB 1••08E08SP•
4 input channels + 4 output channels + 8 input / diagnostics channels	Plastic	FTB 1••12E04SP•
8 input channels + 8 input / diagnostics channels	• Plastic • Metal	FTB 1••16E••
8 input / output channels + 8 input / output / diagnostics channels	• Plastic • Metal	FTB 1••16C••
8 input channels + 8 input / output / diagnostics channels	Metal	FTB 1••08E08CM•

Overview of the Accessories Range

Cables for Connecting the Bus to the Splitter Box

Different cables can be used to connect the splitter box to the field bus and power supply. These are available in different lengths.



Item	Reference	Function
1	FTX DP1203 FTX DP1206 FTX DP1210 FTX DP1220 FTX DP1230 FTX DP1250	Cables fitted with 2 M12,-type straight connectors, 5 pins, at both ends for connecting the bus between two splitter boxes. Available lengths: 0.3 m, 0.6 m, 1 m, 2 m, 3 m and 5 m *(0.98 ft, 1.97 ft, 3.28 ft, 6.56 ft, 9.84 ft, 16.4 ft)*.
2	FTX DP3203 FTX DP3206 FTX DP3210 FTX DP3220 FTX DP3230 FTX DP3250	Cables fitted with 2 M12-type elbow connectors, 5 pins, at both ends for connecting the bus between two splitter boxes. Available lengths: 0.3 m, 0.6 m, 1 m, 2 m, 3 m and 5 m *(0.98 ft, 1.97 ft, 3.28 ft, 6.56 ft, 9.84 ft, 16.4 ft)*.
3	FTX DP2206 FTX DP2210 FTX DP2220 FTX DP2250	Cables fitted with 2 7/8-type connectors, 5 pins, at both ends for daisy-chaining 24 VDC supplies to two splitter boxes. Available lengths: 0.6 m, 1 m, 2 m and 5 m *(1.97 ft, 3.28 ft, 6.56 ft, 16.4 ft)*.
4	FTX DP2115 FTX DP2130 FTX DP2150	Cables fitted with 1 7/8-type connector, 5 pins, with one free end and the other for connecting 24 VDC supplies. Available lengths: 1.5 m, 3 m and 5 m *(4.92 ft, 9.84 ft, 16.4 ft)*.
5	FTX DP12M5 FTX DP12F5	Male and female M12,-type connectors, 5 pins, for PROFIBUS bus cables (encoding B).
6	FTX CNCT1	T-connector fitted with 2 7/8-type connectors, 5 pins, for power supply cables.
7	FTX DPTL12	Line terminators fitted with an M12-type connector.
8	FTX CY1208 FTX CY1212	Y-connector for connecting 2 M8-type connectors to the M12 connector of the splitter box. Y-connector for connecting 2 M12-type connectors to the M12 connector of the splitter box.

Item	Reference	Function
9	FTX C78B	Sealing plugs for 7/8-type connectors.
10	FTX CM12B	Sealing plugs for M12-type connectors.

Installation

2

Presentation

Introduction

This chapter provides all required information for installing an FTB splitter box on a field bus.

Note: The graphic representations of the splitter boxes in this chapter may not correspond to those really used. However, the dimensions are exact whatever the case.

What's in this Chapter?

This chapter contains the following topics:

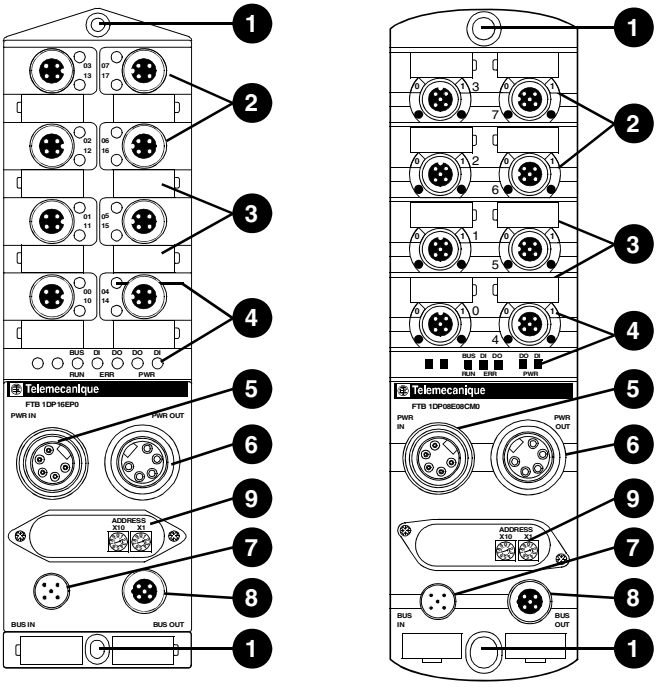
Overview

Introduction

This section gives a detailed technical description of the Advantys FTB PROFIBUS splitter box.

Description

The illustrations below show the plastic units (left) and metal units (right) of the Advantys FTB splitter box.



Item	Function
1	Mounting holes
2	M12 connector for the inputs and outputs
3	Label
4	Display elements (diagnostics and status LED)
5	Power supply connectors (PWR IN)
6	Power supply distribution connector (PWR OUT)
7	Bus connector (BUS IN)
8	Bus connector (BUS OUT)
9	Transmission speed and addressing rotary selector switch

Installing the Unit

Introduction

This section gives a detailed technical description of Advantys FTB splitter boxes.

Description

The Advantys FTB splitter box can be mounted directly onto a wall or a machine. Two mounting holes have been provided for this purpose inside the splitter box.

Note: When mounting the unit, the support must be flat and smooth so as to prevent any undue stress on the unit, which may lead to a loss of sealing.

Types of Screws and Tightening Torques

Plastic unit

The plastic splitter box is mounted using two 4 mm *(0.16 in.)* diameter screws and two washers. The tightening torque is 1.5 Nm *(13.3 lb-in)*.

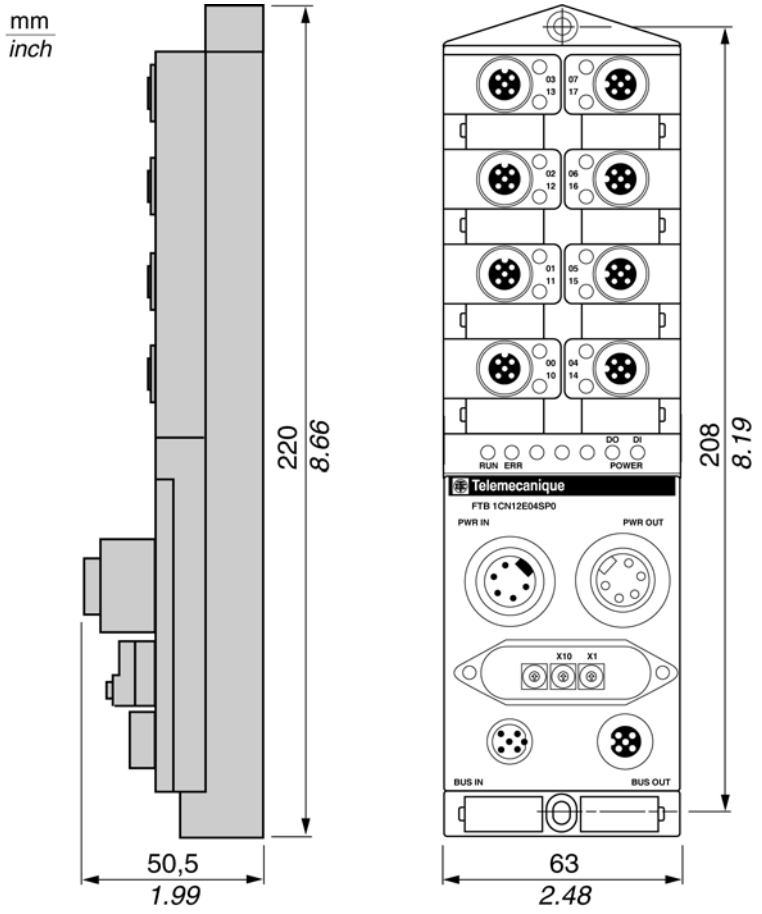
Metal unit

The metal splitter box is mounted using two 6 mm *(0.24 in.)* diameter screws and two washers. The tightening torque is 9 Nm *(79.7 lb-in)*.

Note: For metal units, wire the ground terminal before attaching the splitter box to its support. See *Grounding of the Advantys FTB Splitter Box, p. 19*.

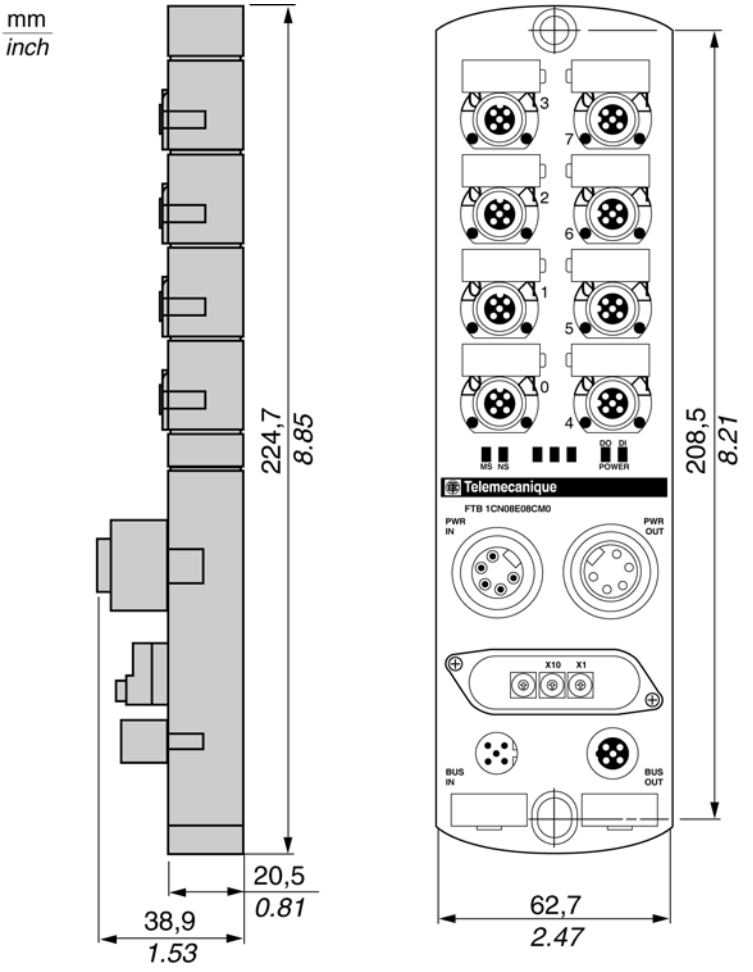
Plastic Unit Dimensions

The dimensions of the plastic unit (front and side views) are given in the following illustrations:



Metal Unit Dimensions

The dimensions of the metal unit (front and side views) are given in the following illustrations:



Method

Follow the steps below:

Step	Action
1	Position the splitter box on the support.
2	Mount the splitter box using the screws and washers.

⚠ WARNING

RISK OF NON-COMPLIANCE WITH IP67

For IP67 protection:

- Properly fit all connectors with cables or sealing plugs and tighten.
- Install cover onto splitter box and tighten captive screws to specified torque.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Grounding of the Advantys FTB Splitter Box

Description

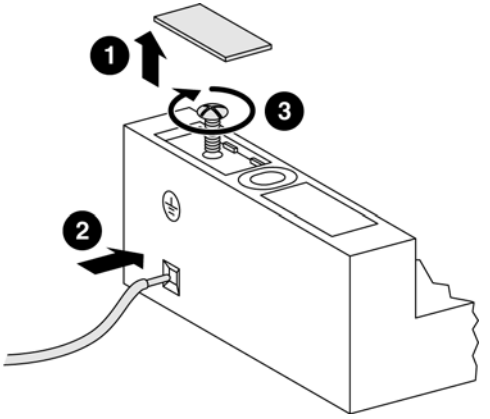
The ground connection is connected internally to the M12 connector of the field bus connector.

If the unit is not grounded properly, it will be sensitive to electromagnetic disturbances. This may lead to unexpected equipment operation.

> **⚠ WARNING**
>
> **RISK OF IMPROPER GROUNDING**
>
> Connect unit to ground using a conductor with cross-section 1...1.5 mm² *(18...16 AWG)* and maximum length 3 m *(9.84 ft)*. See *EMC Compatibility, p. 21*.
>
> **Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Position of the Ground Electrode on the Plastic Unit

The following figure shows the position of the ground electrode on the plastic boxes.



Note: Use a grounding strip or a conductor with a cross-section of 1 to 1.5 mm^2 *(AWG18, AWG16)* and a length of ≤ 3 m *(9.84 ft)* long.

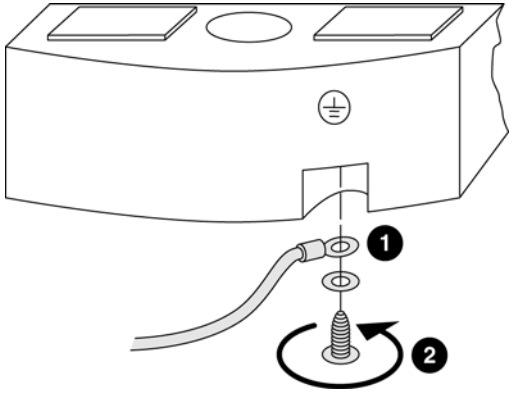
Method for Plastic Units

Follow the steps below to connect the ground to the unit:

Step	Action
1	Remove the label located above the symbol representing the ground.
2	Insert the end of the grounding strip into the grounding terminal of the splitter box.
3	Screw in the ground connection screw.

Position of the Ground Electrode on the Metal Unit

The following figure shows the position of the ground electrode on the metal boxes.



Note: Use a grounding strip or a conductor with a cross-section of 1 to 1.5 mm^2 *(AWG18, AWG16)* and a length of ≤ 3 m *(9.84 ft)* long.

Method for Metal Units

Follow the steps below to connect the unit to the ground electrode:

Step	Action
1	Crimp the lug on the ground cable.
2	Screw in the lug with the ground conductor connection screw (supplied with the product).

Mounting the Metal Unit

Once these steps have all been completed (see table above), the product can be mounted on its support.

EMC Compatibility

Product Compliance

CE

This product complies with the European directive 89/336/CEE on "electromagnetic compatibility".

The products described in this manual meet all the conditions regarding electromagnetic compatibility and are compliant with the applicable standards. However, this does not mean that the electromagnetic compatibility of your installation is assured.

This is why it is strongly recommended to follow all indications concerning an EMC compliant installation. Only in these conditions and thanks to the exclusive use of CE approved components, will the devices used be deemed as compliant with the EMC directives.

When handling the products, ensure that all safety measures related to electromagnetic compatibility and all conditions for the use of the products are complied with by all persons concerned. This is especially important when handling products sensitive to electrostatic discharges.

The products described in this manual contain highly complex semiconductors that can be damaged or destroyed by electrostatic discharges (ESD). If, for example, they are used within the vicinity of devices rated as class A or B according to IEC 61000-4-4, the level of electromagnetic interference may be enough to cause the device to operate unexpectedly, and/or to damage it.

Damage may not necessarily cause a failure or malfunction that is immediately detectable. It may occur sporadically or in a delayed manner.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

Where there is a risk of electromagnetic interference, the system designer must implement the necessary protective measures.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Grounding

A low impedance connection with a maximum length of 3 m *(9.84 ft)* must be installed between the splitter box's ground electrode and the reference ground in order to discharge the noise voltages. The inductance of standard grounding cables (PE) presents a risk of high impedance when high frequency noise voltages are present. It is therefore advisable to use grounding strips. If this solution is not possible, use a ground conductor with a large cable cross-section and a ground connection that is as short as possible.

If the unit is not grounded properly, it will be sensitive to electromagnetic disturbances. This may lead to unexpected equipment operation.

⚠ WARNING

RISK OF IMPROPER GROUNDING

Connect unit to ground using a conductor with cross-section 1...1.5 mm^2 *(16...18 AWG)* and maximum length 3 m *(9.84 ft)*.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Cable Routing

Make sure that the following basic wiring rules are followed:

- Keep the data wire and the power cables apart from one another, in so far as is possible.
- Make sure there is a space of at least 10 cm *(3.94 in)* between the data wires and the power cables.
- The data wires and power cables must only cross at a right angle to one another.
- It is advisable to route the data wires and power cables through separate shielded ducts.
- When laying the cables, the noise voltage from other devices or wires must be considered. This particularly applies to frequency converters, motors and other devices or cables generating high frequency disturbances. High frequency sources and the cables described in this manual must be as far apart from each other as possible.

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

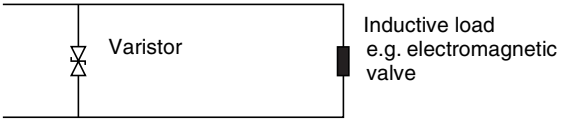
Please read and comply with the cabling rules listed above. Failure to comply with these wiring rules is a common cause of EMC problems.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Control of Inductive Loads

The outputs of the devices described in this manual are equipped with an integrated protective system against the high noise voltages that may be generated by inductive loads.

Integrated protective system against the high noise voltages generated by inductive loads



The varistor rapidly discharges the energy accumulated in the magnetic field of the inductive load.

The high voltages arising from the disconnection of inductive loads create large fields in the wires that may cause disturbances in nearby circuits or devices. It is advisable to provide an anti-interference device at the load level. In this way, the voltage peak generated by the inductive load is short-circuited directly at the point at which it occurs.

Splitter Box Characteristics and Wiring

3

Presentation

Introduction

This chapter provides an overall description of all Advantys FTB splitter boxes.

Note: The "-" in the tables corresponds to values that are not applicable.

What's in this Chapter?

This chapter contains the following topics:

FTB Splitter Box Environment Characteristics

Environment Characteristics

Characteristics	Description	Reference standards
Product certifications	cULus	-
Operating temperature	0°C...+55°C *(32°F...131°F)*	-
Storage temperature	20°C...+70°C *(68°F...131°F)*	-
Degree of protection	IP67	According to IEC 529
Altitude	0...2000 m *(0...6561 ft)*	-
Vibration resistance capacity for plastic units	• Constant amplitude = 0.35 mm *(0.0138 in)*: 10 Hz≤f≤57 Hz • Constant acceleration = 5 gn: 57 Hz≤f≤150 Hz	According to IEC 68-2-6, Fc test
Vibration resistance capacity for metal units	• Constant amplitude = 1.5 mm *(0.06 in)*: 5 Hz≤f≤70 Hz • Constant acceleration = 15 gn: 70 Hz ≤f≤500 Hz	According to IEC 68-2-6, Fc test
Shock resistance capacity for plastic units	30 gn, duration: 11 ms	According to IEC 68-2-27, Fc test
Shock withstand capacity for metal units	50 gn, duration: 11 ms	-
Resistance capacity for electrostatic discharges	• Contact: +/- 4 kV • Air: +/- 8kV	According to IEC 61000-4-2
Withstand capacity for radiated fields	10 V/m *(3.05 V/ft)*	According to IEC 61000-4-3
Withstand capacity for fast transients	• Power supply: +/- 2 kV • Signal: +/- 2 kV	According to IEC 61000-4-4

Withstand capacity for surge	• Power supply:
	  ◦ symmetrical: +/-500 VDC
	  ◦ asymmetrical: +/-1000 VDC
	• Signals:
	  ◦ symmetrical: +/-500 VDC
	  ◦ asymmetrical: +/-1000 VDC
	• PE: +/-500 VDC
		According to IEC 61000-4-5

Withstand capacity for duct fields	10 Vrms	According to IEC 61000-4-6
Withstand capacity for 50 Hz magnetic fields	30 A/m *(9.15 A/ft)*	According to IEC 61000-4-8
Mounting	In all positions	-

Electrical Characteristics

Splitter Box Characteristics

Characteristic	Description
Splitter box's internal current draw	120 mA
Operating voltage	24 VDC
Maximum power current for the splitter box and detector	8 A
Actuator maximum current	8 A
Bus and I/O under-voltage detection	< 18 VDC
Integrated protection against short-circuits	• < 100 mA: Automatic trigger • > 100 mA: reset

Input Characteristics

Characteristic	Description
Compliance with IEC 1131-2	Type 2
Compliance with 2-wire/3-wire sensors	Yes
Rated power voltage	24 VDC
Maximum current	200 mA
Common power supply for both sensors:	18...30 VDC
Logic	Positive
Filtering input	1 ms
Reverse polarity protection	Yes

Output Characteristics

Characteristic	Description
Output type	Transistors
Output voltage	24 VDC
Output current	1.6 A
Over-voltage protection	Yes (transient diode)
Maximum switching cycle	20 Hz
Maximum lamp load	10 W
Connection for outputs / cable lengths	• 0.75 mm^2/10 m *(AWG 18/32.8 ft)* maximum • 0.34 mm^2/5 m *(AWG 22/16.4 ft)* maximum

Connecting the Actuators and Sensors

Description

The actuators and sensors are connected to the FTB splitter box using M12-type connectors.

Characteristics of the Connections

The maximum admissible load for the FTB splitter boxes is limited to:

- 1.6 A per output (actuator current),
- 200 mA for both inputs (sensor current).

⚠ WARNING

RISK OF NON-COMPLIANCE WITH IP67

For IP67 protection:

- Properly fit all connectors with cables or sealing plugs and tighten.
- Install cover onto splitter box and tighten captive screws to specified torque.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Assignment of M12 Connector Pins

The following diagram shows the front view of a 5-pin M12 connector and the convention for numbering the pins:

Pin	Assignment
1	+24 VDC
2	Channel 10 to 17: diagnostics input or functional input or output
3	0 VDC
4	Channel 00 to 07: functional input or output
5	Ground

Allocation of the M12 Connectors to the I/Os

The following table shows the assignment of the M12 connector pins to the marking of the splitter box's Inputs, Outputs and diagnostics:

Connector number	Pin 4	Pin 2
0	Channel 00	Channel 10
1	Channel 01	Channel 11
2	Channel 02	Channel 12
3	Channel 03	Channel 13
4	Channel 04	Channel 14
5	Channel 05	Channel 15
6	Channel 06	Channel 16
7	Channel 07	Channel 17

Power Supply Connection

Description

For the FTB splitter boxes, the power supply is linked using a Mini-Style 7/8" 5-pole connector.

The FTB splitter boxes require a 24 VDC power supply.

Calculation of the Power Supply Cable Cross-Section

Calculations to find cable cross-sections are made according to the system's own configuration data and remain the full responsibility of the user.

⚠ CAUTION

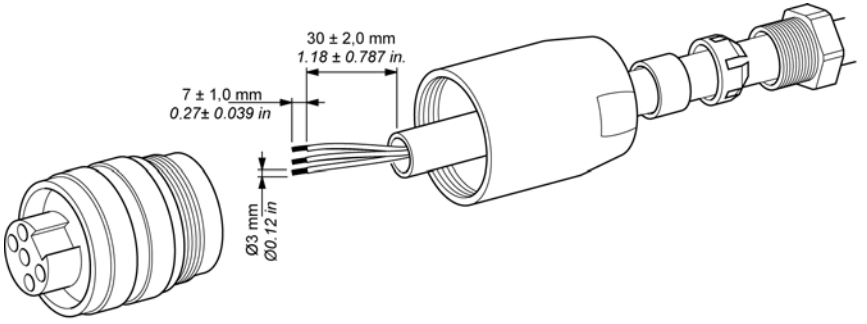
REVERSE POLARITY AND OVERCURRENT HAZARDS

- Do not supply 7/8” connector pins with more than 8A maximum current per pin.
- Do not reverse the polarity of the power supplied to the FTB splitter box.

Failure to follow these instructions can result in injury or equipment damage.

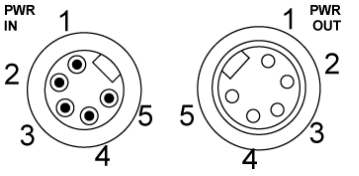
Assembling the Power Supply Cable

The following diagram gives a view of the shape and size of the connection cable connector:



Pin Assignment

The following diagram shows a front view of the PWR IN and PWR OUT connectors:



Pin	Assignment
1	0 VDC
2	0 VDC
3	Ground
4	Splitter box sensor and power supply
5	Actuator power supply

Recommendations for the Power Supply to the Sensors, Actuators and Splitter Boxes

We recommend the use of 2 independent power supplies so as to separate the power supply to the splitter boxes / sensors from the power supply to the actuators.

This configuration provides maximum protection against any disturbance on the outputs (short circuits).

Emergency Stop

Separating the splitter box/sensor (pin 4) power supplies means that the emergency stop can be connected to the actuator power supply (pin 5 of the 7/8" connector).

⚠ WARNING

RISK OF UNINTENDED EQUIPMENT OPERATION

Do not connect pin 4 of the power supply connector to the emergency stop circuit of the system. Interrupting the power supply to this pin, will deactivate the I/O channels of the splitter box, which can result in an unintended equipment operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Method

Follow the steps below:

Step	Action
1	Cut off all power to the system.
2	**On the PWR IN connector:** If the splitter box is the first in the chain, connect a cable with a female connector and free wires. If the splitter box is the last in the chain, connect a connection cable.
3	**On the PWR OUT connector:** If the splitter box is in the middle of the chain, connect a power supply connection cable. If the splitter box is at the end of the chain, fit a sealing plug.

Phaseo Power Supply

A switch mode power supply such as Phaseo (ABL 7••) is particularly well-suited to supply automation systems. It is therefore highly recommended for use with Advantys FTB splitter boxes.

PROFIBUS Network Interface

4

Presentation

Introduction

This chapter provides theoretical background on PROFIBUS field bus operation.

What's in this Chapter?

This chapter contains the following sections:

4.1 Wiring to the PROFIBUS bus

Presentation

Introduction

The following section describes the elements required for wiring the Advantys FTB splitter boxes to the PROFIBUS field bus.

What's in this Section?

This section contains the following topics:

Field Bus Connection

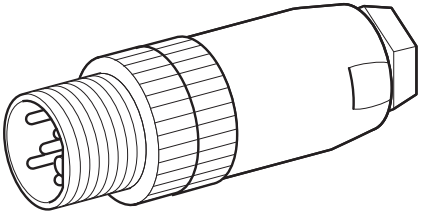
Description

The splitter box can either be in the middle of the chain connection or at line end.

The field bus is connected via a 5-pin M12 connector.

Illustration of Cable Connector Connection

The following diagram shows the characteristics of the connection cable connector:

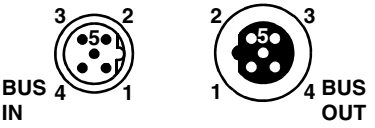


Assignment of M12 Connector Pins (encoding B)

The BUS IN connector is a 5-pin M12 male connector.

The BUS OUT connector is a 5-pin M12 female connector.

The following diagram shows a front view of the bus connectors (encoding B):



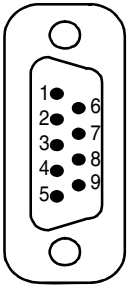
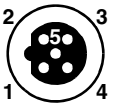
The following table gives the assignments of the bus connector pins:

Pin	Signal	Meaning
1	VP	Line terminator polarization voltage
2	RxD/TxD-N	Receive/transmit data - negative (red)
3	DGND	Discrete ground
4	RxD/TxD-P	Receive/transmit data - positive (green)
5	Shielding	Shielding or grounding
Connector housing	Shielding	Shielding or grounding

Note: It is preferable to connect the shielding to the connector housing. If this is not possible, the connection can also be made using pin 5. These two possibilities can also be combined.

Correspondence between 9-pin SUB-D Connectors and M12 5-pin Connectors

The following table shows the correspondence between pins on 9-pin SUB-D connectors and on 5-pin M12 connectors:

9-pin SUB-D connector	SUB-D pin	Signal	Meaning	M12 pin	5-pin M12 connector
	**1**	**Shielding**	**Shielding/grounding**	5	
	2	M24	24 V output ground	-	
	3	**RxD/TxD-P ***	**Receive/transmit data - positive (green)**	4	
	4	CNTR-P	Control signal for repeaters - positive (direction control): not used	-	
	5	**DGND ***	**Discrete ground**	3	
	6	**VP ***	**Line terminator polarization voltage**	1	
	7	P24	Output voltage, 24 V	-	
	8	**RxD/TxD-N ***	**Receive/transmit data - negative (red)**	2	
	9	CNTR-N	Control signal for repeaters - negative (direction control): not used	-	

Note: (*) Signals in bold and with an asterisk are compulsory and must be provided. Other signals are optional.

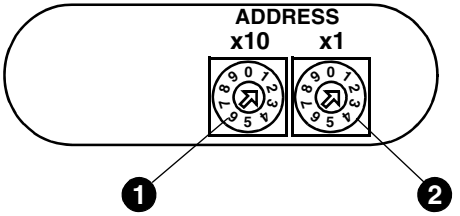
Operating Mode

Follow the steps below:

Step	Action
1	Connect the chaining cable to the BUS IN connector.
2	If the unit is at the end of the line, connect a line terminator to the BUS OUT connector. Otherwise, connect a connection cable to the BUS OUT connector.

Splitter Box Address/Transmission Speed

Rotary Switches - Illustration



Element	Function
1	Node-ID x 10 switch
2	Node-ID x 1 switch

Method

Follow the steps described below:

Step	Action
1	Switch off the splitter box.
2	Unscrew the two screws on the cover.
3	Set the splitter box address.
4	Screw the cover back on.

Assignment of the Address on the Network

The PROFIBUS address is configured directly on the splitter box using two rotary switches.

The addresses can be configured from 0 to 99. However the following addresses are reserved:

- 0 to 2: for the DP masters
- 3 to 99: for the slaves

When assigning the addresses, each slave and/or master must be assigned to a specific and unique address. A configured address is acknowledged at boot-up. It cannot be modified if the cover is not removed.

Using the GSD File for Configuration

The GSD file is required to operate splitting devices.

The file extension indicates the corresponding language. GSD files are available in five languages.

For further information, see *GSD Files, p. 62*.

Automatic Transmission Speed

At power up, the splitter box is in listening mode in order to adapt its transmission speed to the one used on the network. As soon as it is detected by the master, it receives its configuration and settings data. Once the configuration is over, it is operational and ready to exchange data.

Note: If a communication error is detected, fallback values, as defined later in this document, are applied on the outputs if they were configured beforehand.

Transmission Speed and Cable Length

Each transmission speed has a corresponding cable length.

The following data is indicated without a repeater and with a maximum of 32 slaves on the segment.

Transmission speed in Kbits/s	**Maximum cable length in m *(ft)***
≤ 93.75	1200 *(3937 ft)*
187.5	1000 *(3280.83 ft)*
500	400 *(1312 ft)*
1500	200 *(656 ft)*
≥ 3000	100 *(328 ft)*

End of Line Terminator

Description

The PROFIBUS network or segment line terminator resistance power supply is provided by the detector and bus power supply with galvanic isolation. Each PROFIBUS segment start and end must have a line terminator resistance.

Reference

Command number	Designation
FTX DPTL12	Line terminator

4.2 General Principles

About the PROFIBUS network

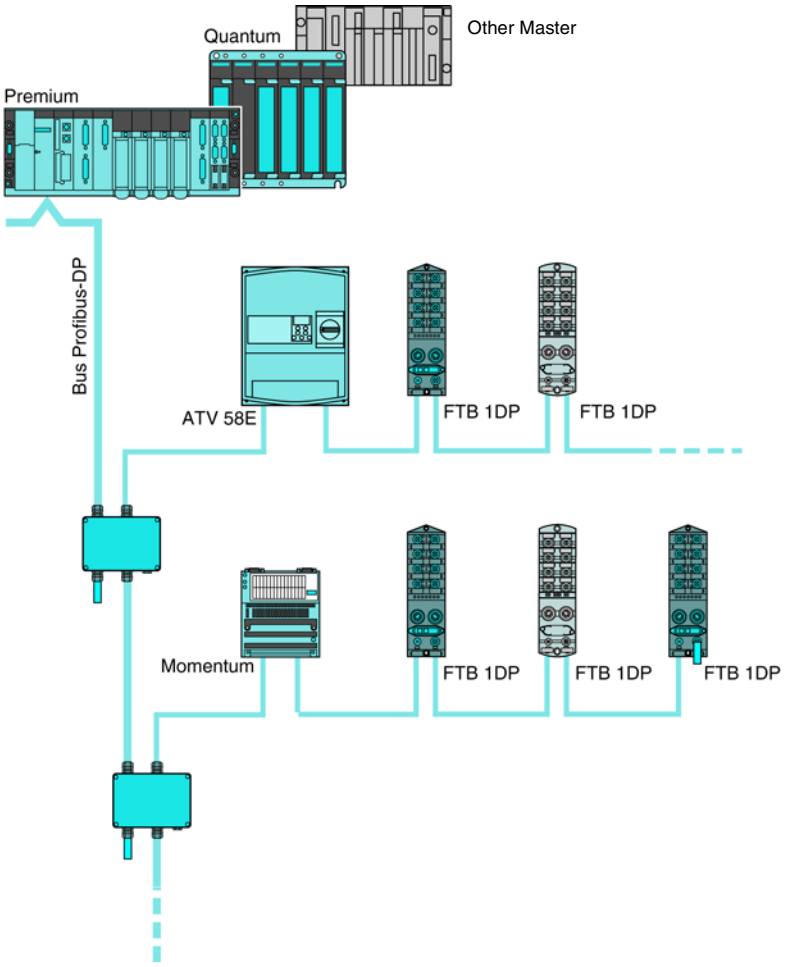
PROFIBUS and PROFIBUS-DP

- PROFIBUS is an open and independent communication standard adapted to industrial applications.
- PROFIBUS-DP (Process Fieldbus Decentralized Peripheral) is the PROFIBUS version optimized for high speed data transmission within a decentralized I/O architecture.

Role

- PROFIBUS enables devices from different manufacturers to communicate without needing a specific interface.
- PROFIBUS-DP is particularly adapted to applications for which the response time is a critical factor.

Operating Diagram



PROFIBUS Standards

Openness and independence are defined by following international standards IEC 61158 and IEC 61784. The PROFIBUS standard is detailed in standard EN 50170.

Master/Slave Communication

Compatibility between the physical equipment installed and the configuration expected by the application is controlled during master and slave communication establishment. The master sends the slave configuration and settings data as soon as it recognizes the equipment installed. The slave provides diagnostic information to the master about its operating state.

The physical link is a type A shielded twisted pair.

The data exchange between the Master (the processing unit) and the Slaves (decentralized devices) is carried out on a cyclical basis: the master sends the output data to the slaves, which respond with their input data.

Slaves and Repeaters

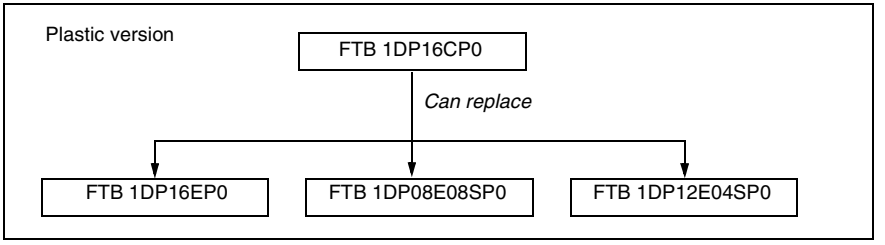
32 slaves in total can be connected to a bus segment. To increase the number of slaves, repeaters must be added to create new bus segments.

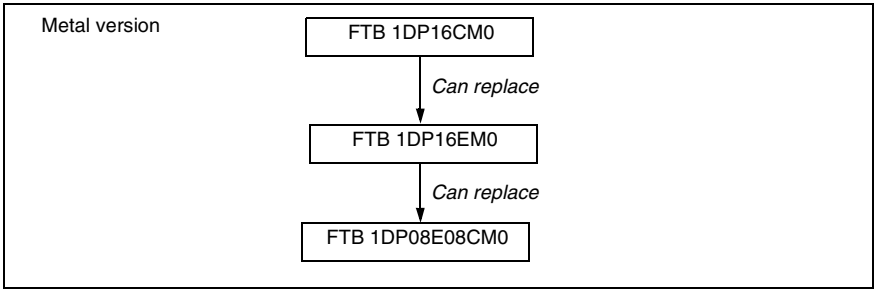
Repeaters are also used to physically isolated bus segments. In total, the number of slaves must not be greater than 126.

There must be a line terminator on the bus at the ends of each new segment.

Interchange-ability

A splitter box with a different reference may be used to replace the splitter box, provided it can carry out all the functions of the replaced splitter box. This characteristic is very useful since, in the case of a module failure, it can help to reduce maintenance stock. The illustrations below help to understand the compatibility between the splitter boxes and their hierarchy:





4.3 Behavior

Behavior patterns of the Advantys FTB PROFIBUS Splitter Box

Behavior at Boot-up	At power up, the Advantys FTB splitter box is in listening mode in order to adapt its transmission speed to the one used on the network. As soon as it is detected by the master, it receives its configuration and settings data. Once the configuration is complete, it is operational and ready to exchange data.
Behavior for Communication Error	The configured fallback modes (maintain or fallback) are applied on the outputs.

Application-Specific Functions

5

At a Glance

Introduction

The FTB distributor offers discrete input channels, digital output, diagnostics and configurable incoming or outgoing channels, depending on its version. This following chapter describes the operating modes for these different channels.

What's in this Chapter?

This chapter contains the following topics:

Description of Discrete I/Os

General

The Advantys FTB PROFIBUS splitter boxes offer the following, according to their version:

- discrete input channels
- discrete output channels
- channels that can be configured as inputs (by default) or outputs

Channels 10 to 17 (pin 2 of M12 connectors) can be configured as "diagnostics inputs" for monitoring sensors or actuators equipped with a diagnostics function (DESINA).

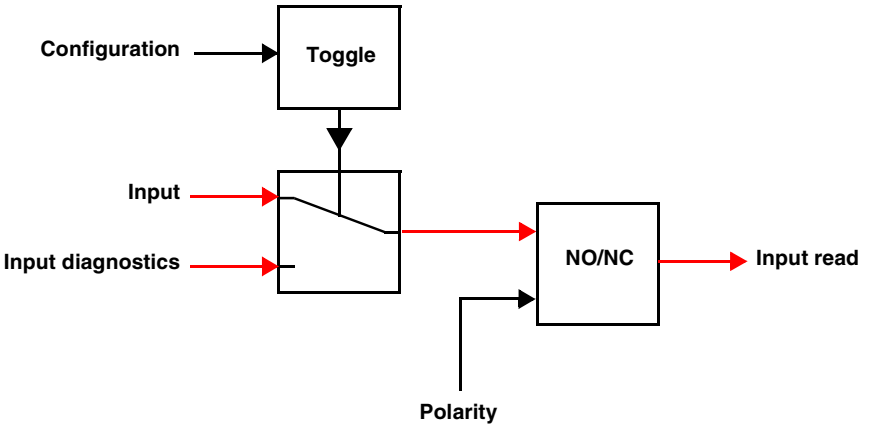
This chapter describes the operation of the I/Os, and the link with configuration objects. Memory areas are assigned to splitter boxes as described in the chapter Software installation (see *Software Installation, p. 61*).

Discrete Inputs

The inputs are configurable for use in NO or NC.

Channels 10 to 17 (pin 2 of M12 connectors) can be configured as "diagnostics inputs". The status read on the inputs is defined as described in the following diagram:

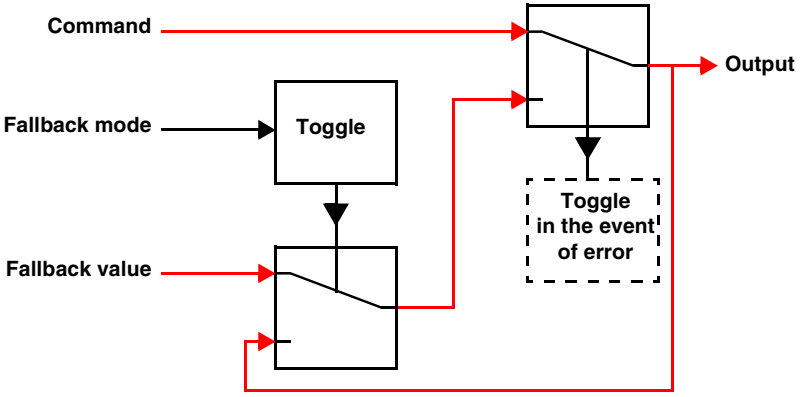
Channels 00 to 07 are configured as "NO input" by default (no reversal). Channels 10 to 17 are configured as "diagnostics input" by default.



Discrete Outputs

In case of communication error with the bus master, the FTB splitter box assigns the state configured by the user to the outputs:

- Maintaining the last value
- Fallback to 0 (by default)
- Fallback to 1



Types of Channel for Each Splitter Box

The table below shows the types of channels available for each splitter box:

Splitter box	Inputs	Outputs	Configurable
FTB 1DP16E••	00...07 10...17	- -	- -
FTB 1DP12E04SP0	00...03 10...17	04...07 -	- -
FTB 1DP08E08SP0	- 10...17	00...07 -	- -
FTB 1DP08E08CM0	- 10...17	- -	00...07 -
FTB 1DP16C••	- -	- -	00...07 10...17

Use of the Diagnostics Function of Pin 2 of the Discrete Splitter Boxes

Diagnostics Function

Advantys FTB and FTM splitter boxes enable the use of sensors and actuators fitted with a built-in diagnostics function (DESINA type).

When configured as a diagnostics input, the pin 2 of each M12-type connector can be used to detect external splitter box faults relating to sensors or actuators.

Types of Faults

This information is used to detect the following faults:

- Damage to the detection surface,
- Inoperative electronics,
- No load.

Choice of Diagnostics Input

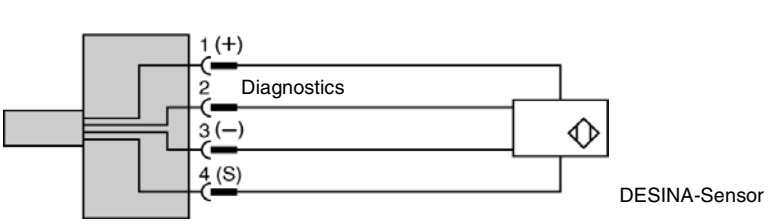
The choice between the sensor input function or diagnostics input function at pin 2 level is made for each channel and each setting, when configuring the splitter box.

Fault Display

Faults can be displayed by a red LED on each channel configured as a diagnostics input.

Example 1

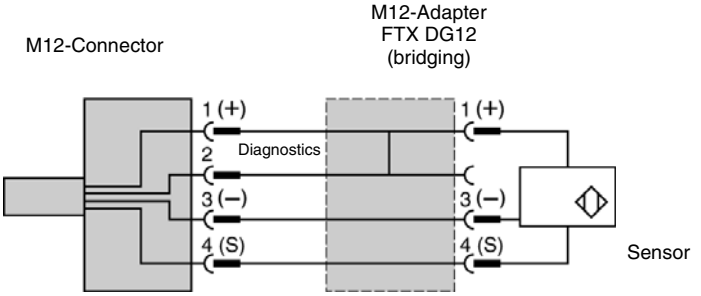
Connecting a sensor fitted with a diagnostics function:



Example 2

Using an FTX DG12 accessory, an M12-type diagnostics adaptor, it is possible to monitor breakages in cables leading to sensors or actuators not fitted with a built-in diagnostics function (only for splitter boxes fitted with M12-type connectors).

Connection of a standard sensor with diagnostics adapter:



Presentation and Operation of Virtual Modules

Virtual Modules

Virtual modules are used to configure exchanges with the required FTB splitter box. They make it possible to specify the type of FTB splitter box (16E, 8E08S, 8E08C, 12E04S, 16C) used, as well as the data to be implicitly exchanged between the master and the slave on the PROFIBUS-DP network.

Integration of Diagnostics Information

In the process memory (PLC input memory), diagnostics data can be exchanged in addition to input and output data.

The splitter box enables the user to integrate this diagnostics information – in the same way as useful (I/O) data – into the exchange of cyclical data.

Advantages of the Virtual Module

Virtual modules offer the following three advantages:

- Diagnostics information access regardless of the master in use.
- Immediate availability of diagnostics information in the process image, allowing simple and fast data evaluation.
- Only the memory space needed is used in the I/O area for the PLC process image.

Head Modules and Data Modules

By selecting virtual modules, the user can define the configuration frame that is sent to the slave on start-up. This is made up of configuration data for the head module and configuration data corresponding to the virtual modules in the order chosen by the user.

The head modules still have a length equal to zero, and are simply used for identifying and setting the module. They are directly linked to the references of the various FTB splitter boxes.

Each data module becomes one byte in length. An address can be assigned to each module in the PLC process image.

Note: FTB PROFIBUS splitter boxes use the specific identification format described in standard IEC 61158.

Name and Reference Number

Head modules	Configuration data (hex)
FTB 1DP16EP0	01 40
FTB 1DP12E04SP0	01 42
FTB 1DP08E08SP0	01 41
FTB 1DP16CP0	01 22
FTB 1DP16EM0	01 50
FTB 1DP08E08CM0	01 51
FTB 1DP16CM0	01 52

Input modules	Length	Configuration data (hex)
Read inputs 00-07 (Pin 4)	1 byte	41 00 02
Read inputs 10-17 (Pin 2)	1 byte	41 00 01
Device diagnostics	1 byte	41 00 04
Device error (by connector)	1 byte	41 00 05
Detector power supply short-circuit	1 byte	41 00 06
Disconnection of actuators 00-07 (Pin 4)	1 byte	41 00 07
Disconnection of actuators 10-17 (Pin 2)	1 byte	41 00 0A
Warning on actuators 00-07 (Pin 4)	1 byte	41 00 08
Warning on actuators 10-17 (Pin 2)	1 byte	41 00 0B

Output modules	Length	Configuration data (hex)
Write outputs 00-07 (Pin 4)	1 byte	81 00 03
Write outputs 10-17 (Pin 2)	1 byte	81 00 09

Functions Available for each Splitter Box

The following table describes the I/O modules that can be used with the different types of splitter boxes:

	Product references				
Splitter boxes	**16E**	**12E04S**	**8E08S**	**8E08C**	**16C**
Read inputs 00-07 (Pin 4)	Yes	Yes (1)	-	Yes (2)	Yes
Read inputs 10-17 (Pin 2)	Yes	Yes	Yes	Yes	Yes
Device diagnostics	Yes	Yes	Yes	Yes	Yes
Device error (by connector)	Yes	Yes	Yes	Yes	Yes
Detector power supply short-circuit	Yes	Yes	Yes	Yes	Yes
Disconnection of actuators 00-07 (Pin 4)	-	Yes	Yes	Yes	Yes
Disconnection of actuators 10-17 (Pin 2)	-	-	-	-	-
Warning on actuators 00-07 (Pin 4)	-	Yes (1)	Yes	Yes (2)	Yes
Warning on actuators 10-17 (Pin 2)	-	-	-	-	Yes
Write outputs 00-07 (Pin 4)	-	Yes (1)	Yes	Yes (2)	Yes
Write outputs 10-17 (Pin 2)	-	-	-	-	Yes

Note: (1) On module FTB 1DP12E04SP0, channels 04 to 07 are outputs. Bits 0 to 3 of the "Write outputs 00-07" byte, and bits 0 to 3 of the actuator diagnostics bytes are not significant.

Note: (2) For modules fitted with configurable channels, the bits of the "Write outputs 00-07" byte are disregarded if the corresponding channels are not configured as outputs. The bits of the actuator diagnostics bytes are not significant if the corresponding channels are not configured as outputs.

Example

This example deals with the configuration of a splitter box FTB 1DP08E08SP0.

It involves transmitting the output data "Write outputs 00-07 (Pin 4)", the "Device diagnostics" and the diagnostics information "Disconnection of actuators 00-07 (Pin 4)" as well as "Warning on actuators 00-07 (Pin 4)" into the exchange of cyclical data in the process image.

Selecting modules:

Head module selection	**Configuration data (hex)**
FTB 1DP08E08SP0	01 41
Selection of virtual modules in the desired order	**Configuration data (hex)**
Write outputs 00-07 (Pin 4)	81 00 03
Device diagnostics	41 00 04
Warning on actuators 00-07 (Pin 4)	41 00 08
Disconnection of actuators 00-07 (Pin 4)	41 00 07

The following configuration frame is generated (Hex):

01 41 81 00 03 41 00 04 41 00 08 41 00 07

Note: As a general rule, visual configuration is possible with the configuration software used to install the system, which avoids having to define the frame yourself.

Channel Settings

At a Glance

This chapter describes the settings data sent to the module (or unit) by the master when communication is established. Where channels are not configurable, pay no attention to the data described: The corresponding bytes must be set to 0.

Plastic units (or modules) are configured differently to metal units (or modules).

Module Configuration

Proceed as follows to configure the units or modules:

Step	Action
1	Integrate the head module in the configuration
2	Add one or more data modules in any order.

⚠ CAUTION

RISK OF MALFUNCTION

Only one head module can be integrated in the configuration. This module will always be the first element of the configuration.

Failure to follow these instructions can result in injury or equipment damage.

Plastic Units

FTB 1DP••••••P0 setting frame:

Byte	Data	Notes
0	Status	Specific to standard IEC 61158
1	WatchDog factor 1	
2	WatchDog factor 2	
3	Min TSDR	
4	Ident Number High	05H
5	Ident Number Low	98H
6	Group Ident	
7	Reserved	
8	Reserved	
9	Reserved	
10	Configuration of channels 10 to 13	Pin 2 of M12 connectors
11	Configuration of channels 14 to 17	Pin 2 of M12 connectors
12	Configuration of channels 00 to 03	Pin 4 of M12 connectors
13	Configuration of channels 04 to 07	Pin 4 of M12 connectors
14	Fallback mode of channels 10 to 13 outputs	Pin 2 of M12 connectors (if output)
15	Fallback mode of channels 14 to 17 outputs	Pin 2 of M12 connectors (if output)
16	Fallback mode of channels 00 to 03 outputs	Pin 4 of M12 connectors (if output)
17	Fallback mode of channels 04 to 07 outputs	Pin 4 of M12 connectors (if output)
18	General settings	Activation of overall diagnostics
19	Under-voltage message	Activation of power diagnostics
20 to 29	Reserved	

Note: The bytes are only significant if the function exists on the splitter box. For example, for FTB 1DP16E•• splitter boxes, the bytes 14 to 17 are not significant.

Metal Units

FTB 1DP••••••M0 setting frame:

Byte	Data	Notes
0	Status	Specific to standard IEC 61158
1	WatchDog factor 1	
2	WatchDog factor 2	
3	Min TSDR	
4	Ident Number High	06H
5	Ident Number Low	4AH
6	Group Ident	
7	Reserved	
8	Reserved	
9	Reserved	
10	General settings	Activation of diagnostics
11	Configuration of channels 10 to 13	Pin 2 of M12 connectors
12	Configuration of channels 14 to 17	Pin 2 of M12 connectors
13	Configuration of channels 00 to 03	Pin 4 of M12 connectors
14	Configuration of channels 04 to 07	Pin 4 of M12 connectors
15	Fallback mode of channels 10 to 13 outputs	Pin 2 of M12 connectors (if output)
16	Fallback mode of channels 14 to 17 outputs	Pin 2 of M12 connectors (if output)
17	Fallback mode of channels 00 to 03 outputs	Pin 4 of M12 connectors (if output)
18	Fallback mode of channels 04 to 07 outputs	Pin 4 of M12 connectors (if output)
19 to 29	Reserved	

Note: The bytes are only significant if the function exists on the splitter box. For example, for FTB 1DP16E•• splitter boxes, the bytes 14 to 17 are not significant.

Status (Byte 0)

The table below describes the structure of the Status byte:

Bit	Description
0	Reserved
1	Reserved
2	Reserved
3	WD_On = 1: Slave monitoring function activated
4	Freeze_Req = 1: Slave in Freeze_Mode
5	Sync_Req = 1: Slave in Sync_Mode
6	Unlock
7	Lock

Details of bits 6 and 7:

Bit 6 (Unlock)	Bit 7 (Lock)	Description
0	0	$TSDR_{min}$ and parameter specific to the slave must not be overwritten
0	1	DP slave available for other masters
1	0	DP slave locked for the other masters, all parameters are reset
1	1	DP slave available for other masters

Settings Data

FTB 1DP••P0 splitter box general settings: Byte 18

The most significant byte activates or deactivates overall diagnostics.

FTB 1DP••P0 splitter box on messages : Byte 19

Bit	Function	Notes
0 (LSb)	Under-voltage in detectors and bus	Authorizes or inhibits message transmission
1	Under-voltage in actuator supply	Authorizes or inhibits message transmission
2 and after	Reserved	

FTB 1DP••M0 splitter box general settings: Byte 10

Bit	Function	Notes
0 (LSb)	Global diagnostics	Authorizes or inhibits message transmission
1	Channel dedicated diagnostics	Authorizes or inhibits message transmission
2	Under-voltage in detectors and bus	Authorizes or inhibits message transmission
3	Under-voltage in actuator supply	Authorizes or inhibits message transmission
4 and after	Reserved	

Metal/Plastic Units: Configuration of Channels 00 to 07

Each channel is configured over two bits:

Bit	7 and 6	5 and 4	3 and 2	1 and 0
Channel	03 (or 07)	02 (or 06)	01 (or 05)	00 (or 04)
Meaning	0 = Input NO 1 = Input NC 2 = Input DIAG 3 = Output			

Metal/Plastic Units: Configuration of Channels 10 to 17

Each channel is configured over two bits:

Bit	7 and 6	5 and 4	3 and 2	1 and 0
Channel	13 (or 17)	12 (or 16)	11 (or 15)	10 (or 14)
Meaning	0 = Input NO 1 = Input NC 2 = Output 3 = Reserved			

Metal/Plastic Units: Fallback Mode Configuration

Each fallback mode is configured over two bits:

Bit	7 and 6	5 and 4	3 and 2	1 and 0
Channel	03 (or 13, 07, 17)	02 (or 12, 06, 16)	01 (or 11, 05, 15)	00 (or 10, 04, 14)
Meaning	0 = Fallback to 0 1 = Fallback to 1 2 = Hold output 3 = Reserved			

Software Installation

6

Presentation

Introduction

This chapter provides all information required for the software installation of Advantys FTB splitter boxes.

What's in this Chapter?

This chapter contains the following topics:

GSD Files

GSD File Content

The GSD file is a configuration file created specifically for each device type. The Advantys FTB range of splitter boxes are supplied with a GSD file and a set of *.dib image files (icons). The configuration files are available on the CD-ROM FTX ES0•.

The GSD file contains all the important information regarding equipment, for example:

- the type of device (Device-Type),
- the manufacturer,
- the identification of the vendor (Vendor-ID),
- the item number,
- the software version,
- the hardware version,
- etc.

Together, these are used by the master for configuration and recognition on establishing communication.

GSD File Names

The table below gives the file names according to type of splitter box:

Type of splitter box	GSD File	Image files
Plastic	FTB1DP_P.gsd	FTBPDP_d.dib FTBPDP_r.dib FTBPDP_s.dib
Metal	FTB1DP_M.gsd	FTBMDP_d.dib FTBMDP_r.dib FTBMDP_s.dib

GSD files can be supplied in different languages. Here, the last letter of the file extension indicates the text language:

Language	Extension
Default (English)	*.gsd
English	*.gse
German	*.gsg
French	*.gsf
Italian	*.gsi
Spanish	*.gss
Portuguese	*.gsp

Installation with PL7 Pro/Unity

Pre-requisites

Below is a description of how to install an FTB slave with a Premium PLC associated to the TSX PBY100 communication coupling device, using the PL7 Pro or Unity software workshop.

The pre-requisites for installation are as follows:

- The GSD files have been imported in SyCon
- The PL7 or Unity and SyCon software have been installed.

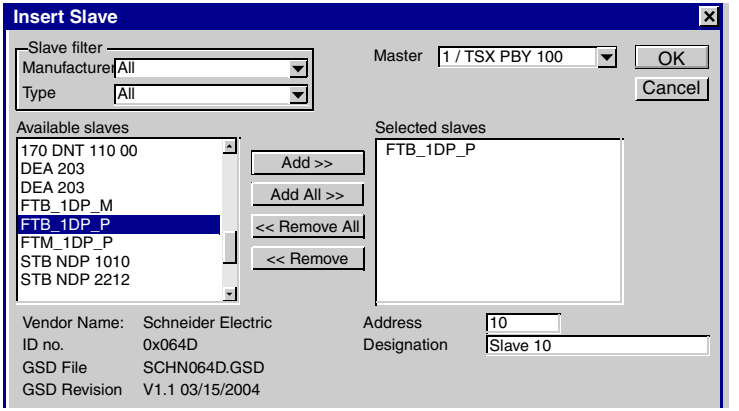
See documentation for the master used if system is installed in a different environment.

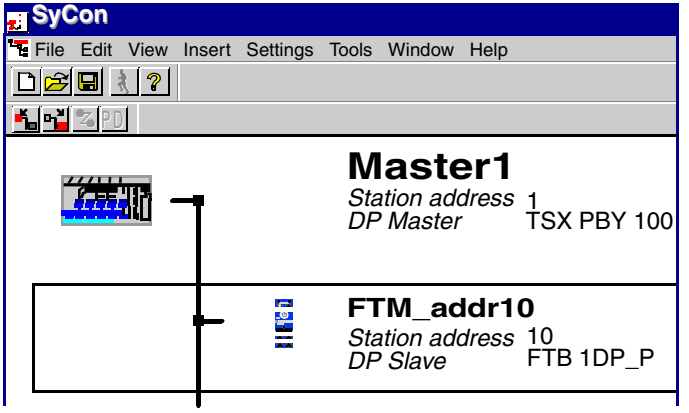
First Phase: Installation Using the SyCon Tool

The first phase is performed using "SyCon", the PROFIBUS network configuration tool. This tool is used to define the bus architecture and its communication settings, as well as to configure and set the slaves using their corresponding GSD files.

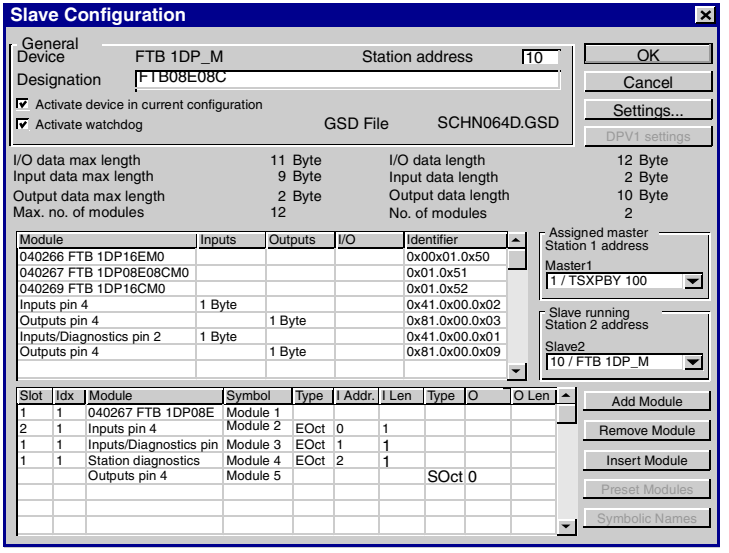
SyCon generates an ASCII file containing all the network management data required by the Schneider PROFIBUS master.

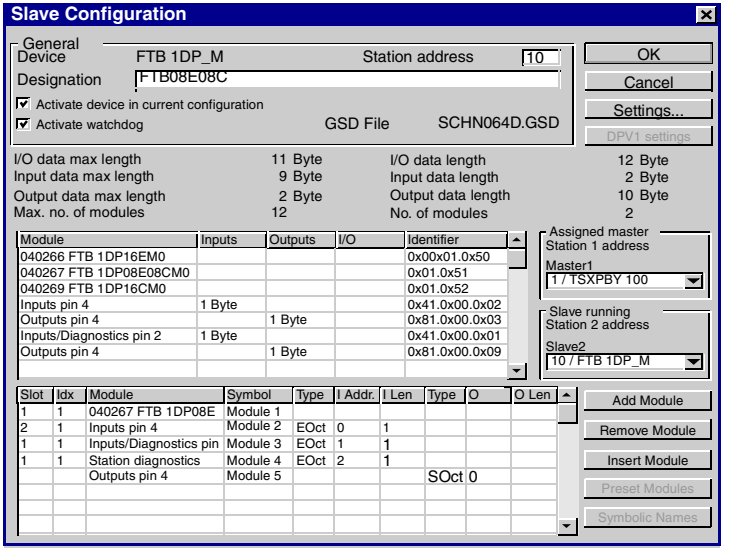
Perform the following steps to configure the splitter box:

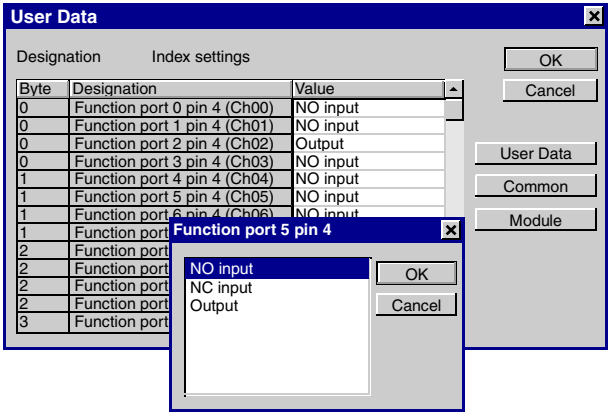
Step	Action
1	Configuration is carried out by selecting the splitter box to be installed. In the following illustration, the FTB 1DP_P (plastic) and FTB 1DP_M (metal) splitter boxes can be selected from the "Available slaves" list, which corresponds to the SyCon software workshop product catalog library. 

Step	Action
2	Access the configuration menu by double-clicking the product icon (see illustration below) or by selecting the "Configure slave DP" option in the **Settings** menu. 

Step	Action
3	Select the splitter box from its reference number in the list shown, then insert it into the second table. The first table displays the available splitter boxes. The second table displays the splitter boxes configured by the user. The following is an illustration for an FTB 1DP08E08CM0 splitter with which the following are exchanged: ● The status of channels 00 to 07 (Pin 4). ● The status of channels 10 to 17 (Pin 2). ● The "device diagnostics". ● The channel commands 00 to 07 (Pin 4).



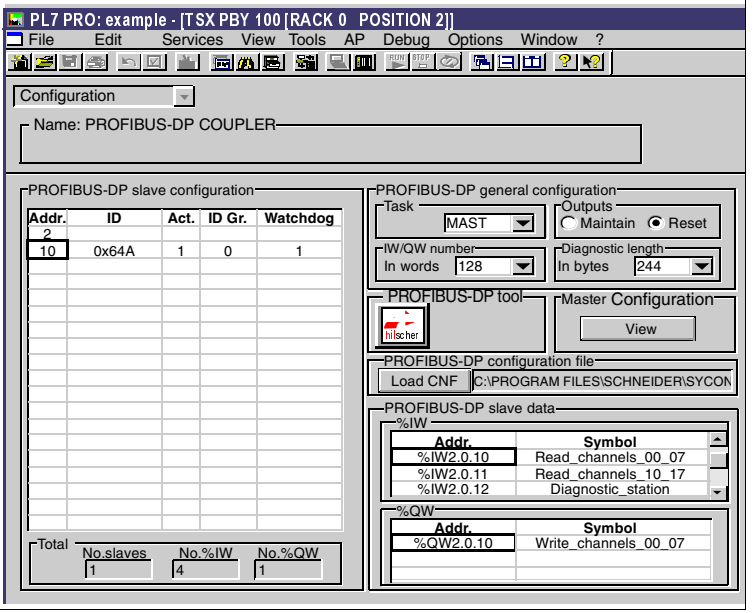
Step	Action
4	For each splitter box, the length of the input or output data is indicated in the columns: ● "I Len": Input length ● "O Len": Output length The length also depends on the splitter box type ("Type" column): ● "IB": Input byte ● "OB": Output byte The address of the input or output data in the PLC memory is shown in the columns: ● "I Addr.": Input address ● "O Addr.": Output address The start address of the input or output data can be modified by the user if the "automatic addressing" function is deactivated in the SyCon software workshop. 

Step	Action
5	The "User data parameters" button is used to access the settings frame sent by the master when the network is started. The FTB splitter box is set in this data setting window. The "Module" button is used to give a clear display of the FTB splitter box settings: channel configuration, diagnostics activation, output fallback mode settings, etc. To modify a setting, simply click on the corresponding line and select a new value in the list. 

Second Phase: PL7 Pro/Unity

The second phase is performed by PL7 Pro

or Unity. Once the ASCII file is selected, the master initializes the network devices and gives them the start-up command. Proceed as follows:

Step	Action
1	In the TSX PBY100 card configuration screen, select the ASCII configuration file (.cnf) generated by SyCon by clicking on the "Load CNF" button. The "PROFIBUS-DP slave configuration" area then shows all the configured slaves. In the following illustration, the master is at address 2 and the Advantys splitter box is at address 10. By clicking a line corresponding to a slave, you can see the address and length of the modules declared using SyCon. In the illustration below, the mnemonics were declared previously in PL7. The length of the PLC's diagnostic buffer is set to 32 bytes by default. However, it may be set to up to 244 bytes (maximum length) to prevent any overflow. 

Diagnostics

7

At a Glance

Introduction

Diagnostics information simplifies installation and accelerates error searching.

This chapter provides the elements necessary for diagnostics by:

- LED display,
- Software.

What's in this Chapter?

This chapter contains the following sections:

7.1 Diagnostics Display

At a Glance

Diagnostics Display

The LEDs on the FTB distributor are used to provide information on the state of the system's power supply, communications and I/O channels.

What's in this Section?

This section contains the following topics:

Power Supply Diagnostic LED

Supply Status

The power supply status for the splitter box, actuators and sensors is displayed on the splitter box's front panel, by the DO and DI POWER LEDs.

Position of the DO POWER and DI POWER LEDs:

Power LED Colors

The color of the LED depends on the power supply, as described in the following table:

LED	Color	Operation	Description
DI POWER	Off	No voltage	Detector and splitter box power supply is unavailable
	Green	Normal	Power supply for detector and splitter box OK
	Red	Under-voltage	Undervoltage in detector and splitter box power supply
DO POWER	Off	No voltage	Actuator power supply unavailable
	Green	Normal	Actuator power supply OK
	Red	Under-voltage	Under-voltage in actuator power supply

Communication Status

The PROFIBUS communication status is shown by the "BUS RUN" LED (Configuration Fault).

LED	Status	Description
BUS RUN	Off	Initialization in progress
	Green, blinking	No exchange on bus
	Green, permanent	Exchanges OK

Fault finding

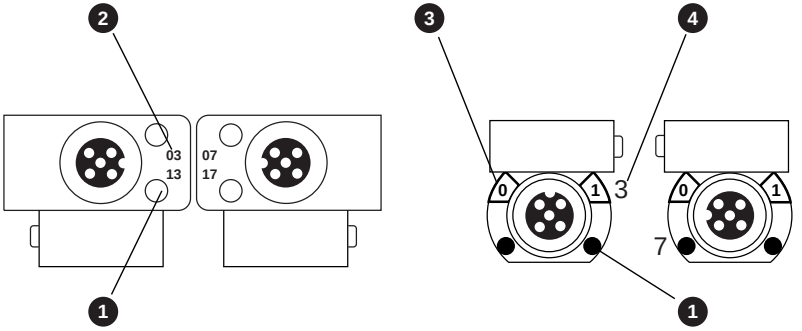
Errors	LED display	Possible causes	Solutions
Slave not accessible or communication disturbed	All LEDs off.	No power	Check device power supply.
	BusRun LED flashing.	No address or wrong address	Correct address.
		Assigned address already used by another module.	Each PROFIBUS unit must be assigned its own, unique address. Correct address.
		The line terminator resistance is activated between the master and unit.	Check that terminator resistance is only activated at the ends of the PROFIBUS segment
		PROFIBUS segment end incorrect.	Each PROFIBUS segment requires a line terminator resistance at the start and end of the line. By selecting low transmission speeds, the network is able to operate despite the unsuitable ends. This can nevertheless lead to sporadic errors in the production process.
		Branch cables for transmission speeds greater than 1.5Mbit/s. Branch cables unsuitable for higher speeds.	If a branch cable is essential, you can use an "active" branch cable or a repeater.
		PROFIBUS segment extension too great or too many slaves.	Use repeaters to subdivide a segment into several segments, or lower bus speed (see table for maximum cable lengths).
Setting or configuration error	BusRun LED flashing at head of bus.	The configured splitting box does not correspond to the splitter box actually installed.	Check reference number of installed splitter box.
Link with master DP interrupted when in service	BusRun LED flashing.	Short-circuit or break in PROFIBUS link.	Check PROFIBUS link: Check which devices can still be accessed in order to pinpoint where the error occurred (e.g. using a lower transmission speed).

Diagnostics LED for I/Os

I/O Status on the M12 Connectors

One LED is associated to each distributor channel. The LED status depends on the channel configuration and its level (0 or 24 V).

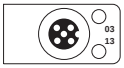
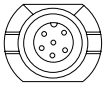
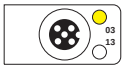
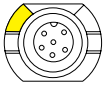
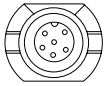
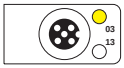
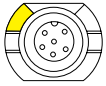
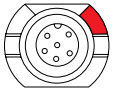
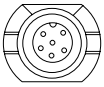
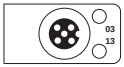
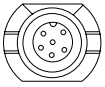
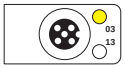
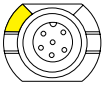
The following figure shows addressing in the LEDs corresponding to I/Os for plastic units (on left) and metal units (on right):



Element	Function
1	LED
2	LED number on the plastic unit
3	Pin number displayed on the metal unit
4	Connector number for the metal unit

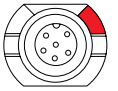
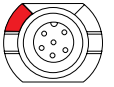
Behavior of the LEDs on Plastic and Metal Units

LED behavior according to settings and channel status: The example provided is for channel 00.

Channel configuration	Input voltage	Logical value	Display LED on the plastic unit	Display LED on the metal unit	Color
Input closing function	0 V	0			Off
	24 V	1			Yellow
Input opening function	0 V	1			Off
	24 V	0			Yellow
Input diagnostics	0 V	1			Red
	24 V	0			Off
Output	0 V	0			Off
	24 V	1			Yellow

Error on the I/O Connectors

An error on the connectors is declared as follows (example given for channels 00 and 10):

Plastic unit display	Metal unit display	Channel diagnostics (00 to 07)	Channel diagnostics (10 to 17)
		**Voltage**: 0 V **Possible errors:** -	**Voltage**: 0 V **Possible errors:** ● External error: ● Detector short-circuit on pin 1 ● Actuator stopped
		Voltage: 0 V **Possible errors:** -	**Voltage**: 24 V **Possible errors:** Actuator stopped
		**Voltage**: 0 V **Possible errors:** ● Detector short-circuit on pin 1 ● Actuator stopped	**Voltage**: 0 V **Possible errors:** -
		Voltage: 24 V **Possible errors:** Actuator stopped	**Voltage**: 0 V **Possible errors:** -

Note: All diagnostics are displayed in red.

LED Display in Each Splitter Box

FTB 1DP16EP0, FTB 1DP08E08SP0 and FTB 1DP12E04SP0

The DO and DI Power LEDs appear in green when the connected power is > 5V. Where it is < 5V, the corresponding LED is off.

Errors	LED of the M12 connector No. x		Error LED	
	0x channel	1x channel	DI	DO
Under-voltage in detectors and bus			Red	
Under-voltage in actuator supply				Red
External error		Red		
Detector power supply short-circuit		Red	Red	
Actuator disconnection		Red		Red
Actuator warning		Red		

FTB 1DP16CP0

Unlike the above splitter boxes, the FTB 1DP16CP0 splitter boxes have two color LEDs for each of the 16 channels (red/yellow) for displaying status and diagnostics. The DO and DI Power LEDs appear in green when the connected power is > 5V. Where it is < 5V the corresponding LED is off.

Errors	LED of the M12 connector No. x		Error LED	
	0x channel	1x channel	DI	DO
Under-voltage in detectors and bus			Red	
Under-voltage in actuator supply				Red
External error		Red		
Detector power supply short-circuit	Red	Red	Red	
Actuator disconnection	Red	Red		Red
Actuator warning	Red	Red		

FTB 1DP08E08CM0 and FTB 1DP16CM0

Errors	LED of the M12 connector No. x		Error LED		Power LED	
	0x channel	1x channel	DO	DI	DO	DI
Under-voltage in detectors and bus				Red		
Under-voltage in actuator supply			Red			
Bus and detector power supply < 12 V				Red		Off
No actuator power supply			Red		Off	
External error		Red				
Detector power supply short-circuit	Red	Red				
Actuator disconnection	Red	Red		Red		
Actuator warning	Red	Red				

FTB 1DP16EM0

Errors	LED of the M12 connector No. x		Error LED		Power	
	0x channel	1x channel	DO	DI	DO	DI
Under-voltage in detectors and bus				Red		
Bus and detector power supply < 12 V				Red		Off
No actuator power supply			Red		Off	
External error		Red				
Detector power supply short-circuit	Red	Red				

7.2 Software Diagnostics

At a Glance

Software Diagnostics

The diagnostic data exchanged cyclically with the controller is read in the input memory. It must nevertheless be supported by the FTB splitter box used before being configured.

There follows a description of diagnostics data provided by the slave. The way data is accessed depends on the master used.

Refer to the master documentation for further information on reading the data.

Diagnostics Information

The diagnostics frame, more complete, is made available for the master and read on request in an asynchronous mode.

The frame provided is between 10 and 58 bytes in length, depending on the number of errors raised per channel. The frame includes 4 types of information (diagnostics):

- Standard information (6 bytes)
- Module or device information (2 bytes)
- Extended diagnostics information (2 bytes)
- Channel information (0 to 48 bytes)

The basic size of diagnostics information is 10 bytes. The additional size varies from 0 to 48 bytes per block of 3 bytes (3 bytes per channel).

⚠ CAUTION

RISK OF PRODUCT MALFUNCTION

Ensure that the "Diagnostic Lengh/in Bytes" field in the TSX PBY100 card configuration screen is maintained during the PROFIBUS master configuration. If this field is not maintained, the product may malfunction.

Failure to follow these instructions can result in injury or equipment damage.

What's in this Section?

This section contains the following topics:

Standard Diagnostics

Byte 0

Bit	Description
0	Diag.station_non_existent : No response from the slave. The bit is activated by the master DP, if the slave DP does not respond (for the collective diagnostic). The slave DP forces the bit to zero.
1	Diag.station_not_ready : Not ready for data exchange. The bit is activated by the DP slave if the DP slave is not ready for the data exchange.
2	Diag.cfg_Fault : Configuration fault. The bit is activated by the DP slave as soon as the latest configuration information received by the master does not correspond to that sent by the DP slave.
3	Diag.ext_diag : Extended diagnostic. The bit indicates a diagnostic input in the diagnostic area specific to the slave (Ext_Diag_Data).
4	Diag.not supported : Request for a non supported function. The bit is activated by the DP slave in case of a request that is not supported by the DP slave.
5	Diag. Invalid slave response : Invalid response. The bit is activated by the DP master as soon as it receives an inconsistent response from a polled DP slave. The slave DP forces the bit to zero.
6	Diag.prm_fault : Configuration error. The bit is activated by the DP slave in case of error in the last configuration telegram (e.g. invalid length, erroneous identification no., invalid parameter).
7	Diag.master_lock : Slave locked by another master. The DP slave has been configured by an other master. The bit is activated by the Requester if the address in byte 3 is different to FFH and its own address. The slave DP forces the bit to zero.

Byte 1

Bit	Description
0	Diag.Prm_req : Configuration request If the DP slave activates this bit, it must be reset and reconfigured. The bit stays active until it is reset.
1	Diag.Stat_diag : Diagnostics available. If the DP slave activates this bit, the DP master must receive the diagnostics data until the bit is once more deactivated. The DP slave activates the bit when for example it does not have useful valid data.
2	Fixed at 1: Diagnostics created by the slave. Set to 0 by the master if the slave diagnostic has not been obtained.
3	Diag.WD_ON : Watchdog activated. If the bit is set to 1, the monitoring of responses is activated.
4	Diag.freeze_mode : FREEZE mode. The bit is activated by the DP slave when it receives Freeze command.
5	Sync_mode : SYNC mode The bit is activated by the DP slave when it receives SYNC command.
6	Diag.Not_Present : Missing. The bit is activated by the DP master for the DP slaves not on the master settings frame. The slave DP forces the bit to zero.
7	Diag.deactivated : Deactivated. The bit is activated by the DP master when the DP slave is removed from the DP master settings frame. The DP slave still forces the bit to zero.

Byte 2

Bit	Description
0 to 6	Reserved
7	Diag.ext_overflow : This bit is activated if there is more diagnostic information than in Ext_Diag_Data. For example, the DP slave activates the bit if the number of diagnostics per channel exceeds its memory capacity. Or the DP master activates the bit if the DP slave sends more diagnostic information than the DP master can take into account in its memory.

Byte 3

Diag.master_add : The DP master address that has set the DP slave is saved in the byte. If the DP slave has not been set by any other DP master the slave saves the FFH address in the byte.

Bytes 4 and 5

For plastic splitter box: 0598H

For metal splitter box: 064AH

Device Diagnostics

Byte 6

Bit	Description
0 to 5	Define the block length in bytes (header included = 2))
6 to 7	00 (bin)

Byte 7

Bit	Description
0	Under-voltage in detectors and bus
1	Under-voltage in actuator supply
2	Reserved
3	Device error (connectors)
4	Device error connectors 0 to 3
5	Device error connectors 4 to 7
6	Reserved
7	Reserved

Extended Diagnostics

Byte 8

Block header-byte:

Bit	Description
0 to 5	Define the block length in bytes (header included = 2))
6 and 7	Fixed at 01 (bin)

Byte 9

Identification number:

Bit	Description
0 to 7	Fixed at 01H

Channel Diagnostics

First Byte

Channel diagnostics information, of 3 bytes in length, is generated for each channel by default. Header-byte = 80H

Second Byte

Table with information relative to byte 2

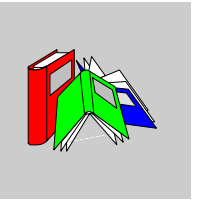
Bit	Meaning
7	The channel is an output
6	The channel is an input
0 to 5	Define the channel number

Third Byte

Table with information relative to byte 3. The byte value defines the type of error.

Byte value (hex)	Error
21	Detector and bus power supply short-circuit
37	Actuator supply warning
38	Actuator power supply disconnection
3A	External error

Glossary



A

Automatic addressing
An address is assigned automatically to each preferred island bus I/O module and device.

Automatic baud rate selection
Automatic assignment and detection of a common baud rate, as well as a device's capacity to adapt to this rate.

C

Configuration
The arrangement and connections made between the hardware components of a system, as well as the selected hardware and software options that determine the system's operating characteristics.

D

Discrete Input/ Output
Another expression used is discrete I/O. Designates an input or output featuring an individual circuit connection to the module corresponding directly to a bit or word of the data table storing the value of the signal on this I/O circuit. A discrete I/O gives the control logic discrete access to I/O values.

E

Electro-magnetic interference — *Electro-magnetic interference (EMI)* are liable to cause interruptions, anomalies or interference in the performance of electronic hardware. They occur when a source electronically transmits a signal that interferes with other devices.

EMC — *Electro-Magnetic Compatibility*. Devices that comply with EMC requirements are capable of error-free operation within the specified electro-magnetic limits of the system.

F

Fallback mode — A mode to which any splitter box can revert should the communication connection fail.

Fallback value — The value adopted by a device when it enters the fallback state. Generally, the fallback value is either configured, or is the device's last stored value.

G

GSD — *Generic Slave Data* file. A GSD file is a device description file supplied by the manufacturer, which defines the functionality of the device concerned on a PROFIBUS DP network.

I

I/O module — In a programmable control system, an I/O module communicates directly with sensors or actuators used in the machine or process. This module is the component that is installed in the I/O connection base and establishes the electrical connections between the controller and the fieldbuses. The functionalities common to all I/O modules are offered in a range of signal capacities and levels.

IEC *International Electrotechnical Commission.* Commission officially founded in 1906 and devoted to the advancement of theory and practice in the following sciences: electrical engineering, electronic engineering, information technology and computer engineering. The IEC 1131 standard covers industrial automation equipment.

IEC type 1 input Type 1 digital inputs support sensor signals from mechanical switching devices such as contact relays and push-buttons operating under normal climatic conditions.

IEC type 1+ input Type 1+ digital inputs support sensor signals from mechanical switching devices such as contact relays and push-buttons (under normal to moderate climatic conditions), three-wire proximity switches and two-wire proximity switches with the following characteristics:

- a voltage drop of less than or equal to 8 V
- a minimum operating current capacity of less than or equal to 2 mA
- a maximum current in blocked state of less than or equal to 0.8 mA

IEC type 2 input Type 2 discrete inputs support sensor signals from solid-state devices and mechanical switching devices such as relay contacts, push-buttons (under normal to rigorous climatic conditions), and two or three-wire proximity switches.

Input filter The period for which a sensor must keep its signal activated/deactivated before the input module detects a change of state.

Input polarity The polarity of an input channel determines when the input module sends a 1 (one) and when it sends a 0 (zero) to the master controller. If the polarity is *normal*, an input channel will send a 1 (one) to the controller as soon as its fieldbus sensor is activated. If the polarity is *reversed*, an input channel will send a 0 (zero) to the controller as soon as its field bus sensor is activated.

L

LSB *Least Significant Byte.* The part of a number, address or field that is written as the value furthest to the right in conventional hexadecimal or binary notation.

LSb *Least Significant Bit.* The part of a number, address or field that is written as the value furthest to the right in conventional hexadecimal or binary notation.

M

Master/slave model — In a network using a master/slave model, the direction of control is always from the master to slave devices.

MSB — *Most Significant Byte*. The part of a number, address or field that is written as the value furthest to the left in conventional hexadecimal or binary notation.

MSb — *Most Significant Bit.* The part of a number, address or field that is written as the value furthest to the left in conventional hexadecimal or binary notation.

N

N.C. contact — Designates a *normally closed* contact. Also called break contacts. A pair of relay contacts that is closed when the relay coil is low and open when it is energized.

N.O. contact — Designates a *normally open* contact. Also called make contacts. A pair of contact relays that is open when the relay coil is low and closed when it is energized.

O

Output filter — The time it takes for an output channel to transmit change of state information to an actuator once the output module has received updated data from the NIM.

Output polarity — The polarity of an output channel determines when the output module activates its fieldbus actuator and when it deactivates. If the polarity is *normal*, an output channel will activate its actuator as soon as the master controller sends it the value 1. If the polarity is *reversed*, an output channel will activate its actuator as soon as the master controller sends it the value 0.

P

PE — *Protective Earth* in English, Ground.

PLC *In English: PLC or Programmable Logic Controller.* The PLC is the nerve center of the industrial manufacturing process. Such a device is said to "automate a process", in contrast to a relay control system. These PLCs are in fact simply computers designed to survive under the sometimes harsh conditions of an industrial environment.

Process image Section of NIM firmware used to store real-time data for the data exchange process. The process image includes an input buffer that contains current state information and data from the island bus, and an output buffer that groups all current outputs from the island bus as they are received from the field bus master.

PROFIBUS DP *PROFIBUS Decentralized Peripheral.* An open bus system that uses an electrical network based on a shielded two-wire cable or an optical network based on a fiber optic cable. DP transmission is designed to enable high-speed cyclical exchange of data between the PLC processor and distributed I/O devices.

R

Repeater A connection device that extends the authorized length of a bus.

Reverse polarity protection In a circuit, use of a diode to protect against damage and any inadvertent operations that may be caused if the polarity of the applied power is accidentally reversed.

S

Segment Designates a group of I/O modules and power modules connected together on an island bus.

Sink load (or positive logic load) Designates an output which, when activated, receives DC current from its load.

Source load Also called a negative logic load. Designates a load with a directed input current. This load must come from a current source.

Suppression of over-voltage Process consisting of absorbing and limiting transient over-voltage on an incoming AC line or a control circuit. Specially designed metal oxide limiters (varistors) and RC networks are frequently used as over-voltage suppression mechanisms.

T

Telegram A data packet used in serial communications.

V

Varistor Also known as a limiter. This is a two-electrode semi-conductor device with a non-linear varistance that causes a considerable drop as the applied voltage gradually increases. A varistor is used to remove transient over-voltages.

W

Watchdog timer Tracking clock that controls a cyclical process and which is cleared at the end of each cycle. The watchdog timer generates an error when it exceeds the assigned delay time.

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