

MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

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

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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

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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.

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*.

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2.9 Changes relative to predecessor modules

DP/PA coupler FDC 157-0 (6E7157-0AC83-0XA0)

- Diagnostics function via PROFIBUS DP
The DP/PA coupler is transparent or optionally it can be used as PROFIBUS slave with the following diagnostics information:
 - Current value on the equipotential bonding line of the active DP/PA coupler, or voltage value on equipotential bonding line at the end of the cable
 - Local LifeList: Detection of the assignment of PA field devices to the DP/PA coupler
 - Wire break/short-circuit on the equipotential bonding line
- Scalable configuration to increase availability:
 - Ring redundancy via the active field distributor (AFD)
 - Coupler redundancy via the active field splitter (AFS)

Bus module BM FDC 157-0 (6ES7195-7HG80-0XA0)

- Bus module for the DP/PA coupler FDC 157-0. Required for operation with ring redundancy and coupler redundancy.
- Coding to ensure connection of permissible modules.

See also

DP/PA coupler FDC 157-0 (Page 2-1)

2.10 Compatibility with predecessor modules

Compatibility DP/PA coupler FDC 157-0:

The DP/PA coupler FDC 157-0 with order number 6E7157-0AC83-0XA0 replaces the DP/PA coupler with order number 6E7157-0AC82-0XA0. The bus module does not need to be replaced.

On the DP/PA coupler FDC 157-0 the PROFIBUS address is factory set to 0. Thus the diagnostic function is deactivated, the DP/PA coupler is transparent. This means that it is compatible to the predecessor module as a replacement part. Configuration is not required.

Note

Diagnostics function

If you would like to use the diagnostic function of the DP/PA coupler FDC 157-0 in existing systems as well, then set the PROFIBUS address on the DP/PA coupler and in the configuration > 0.

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

Compatibility of the Y coupler

Der Y coupler 6ES7197-1LB00-0XA0 **cannot** be used as a spare part for Y coupler 6ES7654-0YK00-0AB0.

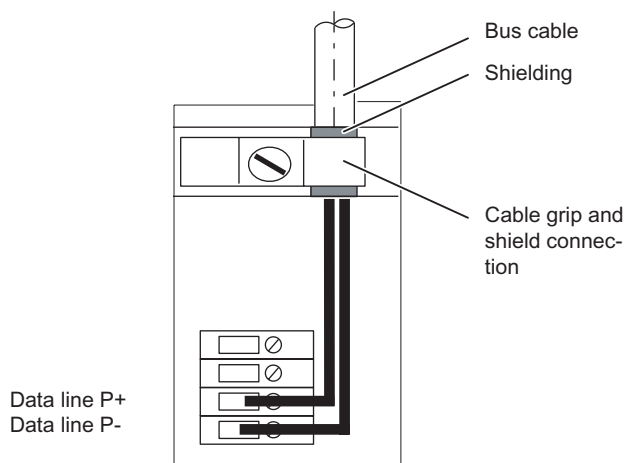
Compatibility of the bus modules

Bus module BM IM/IM 6ES7195-**7HD80**-0XA0 can only be used together with IM 153-2Bxx1-0XB0 and IM 157-0AA82-0XA0 and is **cannot** be used as a spare part for 6ES7195-**7HE80**-0XA0.

PROFIBUS PA connection

The 4-pin screw-type terminal for the PROFIBUS[®] PA connection is positioned under the right-hand front door at the top on the DP/PA coupler. The connections have the following functions:

DP/PA coupler Ex [i]



DP/PA coupler FDC 157-0

PROFIBUS PA loop through:
PA bus terminator switch



Data line P+
Data line P-
Data line P+
Data line P-

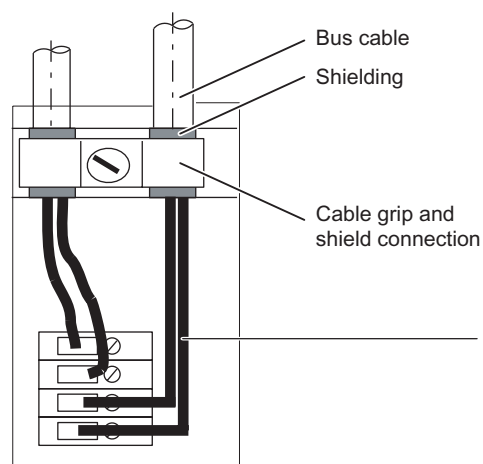


Figure 5-11 PROFIBUS PA connection

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

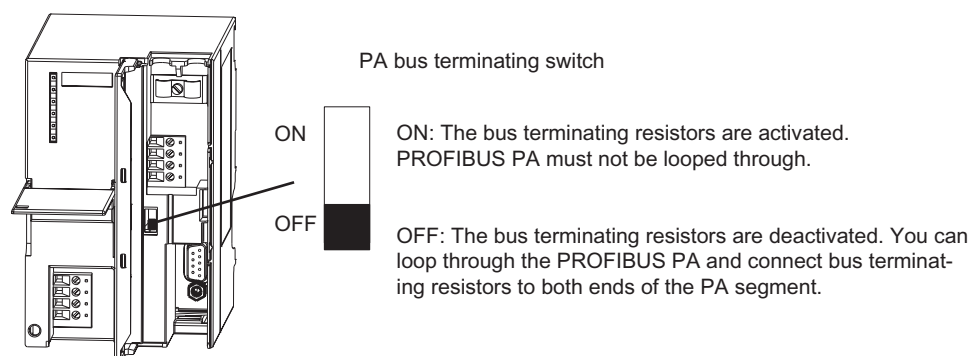
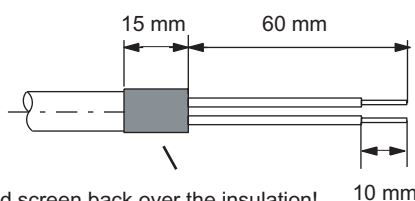


Figure 5-12 PA bus terminator switch

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.



Turn the braided screen back 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.

Commissioning: DP/PA coupler

6.1 Commissioning the DP/PA coupler for stand-alone mode

Requirement

When you have fully installed and wired the DP/PA coupler and switched on the voltage supply, the DP/PA coupler is ready to operate.

Setting transmission speed

The transmission speed must be set at 45.45 kBaud for the DP master.

6.2 Commissioning the DP/PA coupler FDC 157-0

Requirements

Before you commission the DP/PA coupler FDC 157-0 the following prerequisites must be satisfied:

- You must have completely installed and wired the DP/PA couplers.
- You have completely installed the PROFIBUS DP. PROFIBUS DP is ready to operate.
- You have fully installed the PROFIBUS PA. PROFIBUS PA is ready to operate.

Configuring the DP/PA coupler FDC 157-0:

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.

13.1.8 Mechanical and climatic ambient conditions for operation

Conditions of use

The described components are designed for use in a fixed, sheltered location. The operating conditions exceed the requirements of IEC 61131 Part 2.

The described components meet the operating conditions of Class 3C3 in accordance with DIN EN 60721-3-3.

Use with additional measures

The described components must not be operated without additional measures:

- at locations with a high degree of ionizing radiation
- in aggressive environments caused, for example, by
 - the development of dust
 - corrosive vapors or gases
 - strong electric or magnetic fields
- in installations requiring special monitoring, for example
 - elevators
 - electrical plants in potentially hazardous areas

An additional measure can be installation in a cabinet or in an enclosure, for instance.

Mechanical ambient conditions

The mechanical ambient conditions for the described components are specified in the table below for sinusoidal vibrations.

Table 13-5 Mechanical ambient conditions

Frequency range in Hz	Continuous	Infrequently
$10 \leq f \leq 58$	0.0375 mm amplitude	0.075 mm amplitude
$58 \leq f \leq 150$	0.5 g constant acceleration	1 g constant acceleration

Reduction of vibrations

If the described components are exposed to greater shocks or vibrations, you must reduce the acceleration or the amplitude by taking suitable measures.

We recommend securing the described components on shock-absorbing materials (for instance on vibration absorbing metal)

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

Ambient conditions	Permissible range	Remarks
Relative humidity	10 to 95 %	Without condensation, corresponds to relative humidity (RH) strain grade 2 according to IEC 61131 Part 2 With condensation: Active field distributor (AFD) Active field splitter (AFS)
Atmospheric pressure	from 1080 hPa to 795 hPa	corresponds to an altitude of -1000 to 2000 m
Concentration of pollutants	SO ₂ : < 0.5 ppm; RH < 60 %, no condensation H ₂ S: < 0.1 ppm; RH < 60 %, no condensation	Test: 10 ppm; 4 days Test: 1 ppm; 4 days

13.1.9 Specifications for insulation tests, protection class and degree of protection

Test voltages

The insulation stability is tested with the following voltages during product testing:

Table 13-8 Test voltages

Circuits with a rated voltage of U_e relative to other circuits or ground	Test voltage
$0 \text{ V} < U_e \leq 50 \text{ V}$	DC 600 V, 1 s

Protection class

Protection class I in compliance with IEC 61140; this means that a grounding terminal to the rail is required!

Protection against foreign bodies and water

Protection class IP 20 according to IEC 60529; that is protection against contact with standard probes.

There is no protection from penetration by water.

13.1.10 Rated voltage

Rated voltage for operation

The described components work with a rated voltage of 24 V DC.
The tolerance range extends from 20.4 V DC to 28.8 V DC.

Exception:

The AFDs and AFSs work with a rated voltage of 16 V DC.
The tolerance range extends from 16 V DC to 32 V DC.

13.2 Technical specifications of the IM 153-2 (6ES7153-2Bxx1-0XB0)

Dimensions and weight	
Dimension W x H x D (mm)	40 x 125 x 130
Weight	approx. 350 g
Module-specific data	
Transmission speed for the higher level DP master system	9.6; 19.2; 45.45; 93.75; 187.5; 500 kBaud 1.5; 3; 6; 12 MBaud
Bus protocol	PROFIBUS DP
Frame length I / O data	Max. 244 bytes
Length of configuration frame	Max. 244 bytes
Length of diagnostic frame	Max. 231 bytes
Length of parameterization frame	Max. 223 bytes
suitable for system modifications during operation	Yes
Voltages, currents, potentials	
Rated supply voltage	24 VDC (20.4 V ... 28.8 V)
• Polarity reversal protection	Yes
• Power failure bypass	20 ms
Electrical isolation	
• to a high-level DP master system	Yes
• to the DP/PA or Y coupler	No
Insulation tested using	500 VDC
when used in the DP/PA link	
• Power consumption (24 VDC)	Max. 100 mA
• Power loss	Typically 2 W
when used in the Y link	
• Power consumption (24 VDC)	Max. 200 mA
• Power loss	Typically 4 W