

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

SIEMENS

6ES7157-0AF81-0XA0

ACTIVE PROFIBUS PA FIELD DISTRIBUTOR

Used with the applicable SIMATIC DP/PA AFD configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Siemens DP/PA coupler, DP/PA link and Y link, A5E00193841-16, 10/2006; AFD technical data p.13-22

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.



Danger

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



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

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

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.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

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.

2.7 Active field distributor (AFD)

Active field distributor (AFD)

PA field devices, e.g. measuring instruments, sensors and actuators, can be connected to the active field distributor (AFD).

In conjunction with 2 DP/PA couplers FDC 157-0 the active field distributor (AFD) enables operation of **ring redundancy**. In this case a maximum of 8 active field distributors (AFD) connect 2 DP/PA couplers with the PA field devices. You can connect up to 4 PA field devices to one active field distributor (AFD). The total number of PA field devices on the equipotential bonding line is 31 devices and it is limited by 1 A maximum current.

Functions

- Connection of field devices for PROFIBUS PA
- Automatic bus termination
- Isolation of defective PA segments
- Connection of isolated PA segments after fault rectification
- Extending a PA segment during operation

Properties

- 2 cable glands for the PA main line
- 4 cable glands for 4 PA field devices
- Connection of the PROFIBUS PA main line and the PA spur lines via the cage-clamp method
- Reverse polarity protection connections
- Diagnostics via LEDs
- Power supply via the PA bus
- Screw gland on substrate or mount with adapter on mounting rail
- Degree of protection IP66
- Grounding terminal outside

See also

Ring redundancy with active field distributor (AFD) (Page 3-4)

Screw the active field distributor to the substrate (Page 4-6)

Mounting active field distributors on the mounting rail (Page 4-7)

Connecting the PROFIBUS PA to the active field distributor (AFD) (Page 5-8)

4.2 Mounting rules for active field distributors

Mounting position

The AFDs and AFSs can be mounted as desired.

Mounting system

The active AFDs and AFSs can be screwed onto a level surface, or with an adapter they can be mounted on a mounting rail.
Free space of 60 mm must be maintained above and below the modules for trouble-free mounting.

4.3 Mounting the DP/PA coupler

4.3.1 Mounting DP/PA coupler for non-redundant mode

Components required

- Mounting rail for the S7 mounting system
- DP/PA coupler

Mounting the DP/PA coupler

Note

If you operate multiple DP/PA couplers in one rack in stand-alone mode without ring redundancy and coupler redundancy, then you cannot connect the DP/PA coupler via bus connector nor can you connect it via bus modules.

1. Hook the DP/PA coupler into the S7 mounting rails and swing it down.
2. Screw the DP/PA coupler tight.

Dismantling the DP/PA coupler

Remove the DP/PA coupler in the reverse sequence.

If the DP/PA coupler is already in operation, switch off the 24 V DC power supply for the DP/PA coupler prior to removal.

4.4 Mounting active field distributors

4.4.1 Screw the active field distributor to the substrate

Prerequisite

- The substrate must be level, with load-bearing capacity, and it must be vibration free.
- Select appropriate fixing accessories for the substrate.
- Ensure that there is free space of 60 mm both to the side and below the modules for connecting the PA main lines and spur lines.

Tools required

- Cross-tip screwdriver size 4
- 2 fixing screws M4; dowels depending on the substrate
- Screwdriver suitable for the screws used

Procedure

1. Remove the 4 screws of the housing cover using a crosstip screwdriver.
2. Screw the lower part of the enclosure tightly to the substrate with two fixing screws. The torque depends on the fixing screws used.
3. Screw the lid onto the upper part of the enclosure with the 4 cross-tip screws. Torque 2.0 Nm.

See also

Active field distributor (AFD) (Page 2-10)

Active field distributor (AFS) (Page 2-11)

5.2.3.3 Connecting the wiring to the terminal block.

Introduction

Connect the wiring of the PROFIBUS PA cable to the terminal block in the active field distributor via the cage-clamp method.

Tools required

- Screwdriver with 3 mm blade

Fixing the wiring on the cage-clamp contact

Caution

The cage-clamp will be destroyed if handled incorrectly

The cage-clamp will be destroyed if you insert the screwdriver into the opening for the wiring. Only insert the screwdriver in the **rectangular openings** of the terminal block.

-
1. With a screwdriver press the cage-clamp in the rectangular opening down, and keep it depressed. Ensure that the wires have the correct polarity.
 2. Insert the wiring into the round opening of the appropriate cage-clamp until the stop.
 3. Remove the screwdriver from the cage-clamp. The wiring is held in place by the cage-clamp contact.

5.2.3.4 Pin assignment for active field splitter (AFS)

Connection rules

Note

Shield connection

If you use the cable glands of the active field distributor then the shield connection via the terminal S is not required.

Caution

Failure of the equipotential bonding line

Inadvertent insertion of the PA+/PA- wiring in the terminal S can result in the failure of all PA nodes.

Pin assignment for active field splitter (AFS)

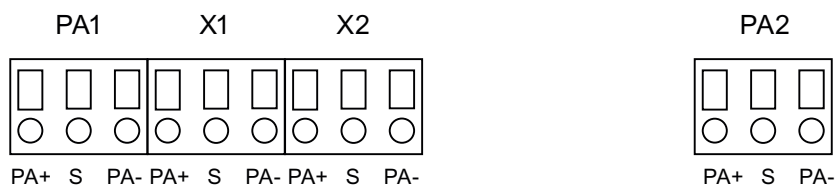


Table 5-2 Pin assignment for active field splitter (AFS)

Connection		Terminal	Assignment
PA1, PA2	PA main line to the DP/PA couplers	PA+	Data cable (red)
		S	Shield (not required)
		PA-	Data cable (green)
X1	Spur line to the PA field device (feed)	PA+	Data cable (red)
		S	(not required)
		PA-	Data cable (green)
X2	Spur line to the PA field devices (for center feed)	PA+	Data cable (red)
		S	(not required)
		PA-	Data cable (green)

Connecting the active field distributor

1. Place the enclosure lid on the lower part of the enclosure.
2. Tighten the 4 cable glands on the enclosure. Torque 2.0 Nm.

See also

Earthing the field distributor (Page 5-3)

10.3 Replacing active field distributors

Replacing active field distributors (AFD)

You can replace the AFD during operation.

Perform the following steps to replace a defective AFD:

1. Remove the 4 screws of the housing cover using a crosstip screwdriver.
2. Disconnect the PA1 and PA2 main lines from the AFD.
3. Disconnect the PA field devices from the AFD.
4. Replace the defective module.
5. Connect the PA field devices to the new AFD.
6. Connect the PA1 and PA2 main lines to the new AFD.
7. Tighten the 4 screws on the enclosure.

Replacing active field splitter (AFS)

Perform the following steps to replace a defective active distributor splitter (AFS):

1. Remove the 4 screws of the housing cover using a crosstip screwdriver.
2. Disconnect the equipotential bonding line from the AFS.
3. Disconnect the PA1 and PA2 main lines from the AFS.
4. Replace the defective module.
5. Connect the equipotential bonding line to the new AFS.
6. Connect the PA1 and PA2 main lines to the new AFS.
7. Tighten the 4 screws on the enclosure.

13.7 Technical data - active field distributor (AFD) (6ES7157-0AF81-0XA0)

Dimensions and weight	
Dimensions W x H x D (mm)	120 x 57 x 80
Weight	Approx. 700 g
Voltages, currents, potentials	
Nominal power supply voltage	DC 16 V (16 V ... 32 V)
U _{max}	35 V
• Reverse polarity protection	Yes
Output voltage for PA segment:	DC 31 V ± 1 V
• Power failure bypass	5 ms
Current consumption	Typically 20 mA
Output current PA section (for dimensioning the PA configuration)	1 A
Power dissipation of the module	Typically 600 mW
Status, interrupts, diagnostics	
Status display	No
Interrupts	none
Diagnostics function	Yes
• Status PA main line PA1, PA2	Green LED
• Error PA main line PA1, PA2	red LED
• Status / error PA spur line X1 to X4	Green LED
Data for selecting the PA field devices	
Connection	• Max. power consumption of the PA field devices altogether 1 A • Field devices with certification for PROFIBUS PA • Field devices are located outside the Ex area • Max. 4 PA field devices can be connected
Current I _{max} per PA spur line X1 to X4	• 60 mA