

INSTALLATION DOCUMENT PACKAGE

Installation Instructions

SIEMENS SIMATIC S7

6ES7157-0AC83-0XA0

FDC 157-0 DP/PA COUPLER

Applicable product family: SIMATIC process fieldbus networks

OFFICIAL SOURCE

6ES7157-0AC83-0XA0.pdf

The following pages are selected from the supplied manufacturer document and retain their original page content.

SIMATIC

Bus links

DP/PA coupler, DP/PA link and Y link

Operating instructions



The following supplement is part of this documentation:

No.	Product Information	Drawing number	Edition
1	Standards and approvals	A5E01200465-02	11/2007
2	DP/PA Link and Y Link bus links IM 153-2 Interface Module	A5E01208363-01	08/2007

Preface

Product Overview

1

Description of the components

2

Application planning

3

Mounting

4

Connecting

5

Commissioning: DP/PA coupler

6

Commissioning: DP/PA link

7

Commissioning: Y link

8

Operation of the DP/PA-Link and Y-Link

9

Maintenance and service

10

Functions

11

Interrupt, error and system messages

12

Technical specifications

13

Order numbers

A

Basics about PROFIBUS PA

B

Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.



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Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.



Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

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Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:



Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Preface

Purpose of the operating instructions

These operating instructions provide all required information to configure, mount, wire, and commission the DP/PA coupler and the DP/PA link and Y link bus couplings.

Basic knowledge required

To understand these operating instructions you should have general experience in the field of automation engineering.

Range of validity of these operating instructions

These operating instructions apply for the following products:

- IM 153-2: 6ES7153-2BA01-0XB0 and 6ES7153-2BA81-0XB0
- DP/PA coupler FDC 157-0: 6ES7157-0AC83-0XA0
- DP/PA coupler: 6ES7157-0AC82-0XA0
- DP/PA coupler Ex [i]: 6ES7157-0AD81-0XA0 and 6ES7157-0AD82-0XA0
- Y coupler: 6ES7197-1LB00-0XA0
- Bus module BM PS/IM: 6ES7195-7HA00-0XA0
- Bus module BM IM/IM: 6ES7195-7HD10-0XA0
- Bus module BM IM/IM: 6ES7195-7HD80-0XA0
- Bus module BM FDC 157-0: 6ES7195-7HG80-0XA0
- Bus module BM; DP/PA coupler: 6ES7195-7HF80-0XA0
- Bus module BM Y coupler: 6ES7654-7HY00-0XA0
- Active Field Distributor (AFD): 6ES7157-0AF81-0XA0
- Active Field Splitter (AFS) 6ES7157-0AF82-0XA0
- Complete package of the above components: 6ES7197-1LA03-0XA0

These operating instructions contain a description of the components that was valid at the time the operating instructions were published. We reserve the right to include product information with information updates with new components and components with a new product status.

Changes compared to the previous version

The following changes have been made relative to the predecessor version of these operating instructions *Bus couplings DP/PA link and Y link* with the drawing number A5E00193840-15, version 02/2006:

- New components:
 - DP/PA coupler FDC 157-0: 6ES7157-0AC83-0XA0
The DP/PA coupler FDC 157-0 replaces the previous DP/PA coupler.
 - Bus module BM FDC 157-0: 6ES7195-7HG80-0XA0
 - Active Field Distributor (AFD): 6ES7157-0AF81-0XA0
 - Active field splitter (AFS) 6ES7157-0AF82-0XA0
- New functionalities:
 - Diagnostic capability
 - Ring redundancy
 - Coupler redundancy

Configure with **STEP 7**

The DP/PA coupler FDC 157-0 can be configured with *STEP 7* from V 5.3 SP3 and HSP0095.

The bus couplings DP/PA link and Y link can be configured with *STEP 7* from V 5.4.

Position in the overall information structure

Depending on the hardware used you require the following manuals in addition to these operating instructions:

- The manual for the implemented DP master, including the following special information:
 - Configuring and commissioning of a DP master system
 - Description of the DP master
- The *SIMATIC NET, PROFIBUS Networks* manual (order number 6GK1970-5CA10-0xA0)
- The *S7-300 Automation System, Hardware and Installation manual: CPU 312 IFM - 318-2 DP* (order number 6ES7398-8FA10-8xA0)
- The *S7-300, ET 200 M Ex peripheral modules automation systems* manual (order number 6ES7398-8RA00-8xA0), particularly the special information on the topics of intrinsic safety and explosion protection.

Sign posts

These operating instructions are subdivided into the following subjects:

- Product overview and description of the components
- Mounting, connecting and commissioning
- Operation and diagnostics
- Technical data
- Appendices
- Important terms are explained in the glossary.
- The index helps you to quickly find all texts relevant to your keyword.

Recycling and disposal

The described components are ecologically compatible, and thus suitable for recycling. For environmentally sound recycling and disposal of your old devices please contact a certified disposal service company for electronic scrap.

Contacts

See production information *Technical Support, Contacts and Training*.

You will find the documentation online at:

<http://support.automation.siemens.com>

Look for item number 19293011.

Training

See production information *Technical Support, Contacts and Training*.

SIMATIC Technical Support

See production information *Technical Support, Contacts and Training*.

Service & support on the Internet

See production information *Technical Support, Contacts and Training*.

Table of contents

	Preface	iii
1	Product Overview	1-1
1.1	Bus links	1-1
1.2	Integration in the automation environment	1-2
1.2.1	What are distributed I/O devices?	1-2
1.2.2	DP/PA coupler FDC 157-0	1-3
1.2.3	DP/PA coupler / DP/PA Ex [i] coupler	1-4
1.2.4	DP/PA link	1-5
1.2.5	Y link	1-6
2	Description of the components	2-1
2.1	DP/PA coupler FDC 157-0	2-1
2.2	DP/PA coupler / DP/PA Ex [i] coupler	2-3
2.3	Y coupler	2-4
2.4	IM 153-2	2-5
2.5	DP/PA link	2-5
2.6	Y link	2-8
2.7	Active field distributor (AFD)	2-10
2.8	Active field splitter (AFS)	2-11
2.9	Changes relative to predecessor modules	2-12
2.10	Compatibility with predecessor modules	2-12
3	Application planning	3-1
3.1	Installation variants with the DP/PA coupler FDC 157-0	3-1
3.1.1	Installation variants	3-1
3.1.2	DP/PA coupler in non-redundant mode	3-2
3.1.3	DP/PA coupler in redundancy mode	3-4
3.1.3.1	Ring redundancy with active field distributor (AFD)	3-4
3.1.3.2	Coupler redundancy with active field splitter (AFS)	3-6
3.1.3.3	Redundancy mode of the DP/PA coupler in the DP/PA link	3-8
3.1.3.4	Redundancy mode of the DP/PA coupler in the redundant DP/PA link	3-9
3.1.3.5	Combination of non-redundant and redundant DP/PA couplers	3-10
3.2	Installation variants with the IM 153-2	3-12
3.2.1	Configuration variants	3-12
3.2.2	Detecting the configuration variant by means of the IM 153-2	3-13

4	Mounting	4-1
4.1	Mounting rules for bus couplings	4-1
4.2	Mounting rules for active field distributors	4-3
4.3	Mounting the DP/PA coupler	4-3
4.3.1	Mounting DP/PA coupler for non-redundant mode	4-3
4.3.2	Mounting the DP/PA coupler for redundancy mode	4-4
4.3.3	Swapping DP/PA couplers FDC 157-0	4-5
4.4	Mounting active field distributors	4-6
4.4.1	Screw the active field distributor to the substrate	4-6
4.4.2	Mounting active field distributors on the mounting rail	4-7
4.5	Mounting the DP/PA link	4-8
4.5.1	Mounting the DP/PA link for non-redundant mode	4-8
4.5.2	Mounting the DP/PA link for redundant operation	4-9
4.6	Mounting the Y link	4-11
4.7	Setting the PROFIBUS address of the IM 153-2	4-13
5	Connecting	5-1
5.1	Electrical isolation and grounding	5-1
5.1.1	General Rules and Regulations for Operation	5-1
5.1.2	Earthing the field distributor	5-3
5.1.3	Operating with grounded supply	5-4
5.1.4	Operation with ungrounded reference potential	5-5
5.2	Connecting DP/PA couplers	5-6
5.2.1	Wiring the DP/PA coupler for stand-alone mode	5-6
5.2.2	Connecting DP/PA couplers for ring redundancy	5-7
5.2.2.1	Connections for ring redundancy	5-7
5.2.2.2	Connecting the PROFIBUS PA to the active field distributor (AFD)	5-8
5.2.2.3	Connecting the wiring to the terminal block	5-10
5.2.2.4	Pin assignment for active field distributor (AFD)	5-10
5.2.3	Connecting DP/PA couplers for coupler redundancy	5-12
5.2.3.1	Connections for coupler redundancy	5-12
5.2.3.2	Connecting the PROFIBUS PA to the active field splitter (AFS)	5-13
5.2.3.3	Connecting the wiring to the terminal block	5-15
5.2.3.4	Pin assignment for active field splitter (AFS)	5-15
5.3	Connecting the DP/PA link	5-17
5.3.1	Wiring the DP/PA link for non-redundant mode	5-17
5.3.2	Wiring the DP/PA link for redundant operation	5-18
5.4	Connecting Y link	5-19
5.5	Connecting the Voltage Supply	5-20
5.6	Connecting PROFIBUS DP	5-21
5.7	Connecting PROFIBUS PA on the DP/PA coupler	5-22

6	Commissioning: DP/PA coupler	6-1
6.1	Commissioning the DP/PA coupler for stand-alone mode	6-1
6.2	Commissioning the DP/PA coupler FDC 157-0	6-1
6.3	Configuration with a GSD file	6-3
6.4	Configuring with STEP 7	6-4
6.5	DP/PA coupler FDC 157-0 in the redundant DP/PA link	6-6
6.6	Parameters for diagnostic selection of the DP/PA coupler FDC 157-0	6-8
6.7	Setting the PROFIBUS address and redundancy mode	6-8
7	Commissioning: DP/PA link	7-1
7.1	Commissioning DP/PA link	7-1
7.2	Configuring for S7 standard or redundant mode	7-2
7.2.1	Configuring DP/PA link	7-2
7.2.2	Configuring the PROFIBUS PA master system	7-4
7.3	Configuring for DP standard master mode	7-5
7.3.1	GSD files	7-5
7.3.2	Configuring DP/PA link	7-6
7.3.3	How to configure PROFIBUS PA field devices	7-7
8	Commissioning: Y link	8-1
8.1	Commissioning Y link	8-1
8.2	Configuring for the redundant mode	8-2
8.2.1	How to configure Y link	8-2
8.2.2	Configuring underlying DP slaves	8-4
8.3	Configuring for DP standard master mode	8-5
8.3.1	GSD files	8-5
8.3.2	How to configure Y link	8-6
8.3.3	Configuring underlying DP slaves	8-6
9	Operation of the DP/PA-Link and Y-Link	9-1
9.1	Start-up delay	9-1
9.2	Behavior after certain events in the redundant mode	9-2
9.3	Starting behavior	9-3
9.3.1	Starting behavior of the DP/PA link in non-redundant mode	9-3
9.3.2	Starting behavior in redundant mode	9-4
10	Maintenance and service	10-1
10.1	Replacing IM 153-2 or Y couplers	10-1
10.2	Replacing DP/PA couplers	10-2
10.3	Replacing active field distributors	10-3
10.4	Firmware update	10-4
10.4.1	When should you update the IM 153-2?	10-4
10.4.2	How to update the IM 153-2Bxx1	10-4
10.5	Maintenance	10-6

13	Technical specifications	13-1
13.1	General technical specifications	13-1
13.1.1	Standards and Approvals.....	13-1
13.1.2	Standards and approvals of the DP/PA Ex [i] coupler (6ES7157-0AD81-0XA0)	13-5
13.1.3	Standards and approvals of the DP/PA Ex [i] coupler (6ES7157-0AD82-0XA0)	13-6
13.1.4	Standards and approvals of the active field distributors (AFD) and splitters (AFS)	13-8
13.1.5	Use in zone 2 potentially explosive areas.....	13-10
13.1.6	Electromagnetic Compatibility.....	13-10
13.1.7	Shipping and storage conditions.....	13-12
13.1.8	Mechanical and climatic ambient conditions for operation	13-13
13.1.9	Specifications for insulation tests, protection class and degree of protection	13-15
13.1.10	Rated voltage	13-16
13.2	Technical specifications of the IM 153-2 (6ES7153-2Bxx1-0XB0)	13-16
13.3	Technical data DP/PA coupler FDC 157-0 (6ES7157-0AC83-0XA0).....	13-17
13.4	Technical specifications for DP/PA Ex [i] coupler (6ES7157-0AD81-0XA0, 6ES7157-0AD82-0XA0)	13-18
13.5	Technical specifications for DP/PA coupler (6ES7157-0AC82-0XA0)	13-20
13.6	Technical specifications Y coupler (6ES7197-1LB00-0XA0).....	13-21
13.7	Technical data - active field distributor (AFD) (6ES7157-0AF81-0XA0).....	13-22
13.8	Technical data - active field splitter (AFS) (6ES7157-0AF82-0XA0)	13-23
A	Order numbers	A-1
A.1	Components of the bus couplings.....	A-1
A.2	Accessories for PROFIBUS DP	A-2
A.3	Accessories for PROFIBUS PA	A-3
B	Basics about PROFIBUS PA	B-1
B.1	Intrinsic safety	B-1
B.2	Field device supply via PROFIBUS PA	B-3
B.3	Configuration of PROFIBUS PA with the DP/PA link bus coupler.....	B-4
B.4	Line and star-type topology.....	B-5
	Glossary	Glossary-1
	Index.....	Index-1

Product Overview

1.1 Bus links

DP/PA coupler

The DP/PA coupler is the physical link between PROFIBUS DP and PROFIBUS PA. In stand-alone operation it offers the possibility of addressing PA field devices via PROFIBUS DP. No other components are required for this.

The DP/PA coupler is also used for more advanced coupling tasks in the DP/PA link.

The DP/PA coupler Ex [i] is available for connecting PA field devices in explosion protected environments.

DP/PA coupler FDC 157-0

The DP/PA coupler FDC 157-0, FDC stands for "Field Device Coupler" has PROFIBUS-DP diagnostic functions as DP slave.

Using a DP/PA coupler pair and field distributors enables redundant operation on an equipotential bonding line in 2 variants:

- Ring redundancy with the active field distributor (AFD)
- Coupler redundancy with the active field splitter (AFS)

The DP/PA coupler FDC 157-0 can be used stand-alone or in the DP/PA link in this regard

DP/PA link

The DP/PA link consists of one or two IM 153-2 interface modules, and one to five DP/PA couplers that are either connected with one another via passive bus couplers or via bus modules.

The DP/PA link creates a network transition from a PROFIBUS DP master system to PROFIBUS PA. In this case the two bus systems are non-interacting through the IM 153-2 both physically (galvanically) and in terms of protocols and time.

By using two IM 153-2 interface modules, the entire underlying PROFIBUS PA master system can be connected to a redundant DP master system of an S7-400H as switched peripherals. For this purpose installation is always executed with bus modules.

Y link

The Y link comprises two IM 153-2 interface modules and a Y coupler that are connected to one another via bus modules.

The Y link creates a network transition from the redundant DP master system of an S7-400H to a non-redundant DP master system. This means that devices with only one PROFIBUS DP interface can be connected to a S7-400H as switched peripherals.

1.2 Integration in the automation environment

1.2.1 What are distributed I/O devices?

Distributed I/O Devices - Field of Application

When a system is configured, the I/Os from and/or to the process are often integrated centrally in the automation system.

In the case of greater distances of the inputs and outputs from the automation system the wiring may be very extensive and confusing. Electromagnetic interference may impair reliability.

Distributed I/O is suitable for use with systems of this kind.

- The PROFIBUS DP master is located in a central position.
- The distributed I/O devices (inputs and outputs) work at their decentral locations.
- With its high transmission speeds the high power PROFIBUS DP ensures that the control system CPU and the distributed I/O devices communicate smoothly.

What is PROFIBUS DP?

PROFIBUS DP is an open bus system conforming to IEC 61784-1:2002 Ed1 CP 3/1 with the "DP" transmission protocol (DP stands for distributed I/O).

Physically PROFIBUS[®]DP is implemented either as an electrical network based on shielded twisted-pair cables, or as an optical network based on fiber optic cable.

The "DP" transmission protocol facilitates very fast cyclical data exchange between the control system CPU and the distributed I/O devices.

What is PROFIBUS PA?

PROFIBUS PA is the communication-compatible extension of PROFIBUS DP to include a transmission technology that also permits applications in potentially explosive areas. Transmission from PROFIBUS PA conforms to the international IEC 61784-1:2002 Ed1 CP 3/2 standard.

PROFIBUS PA enables transducers and control devices in potentially explosive areas to communicate with the automation system over long distances. With the PROFIBUS PA the field devices can be fed via the data lead at the same time.

The following components are available for the transition of the transmission technology of PROFIBUS DP (IEC 61784-1:2002 Ed1 CP 3/1) to PROFIBUS PA (IEC 61784-1:2002 Ed1 CP 3/2):

- DP/PA coupler in stand-alone mode
- DP/PA link

Description of the components

2.1 DP/PA coupler FDC 157-0

Applications

The DP/PA coupler FDC 157-0 is designed for the following applications:

- Non-redundant operation:
 - Stand-alone operation without additional components
 - Replacement for the DP/PA coupler with order number 6E7157-0AC82-0XA0
 - Operation in the DP/PA link on a simple DP master system or on an S7-400H
- Redundant operation:
 - Ring redundancy when using the AFD
 - Coupler redundancy when using the AFS
 - Operation in the DP/PA link on a simple DP master system or on an S7-400H

Availability

- Increased availability through ring redundancy and coupler redundancy
- Automatic isolation of defective partial segments including automatic bus termination
- Repair and extension of the bus segment is possible in during operation

Commissioning

- Simplified commissioning through extended diagnostic possibilities and automatic bus termination.

Properties

The DP/PA coupler FDC 157-0 is designed for the following applications:

- Electrical isolation between PROFIBUS DP and PROFIBUS PA
- Implementation of the transmission physics between RS 485 and symmetric bus physics in accordance with IEC IEC 61784-1:2002 Ed1 CP 3/2
- DP slaves: adjustable PROFIBUS address 1 to 125 via DIL switch
- Diagnostics via LEDs
- Diagnostics function via PROFIBUS DP:
 - Current value or voltage value as user data
 - Local LifeList
 - Wire-break/short circuit
- Selection of the redundancy mode via DIL switch
- Transmission rate of 45.45 kBaud on PROFIBUS DP
- Transmission rate of 31.25 kBaud on PROFIBUS PA
- Integrated supply unit for PROFIBUS PA
- Integrated bus terminator for PROFIBUS PA
- Extended environmental conditions

Configuration

The DP/PA coupler FDC 157-0 can be used as a stand-alone device on all DP masters that support 45.45 kBaud.

DP/PA coupler FDC 157-0 configuration as DP slave is required in the following cases:

- If the diagnostic functions will be effective.
- If the DP/PA couplers will be operated with ring redundancy or coupler
- redundancy.

Note

If you use the IM 153-2 together with the DP/PA couplers as DP/PA link, in this case the PROFIBUS DP connections to the DP/PA couplers are not required. The IM 153-2 and the DP/PA couplers are connected via the S7 backplane bus.

See also

Changes relative to predecessor modules (Page 2-12)

Note**Redundancy mode**

If you would like to use the DP/PA coupler FDC 157-0 with ring redundancy then you must use the BM FDC 157-0 bus module.

Bus module BM FDC 157-0

The bus module BM FDC 157-0 with order number 6ES7195-7HG80-0XA0 can only be used together with the DP/PA coupler FDC 157-0 with order number 6ES7157-0AC83-0XA0.

Compatibility of the IM 153-2

The IM 153-2BA81-0XB0 can be used as a spare part for all IM 157s. This means that configuration can then also be performed with an older version of *STEP 7*. The specifications in the documentation on the replaced IM 157 apply.

Rule:

If the IM 153-2BA81 is configured as IM 157-0AA81-, you then require the bus module, BM IM/IM 6ES7195-7HE80-0XA0.

If the IM 153-2BA81 is configured as IM 157-0AA82-, you require the bus module, BM IM/IM 6ES7195-7HD80-0XA0.

Compatibility of the IM 157

The IM 157 with order number -0AA82- can be used as a spare part for all preceding modules. This means that configuration can then also be performed with an older version of *STEP 7*. The specifications in the documentation on the replaced IM 157 apply.

Rule:

If the IM 157 is configured as ...0AA81-, you then require the bus module, BM IM/IM 6ES7195-7HE80-0XA0.

If the IM 157 is configured as ... 0AA82-, then you require the bus module, BM IM/IM 6ES7195-7HD80-0XA0.

Arrangement rules

If configured accordingly, you can operate the combinations of IM 153-2 and IM 157 interface modules listed in the table compatibly on active BM /IM bus modules.

Table 2-1 Compatible product statuses of interface modules IM 153-2 and IM 157.

If the redundant interface modules are configured as	... and the interface modules are plugged in on the active busmodule 6ES7195-,	then the following interface modules can be operated compatibly:
IM 157-0AA81	7HE80-0XA0	IM 157-0AA81 IM 157-0AA82 IM 153-2BA81
IM 157-0AA82	7HD80-0XA0	IM 157-0AA82 IM 153-2BA81
IM 153-2BA01	7HD10-0XA0 7HD80-0XA0	IM 153-2BA01 IM 153-2BA81
IM 153-2BA81	7HD80-0XA0	IM 153-2BA81

PA bus terminator switch

You can loop through the PROFIBUS PA on DP/PA couplers with a PA bus terminator switch. The PA bus terminator switch is available on the following DP/PA couplers:

- DP/PA coupler FDC 157-0 (6ES7157-0AC83-0XA0)
- DP/PA coupler (6ES7157-0AC82-0XA0)

In the DP/PA coupler Ex [i] the bus terminator cannot be switched off. Consequently the DP/PA coupler Ex [i] must be located at the beginning or the end of a PA segment.

DP/PA coupler

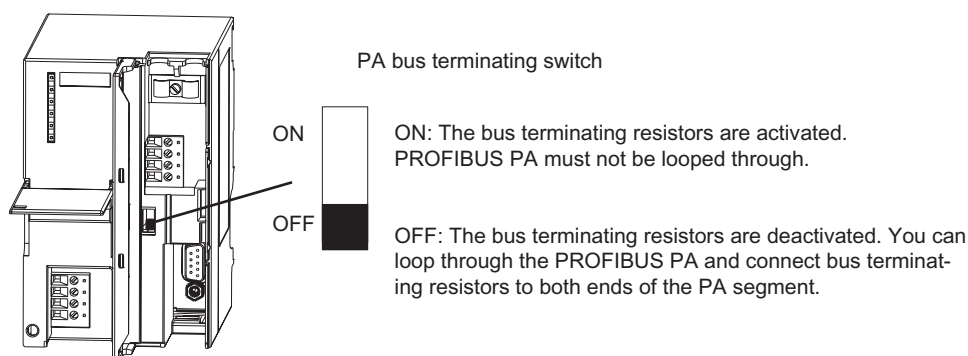
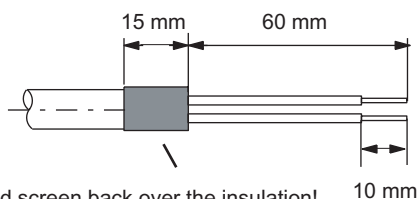


Figure 5-12 PA bus terminator switch

Procedure

Connect the PROFIBUS PA as follows:

1. Strip the insulation from the bus cable as depicted and pull the braided shield over the insulation.



2. Clamp the shield of the bus cable under the cable grip and screw down the cable grip.
3. Fix the wires of the bus lead into the screw-type terminals P+ and P-. Ensure that the wires have the correct polarity.

Compatibility test, mechanical environmental conditions

The table below provides information on the type and scope of the test of mechanical environmental conditions.

Table 13-6 Test of mechanical environmental conditions

Test for ...	Test standard	Remarks
Vibration	Vibration test in compliance with IEC 60068 Part 2-6 (Sine)	Type of oscillation: Frequency cycles at a rate of change of 1 octave per minute. $10 \text{ Hz} \leq f \leq 58 \text{ Hz}$, constant amplitude 0.075 mm $58 \text{ Hz} \leq f \leq 150 \text{ Hz}$, constant acceleration 1 g Duration of oscillation: 10 frequency cycles per axis in each of the 3 mutually perpendicular axes
Shock	Shock test in compliance with IEC 60068 Part 2-29	Type of shock: half-sine Severity of shock: 15 g peak value, 11 ms duration Direction of shock: 3 shocks each in the +/- direction in each of the 3 mutually perpendicular axes

Climatic environmental conditions

The described components may be operated under the following climatic ambient conditions:

Table 13-7 Climatic environmental conditions

Ambient conditions	Permissible range	Remarks
Temperature: horizontal installation vertical installation	from 0 to 60 °C from 0 to 40 °C	IM 153-2 (6ES7153-2BA01-0XB0) Y coupler 6ES7197-1LB00-0XA0 Bus module BM IM/IM 6ES7195-7HD10-0XA0 Bus module BM Y coupler 6ES7654-7HY00-0XA0
Temperature: horizontal installation vertical installation	from -25 to 60 °C from -25 to 40 °C	IM 153-2 Outdoor 6ES7153-2BA81-0XB0 DP/PA coupler FDC 157-0 6ES7157-0AC83-0XA0 DP/PA coupler 6ES7157-0AC82-0XA0 DP/PA coupler Ex [i] 6ES7157-0AD81-0XA0 6ES7157-0AD82-0XA0 Bus module BM IM/IM 6ES7195-7HD80-0XA0 Bus module BM DP/PA coupler 6ES7195-7HF80-0XA0 Bus module BM FDC157-0 6ES7195-7HG80-0XA0
Temperature: any installation	from -25 to 70 °C	Active field distributor (AFD) 6ES7157-0AF81-0XA0 Active field splitter (AFS) 6ES7157-0AF82-0XA0

13.3 Technical data DP/PA coupler FDC 157-0 (6ES7157-0AC83-0XA0)

Status, interrupts, diagnostics	
Status display	No
Interrupts	Yes
Diagnostic function	Yes
• Group error	Red LED "SF"
• Bus error on higher level DP master system	Red LED "BF 1"
• Bus error on underlying bus system	Red LED "BF 2"
• IM has an active channel	Yellow LED "ACT"
• Monitoring 24 V voltage supply	Green "ON" LED
Data for connecting underlying bus components	
DP/PA coupler can be connected	Max. 5
Y coupler can be connected	1
Underlying slaves can be connected	Max. 64
Number of slots in underlying slaves	max. 236 or (244 minus number of PA field devices)

13.3 Technical data DP/PA coupler FDC 157-0 (6ES7157-0AC83-0XA0)

Dimensions and weight	
Dimensions W x H x D (mm)	80 x 125 x 130
Weight	Approx. 515 g
Module-specific data	
Transmission speed on PROFIBUS DP	45.45 kBaud
Transmission speed on PROFIBUS PA	31.25 kBaud
Bus protocol	PROFIBUS DP
Voltages, currents, potentials	
Nominal power supply voltage	DC 24 V (20.4 V ... 28.8 V)
• Reverse polarity protection	Yes
• Overvoltage protection	Yes
Output voltage for PA segment:	DC 31 V $\pm$ 1 V
• Voltage monitoring	15.5 V
• Overvoltage monitoring	U > 35 V; holding switch-off
• Power failure bypass	min. 5 ms
Galvanic isolation of the 24 V power supply	
• PROFIBUS DP / PROFIBUS PA	Yes
• PROFIBUS DP / power supply	Yes
• PROFIBUS PA / power supply	Yes
• All electric circuits / FE	Yes
Isolation test voltage	500 V DC
DP/PA coupler power consumption (24 V DC)	max. 2.3 A

Order numbers

A.1 Components of the bus couplings

Components of the bus couplings

Table A-1 Order numbers for the components of the bus couplers

Component	Order number
IM 153-2	6ES7153-2BA01-0XB0
IM 153-2 Outdoor	6ES7153-2BA81-0XB0
DP/PA coupler FDC 157-0	6ES7157-0AC83-0XA0
DP/PA coupler	6ES7157-0AC82-0XA0
DP/PA coupler Ex [i]	6ES7157-0AD81-0XA0
DP/PA coupler Ex [i]	6ES7157-0AD82-0XA0
Y coupler	6ES7197-1LB00-0XA0
Bus module BM PS/IM	6ES7195-7HA00-0XA0
Bus module BM IM/IM	6ES7195-7HD10-0XA0
Bus module BM IM/IM Outdoor	6ES7195-7HD80-0XA0
Bus module BM DP/PA coupler	6ES7195-7HF80-0XA0
Bus module BM FDC 157-0 (left/right bus module)	6ES7195-7HG80-0XA0
Bus module BM Y coupler	6ES7654-7HY00-0XA0
Active Field Distributor (AFD)	6ES7157-0AF81-0XA0
Active Field Splitter (AFS)	6ES7157-0AF82-0XA0
Complete package Y link, consisting of:	
• 2 x IM 157 • 1 x bus module BM IM/IM • 1 x Y coupler • 1 x bus module BM Y coupler:	6ES7197-1LA02-0XA0
• 2 x IM 153-2 • 1 x bus module BM IM/IM • 1 x Y coupler • 1 x bus module BM Y coupler:	6ES7197-1LA03-0XA0