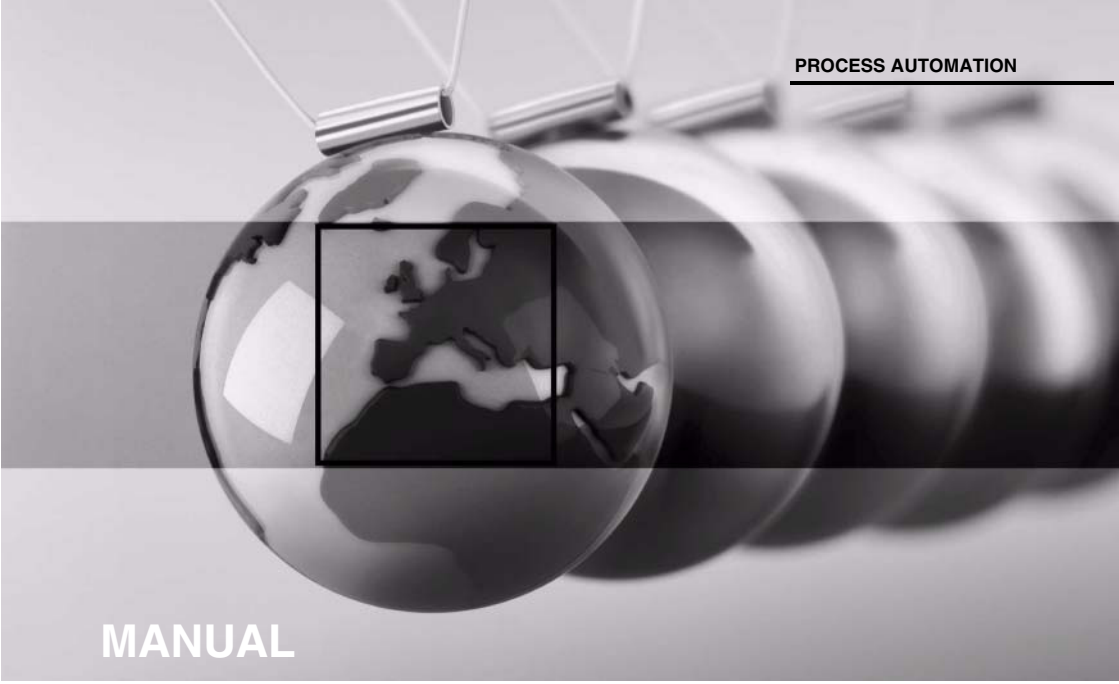


MANUAL

PROFIBUS POWER HUB SEGMENT COUPLER

HD2-GTR-4PA



PEPPERL+FUCHS

PROTECTING YOUR PROCESS

With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, as published by"
the Central Association of the „Elektrotechnik and Elektroindustrie (ZVEI) e.V.“,
including the supplementary clause „Extended reservation of title“.

We at Pepperl+Fuchs recognise a duty to make a contribution to the future.
For this reason, this printed matter is produced on paper bleached without the use of chlorine.

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1 Safety

1.1 Validity

The chapter "Safety" is valid as operating instructions.

Specific process and instructions in this document require special precautions to guarantee the safety of personnel.

1.2 Symbols Used



Warning

This symbol indicates a warning about a possible danger.
In the event the warning is ignored, the consequences may range from personal injury to death or from damage to equipment to destruction.



Attention

This symbol warns of a possible fault. Failure to observe the instructions given in this warning may result in the device and any connected facilities or systems to it develop a fault or fail completely.



Note

This symbol brings important information to your attention.



This symbol marks an acting paragraph.

1.3 System Operator and Personnel

The operator of the system is responsible in terms of planning, mounting, commissioning, operating and maintenance.

Assembly, commissioning, operation, maintenance and dismounting of any devices may only be carried out by trained, qualified personnel who have read and understood the instruction manual.

1.4 Pertinent Laws, Standards, Directives, and further Documentation

Laws, standards, or directives applicable to the intended use must be observed. In relation to explosive areas, Directive 1999/92/EC must be observed.

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The corresponding data sheets, the declaration of conformity, the EC-type-examination certificate and applicable certificates (see data sheet) are an integral part of this document. You can find this information under www.pepperl-fuchs.com.

1.5 Delivery, Transport and Storage

Check the packaging and contents for damage.

Check if you have received every item and if the items received are the ones you ordered.

Keep the original packaging. Always store and transport the device in the original packaging.

Always store the device in a clean, dry environment. Note the permitted storage temperature (see data sheet).

1.6 Marking

Gateway motherboards

MB-FB-GT
Pepperl+Fuchs GmbH
Gateway motherboard
Declaration of Conformity
TÜV 04 ATEX 2500X
⟨Ex⟩ Ex II 3G EEx nA IIC T4

MB-FB-GTR
Pepperl+Fuchs GmbH
Redundant gateway motherboard
Declaration of Conformity
TÜV 04 ATEX 2500X
⟨Ex⟩ Ex II 3G EEx nA IIC T4

Gateway module

HD2-GTR-4PA
Pepperl+Fuchs GmbH
Gateway module
Declaration of Conformity
TÜV 04 ATEX 2500X
⟨Ex⟩ Ex II 3G EEx nA IIC T4

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1.7 Intended Use

The PROFIBUS Power Hub Segment Coupler, as part of the Power Hub System, serves as a Segment Coupler for connecting PROFIBUS PA segments to PROFIBUS DP. Various Power Hub Power Supply solutions offer either simplex or redundant power to PROFIBUS PA segments. Power Hub Supplies for High-Power Trunk and the Fieldbus intrinsically safe concept DART are available.

The Segment Coupler ensures communication and galvanic isolation between PROFIBUS PA and PROFIBUS DP. The Segment Coupler can be used in all system environments in compliance with industry standard PROFIBUS DP Masters.

PROFIBUS PA is an extended version of the PROFIBUS DP that allows for the physical transmission specifications of IEC 61158-2. Fieldbus devices receive their electrical supply through the transmission lines.The combination of PROFIBUS Power Hub components makes it possible to connect and supply four PROFIBUS PA segments per Gateway to the PROFIBUS DP.

The Segment Coupler may be installed in Zone 2 Category 3G hazardous areas. Types of protection are Ex nA (non-arcing) for Zone 2 Gas Groups IIC, IIB, IIA.

The devices are only approved for appropriate and intended use. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

The device must only be operated in the ambient temperature range and at the relative humidity (non-condensing) specified.

1.8 Mounting and Installation

Prior to mounting, installation, and commissioning of the device you should make yourself familiar with the device and carefully read the instruction manual.

The devices may be installed in a corrosive location acc. to ISA-S71.04-1985, severity level G3.

1.8.1 Mounting Instructions for Power Hub

The devices should be installed at least in an environment according pollution degree 2.

Instructions for Zone 2

The devices may only be installed and operated in Zone 2 if they have been mounted in an enclosure with degree of protection IP 54 acc.to IEC/EN 60529. The enclosure must have a declaration of conformity according to 94/9/EC for at least category 3G.

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Connection or disconnection of energized non-intrinsically-safe circuits is only permitted in the absence of a hazardous area.

Instructions for Zone 22

The devices may only be installed and operated in zone 22 if mounted in an enclosure for which an EC-type-examination certificate acc. 94/9/EG for at least category 3D exists.

1.8.2 Mounting instructions for HD2-GT* modules

The modules are intended for mounting on an appropriate Fieldbus Power Hub Gateway motherboard.

1.8.3 Shield/Grounding

Take care about good earthing practice and specific earthing requirements of your installation (see chapter “Shield/Grounding” on page 25).

Observe IEC 60079-14 for requirements of potential equalization.

1.9 Housing

The device must be mounted at least in protection category IP 54 in accordance with IEC 60529/EN 60529.

If additional housings are needed for installation in hazardous areas, the following points must be considered / evaluated:

- Degree of protection as per IEC/EN 60529
- Light resistance as per IEC/EN 60079-0
- Impact strength as per IEC/EN 60079-0
- Chemical resistance as per IEC/EN 60079-0
- Heat resistance as per IEC/EN 60079-0
- Electrostatics as per IEC/EN 60079-0

To ensure the IP degree of protection:

- All seals must be undamaged and have been correctly fitted.
- All screws of the housing / housing cover must have been tightened with the appropriate torque.
- Only cable of the appropriate size must be used in the cable glands.
- All cable glands must have been tightened with the appropriate torque.
- All empty cable glands must have been sealed with sealing plugs.

1.10 Repair and Maintenance

The devices may not be repaired, changed or manipulated. If there is a defect, the product must always be replaced with an original part.

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1.11 Disposal

Devices, packaging material, and possibly contained batteries must be disposed of in compliance with the applicable laws and guidelines of the corresponding country.

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2 Specification

2.1 Overview

The Pepperl+Fuchs PROFIBUS Power Hub System has a modular design. It offers a number of possible combinations so it can be adapted to the specific requirements of different explosion protection concepts or the need for increased segment availability.

Functionally, the system may be divided into two component groups:

- Coupling (described in this manual)
- Segment supply (described in the Power Hub manuals)

Modules and Motherboards are assigned to these groups as shown:

Coupling:	Segment supply:
Modules:	
Gateway Module HD-2-GTR-4.PA	Power Hub Modules HD2-FB* HD2-DM* Diagnostic Modules
Motherboards:	
Gateway Motherboard simplex: MB-FB-GT Gateway Motherboard redundant: MB-FB-GTR	Power Hub Motherboards simplex or redundant: MB-FB*.GEN MBHD-FB*.GEN DART Power Hub Motherboard redundant: MBHD-FB-D-4R.GEN

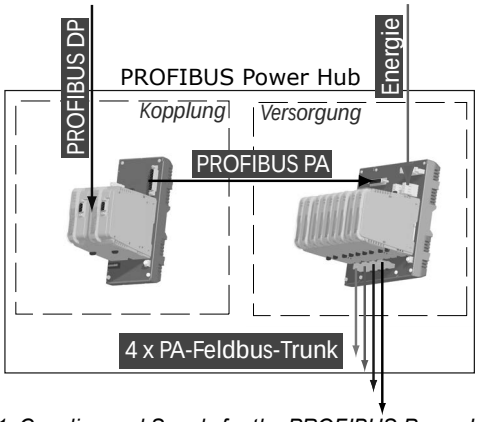


Figure 2.1: Coupling and Supply for the PROFIBUS Power Hub System

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Various Power Hub power supply solutions offer either simplex or redundant power to PROFIBUS PA segments. The Power Hub consists of a motherboard with sockets for plug-in modules.

- One power supply module per segment in simplex mode or, alternatively, two power supply modules per segment in redundant mode.
- A physical layer diagnostic module HD2-DM*.

The Power Hub feeds fieldbus segments following the High-Power Trunk concept for explosion protection. High energy level on the trunk line is fed to the field instruments via couplers like FieldBarriers or Segment Protectors. A dedicated version of the Power Hub (DART) supports the intrinsically safe concept for fieldbus.

A plug-in Advanced Diagnostic Module for fieldbus is available. This module monitors the physical layer online and in real time enabling detection of degradation and faults during operation. Measurement data and alarms are transmitted to the control room thus bringing visibility to the fieldbus physical layer, which can now be treated as active component in Plant Asset Management systems. Operators are enabled to decide on proactive measures to avoid unwanted situations while the plant is running smoothly.


Note

Although segment supply is part of the PROFIBUS Power Hub System, it is not described in this manual (only where needed for better understanding). Please refer to the respective „Generic Power Hub“ manuals for detailed information on segment supply.

2.2 Coupling

Coupling involves a Gateway Motherboard and one or, in the case of redundant coupling, two Gateway Modules.

The purpose of coupling is to adjust the physical transmission properties on the DP side (RS 485) to those of the PROFIBUS PA (in conformity with IEC 61158-2). The coupling provides a baudrate of 31.25 kbit/s on the PA side. In addition, the coupling creates galvanic isolation between PROFIBUS DP and PROFIBUS PA. The DP/PA coupling of the PROFIBUS Power Hub System is functionally compatible with the Pepperl+Fuchs SK 2 System, which is well established on the market.

The coupling of the PROFIBUS PA slave to the PROFIBUS DP is transparent. This means that all PA slaves appear on the DP bus and are interpreted by the Host as DP slaves. A DP address is also assigned to the Gateway itself for diagnostic and parameterization purposes.

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Cyclic data exchange can be connected redundantly to the DP line by using the redundant Gateway Motherboard MB-FB-GTR and two HD2-GTR-4PA Gateways.

The Gateway Module HD2-GTR-4PA supports PROFIBUS "Flying Redundancy“ (chapter “Redundancy Concepts” on page 65) as well as all non-redundant DP Masters.

In summary, the Gateway is responsible for the following tasks:

- Conversion of the PROFIBUS DP physical layout to that of the PROFIBUS PA
- Adjusting the DP transmission rate to the PA transmission rate
- Galvanic isolation between PROFIBUS DP and PA
- Elementary functional diagnostics via LEDs
- Ensuring increased availability through redundant coupling of cyclic data exchange (with redundant layout)
- Acyclic Parameterization of Gateway parameters by FDT/DTM
- Redundancy diagnostics (with redundant layout)

2.3 Segment Supply

Power is supplied to the field devices through Power Hub Modules on a Power Hub Motherboard (simplex: 4 Power Hub connection slots, redundant: 8 connection slots) and via bus lines to the individual segments.

PA segments can receive redundant power supply if the redundant Power Hub Motherboard is used along with two Power Hub Modules for each segment.

In summary, the supply is responsible for the following tasks:

- Power supply of field devices: power and communication signal
- Redundant supply for high system availability
- Elementary diagnostic information via LEDs
- Advanced Physical Layer Diagnostics via the HD2-DM* Diagnostic Module and the FDT/DTM software package (see corresponding documentation).

2.4 System Components

2.4.1 Motherboards

Gateway motherboard simplex MB-FB-GT

The gateway motherboard simplex MB-FB-GT allows the connection of the Fieldbus Power Hub motherboards MB-FB*.GEN or MBHD-FB*.GEN using a standard cable. A socket will hold the DP/PA Gateway HD2-GTR-4PA. The Built-In Slave of the HD2-GTR-4PA can be addressed using the DIP switch on the motherboard.

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Gateway motherboard redundant MB-FB-GTR

The gateway motherboard redundant MB-FB-GTR allows the connection of the Fieldbus Power Hub motherboards MB-FB*.GEN or MBHD-FB*.GEN with a standard cable. Two sockets will hold two DP/PA Gateways HD2-GTR-4PA. The Built-In Slaves of the HD2-GTR-4PA modules can be addressed using the DIP switch on the motherboard.

Power Hub motherboard simplex MB-FB-4.GEN

The MB-FB-4.GEN allows the supply of four Fieldbus segments as well as the direct connection of the PROFIBUS DP/PA Gateway Motherboards MB-FB-GT or MB-FB-GTR with a standard cable. Four sockets hold the Power Modules. The modules are available for different explosion protection concepts and with various isolation levels. A further sokket holds a Diagnostic Module

Power Hub motherboards redundant MB*-4R.GEN

The MB*-4R.GEN motherboards allow the redundant supply of four fieldbus segments as well as the direct connection of the PROFIBUS DP/PA Gateway Motherboards MB-FB-GT or MB-FB-GTR with a standard cable. Eight sockets hold the power supply modules, two power supply modules supplying each of the four segments redundantly. The modules are available for different explosion protection concepts and with various isolation levels. A further socket holds a Diagnostic Module.

DART Power Hub motherboard redundant MBHD-FB-D-4R.GEN

The MBHD-FB-D-4R.GEN motherboard allows for the redundant supply of four intrinsically safe Ex ib fieldbus segments as well as the direct connection of the PROFIBUS DP/PA Gateway Motherboards MB-FB-GT or MB-FB-GTR with a standard cable. Eight sockets hold the power supply modules, two power supply modules supplying each of the four segments redundantly. A further socket holds a Diagnostic Module.

2.4.2 Modules for Coupling, Supply and Diagnosis

Gateway module HD2-GTR-4.PA

The Gateway module provides the connection of four PROFIBUS PA segments to a PROFIBUS DP. In conjunction with Fieldbus Power Modules, PA segments are supplied directly via Fieldbus lines. Coupling is transparent, so each PA device is addressed and configured as a PROFIBUS DP device.

The HD2-GTR-4PA module includes four full-featured PA masters, who perform data exchange time independently.

The FDT/DTM based PC software package allows the parameterization of the Gateway and offers several status and diagnostic functionalities.

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Used in connection with the corresponding motherboard, two Gateways provide redundant coupling. The HD2-GTR-4PA supports PROFIBUS „Flying Redundancy“ as well as all non-redundant masters.

Power modules HD2-FB*

Power Modules supply electrical power to segments. They couple the supply current to the two-wire Fieldbus cable while maintaining the highest signal quality.

Diagnostic modules HD2-DM*

Diagnostic modules are divided into the Basic Diagnostic Module HD2-DM-B and the Advanced Diagnostic Module HD2-DM-A. The diagnostic modules provide various system diagnostics.

2.5 Recommended System Combinations

2.5.1 Case 1: Fully Redundant

In the fully redundant system, both coupling of PROFIBUS DP to PROFIBUS PA and the supply of the four segments are designed redundantly. The fully redundant PROFIBUS Power Hub consists of the following components:

- Gateway motherboard MB-FB-GTR
- Power Hub motherboard MB*-4R.GEN
- 2 x HD2-GTR-4PA
- 8 x Power Modules
- 1 x Diagnostic Module
- 1 x Sub-D cable to connect motherboards

The fully redundant system offers the highest protection against individual failures or failure of all PA segments of PROFIBUS.

2.5.2 Case 2: Redundant Coupling

In this case, coupling is designed redundantly, but there is only one supply per segment (simplex). The redundantly coupled system consists of the following components:

- Gateway motherboard MB-FB-GTR
- Power Hub motherboard MB-FB-4.GEN
- 2 x HD2-GTR-4PA
- 4 x Power Modules
- 1 x Diagnostic Module
- 1 x Sub-D cable to connect motherboards

Redundant coupling ensures communication of the four PA segments. Failure of one segment has no effect on the other three segments.

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2.5.3 Case 3: Simplex

In the simplex system, both the coupling of DP to PA and the supply of the four segments are single (simplex). The simplex system consists of the following components:

- Gateway motherboard MB-FB-GT
- Power Hub motherboard MB-FB-4.GEN
- 1 x HD2-GTR-4PA
- 4 x Power Modules
- 1 x Diagnostic Module
- 1 x Sub-D cable to connect motherboards



Note

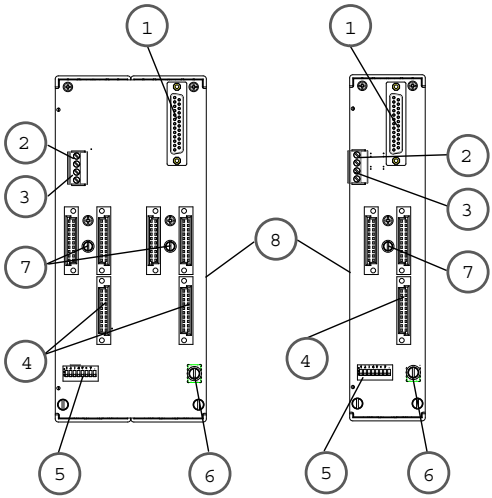
Combining a simplex Gateway Motherboard and a redundant Power Hub Motherboard also makes a fourth combination possible. Pepperl+Fuchs does not recommend using this arrangement. Since a fault in the coupling of DP to PA results in failure of all four segments together, but the failure of a single segment does not have any effect on the remaining segments, increased segment availability can be achieved most easily with redundant coupling (as described in case 1 and case 2).

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2.6 Component Identity

MB-FB-GTR	MB-FB-GT



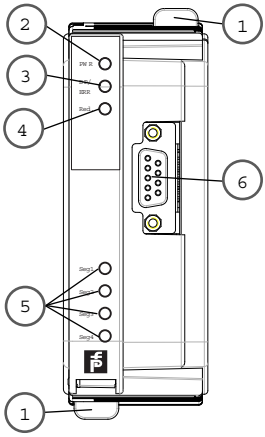
1 Sub-D connection to Power Hub mother board
2 VFC alarm contact
3 Diagnostic bus contact
4 Slots for DP/PA Gateway Modules
5 DIP Switch for BIS address
6 Screen/ground connection clamp
7 Motherboard fastening screws
8 DIN rail slot

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Specification

HD2-GTR-4PA



1 Quick Lok Bar

2 LED „PWR“
- Green: Device in operation

3 LED „DP/ERROR“
- Red, flashing with 2 Hz: DP error.
- Red: Hardware error

4 LED Redundancy
- Yellow: Redundant operation (this Gateway Module is the primary device)
- Yellow, flashing with 2 Hz: Synchronisation or Redundancy not available (this Gateway Module is the primary device)
- LED is off: simplex operation; in redundant mode, this Gateway Modul is the secondary device

5 Segment status LEDs
- LED segments 1...4. Red, flashing with 2 Hz: PA error
- Segment LED and LED „DP/ERROR“ on: MAU hardware error

6 PROFIBUS DP connection

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2.7 Technical Data

System overview	
Ambient conditions:	
Ambient temperature	-40..60 °C
Storage temperature	-40..85 °C
Relative humidity	<95% non-condensing
Shock resistance	15 g 11 ms
Vibration resistance	1 g, 58 to 150 Hz
Mechanical data:	
Protection degree	IP 20 acc. to EN 60529
Motherboard mounting	Mounting rail, 35 mm
Conformity to standards:	
Shock resistance	DIN EN 60068-2-27
Vibration resistance	DIN EN 60068-2-6
Fieldbus standard	IEC 61158
EMV	Namur NE 21 • If you operate the device with a DC supply voltage, you must ensure that the bridging of the 20 ms voltage interruption is realized by the power supply. EN 61326
Installation in hazardous areas:	
Approvals:	Zone 2 II 3 G Ex nA II T4 Class 1 Division 2 Gas groups IIC, IIB, IIA

HD2-GTR-4PA	
Supply:	
Rated voltage	19.2 to 35 V DC
Rated current	160... 90 mA
Power dissipation	3 W
Fieldbus interface/PROFIBUS DP:	
Connection	SUB-D-socket, 9-pin
Protocol	PROFIBUS DP V1

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Specification

HD2-GTR-4PA	
Galvanic isolation:	
PROFIBUS DP/CH PROFIBUS DP/supply All circuits/FE	Functional isolation per IEC 62103, rated isolation voltage 50 V_{eff}

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Gateway Motherboards MB-FB-GT / MB-FB-GTR	
Supply:	
Rated voltage	19.2 to 35 V DC
Rated current	16 A
Display/control elements:	
Error message	VFC alarm output via connections
DIP switch:	
MB-FB-GT	PROFIBUS address 0...125
MB-FB-GTR	PROFIBUS address 0...61

Accessories

Description	Part number	Special feature	
Sub-D cable, 9-pin*	ACC-MB-HGC	For connecting the Gateway Motherboard and Power Hub Motherboard	

*comes with the Gateway Motherboards

Overview of ordering information

Designation	Description
HD2-GTR-4PA	Gateway Module for 4 PA segments
MB-FB-GT	Gateway Motherboard for a HD2-GTR-4PA (Sub-D cable included)
MB-FB-GTR	Redundant Gateway Motherboard for two HD2-GTR-4PAs (Sub-D cable included)

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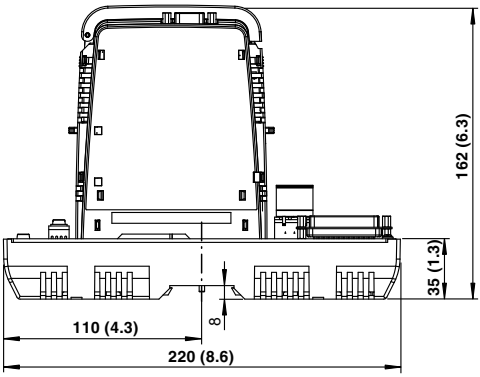
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Specification

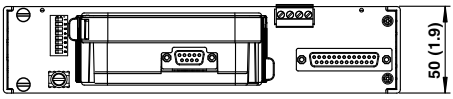
2.8 Dimensions

Note

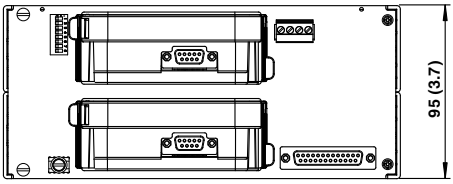
All dimensions in millimeters and inches (values in brackets) and without tolerance indication.



MB-FB-GT



MB-FB-GTR



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3 Installation and Commissioning

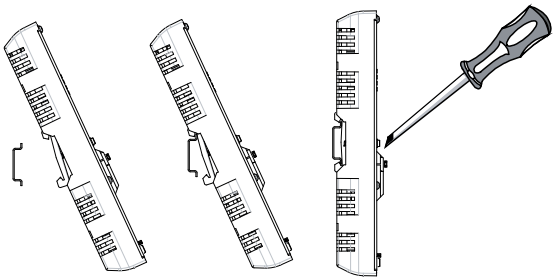
3.1 Mounting and Dismounting

Mounting Motherboards on a DIN rail

To mount a motherboard, proceed as follows:

1. Place the motherboard on the DIN rail.
2. Tighten the fastening screw in the middle of the motherboard to attach the motherboard to the DIN rail.

The motherboard is mounted. Dismounting is performed in the reverse order.

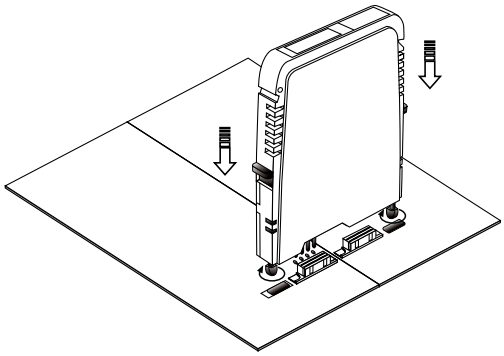


Mounting of HD2-* modules on the Motherboard

To install a new module on the motherboard, proceed as follows.

1. Carefully center the polarisation holes and mate the two connectors, then gently press down the module.
2. Push down the red Quick Lok bars on each side of the module to fix it to the panel (no tools required).

The new module is installed.



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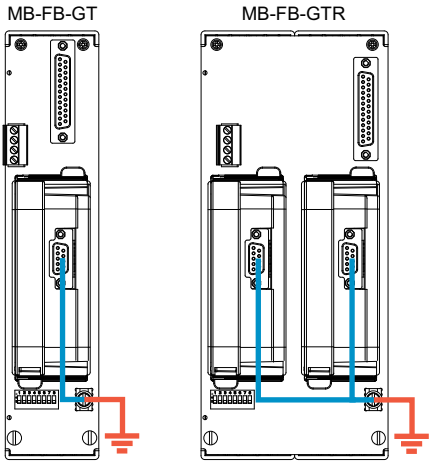
Dismounting of HD2-* modules from the Motherboard

To dismount a module from the motherboard, proceed as follows:

Push the red Quick Lok bars upwards and gently lift off the entire module.

The module is removed.

3.2 Shield/Grounding



The screen/shield of the Profibus cable on the HD2-GTR-4PA is connected directly to the screen/ground connection clamp of the motherboard.

Attention

Earth Connection

Take care about good earthing practice and ensure a clean earth at all times.

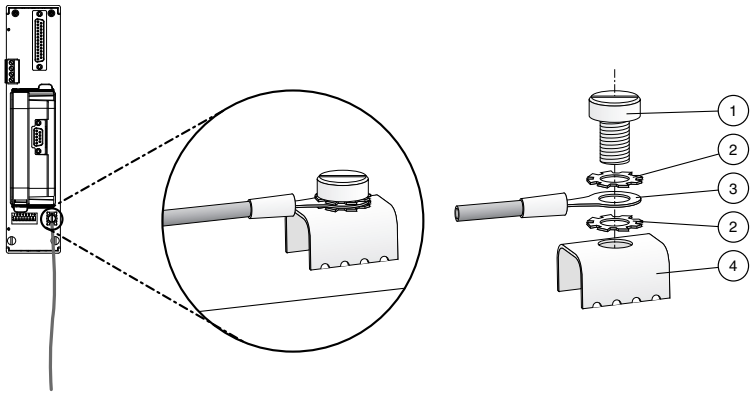
If the Profibus DP cable leads into a hazardous area the screen/ground connection clamp has to be connected to safety earth.

There might be a requirement to earth all exposed metal parts as a matter of course.

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Connecting the ground connection cable

1. Connect the ground cable to a cable lug.
2. Position the cable lug over the ground connection clamp so that the cable points downwards.
3. Screw the cable lug to the ground connection clamp using two toothed lock washers.
4. Tighten the screw so that the cable lug can not move.

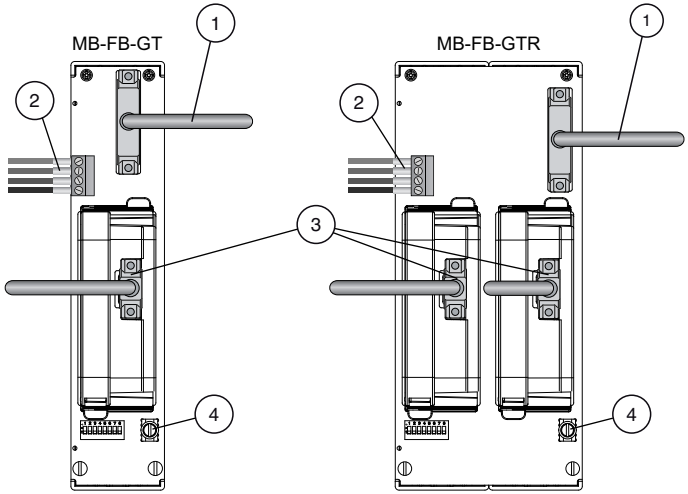


1 Screw
2 Toothed lock washer
3 Cable lug
4 Ground connection clamp on motherboard

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3.3 Connections



1 Sub-D connection to Power Hub motherboard MB*-FB*.GEN using ACC-MB-HGC link cable

2 Diagnostics coupling to neighboring Power Hub motherboard using ACC-MB-HDC link cable (optional, see also next page)

3 PROFIBUS DP connection

4 Ground connection clamp

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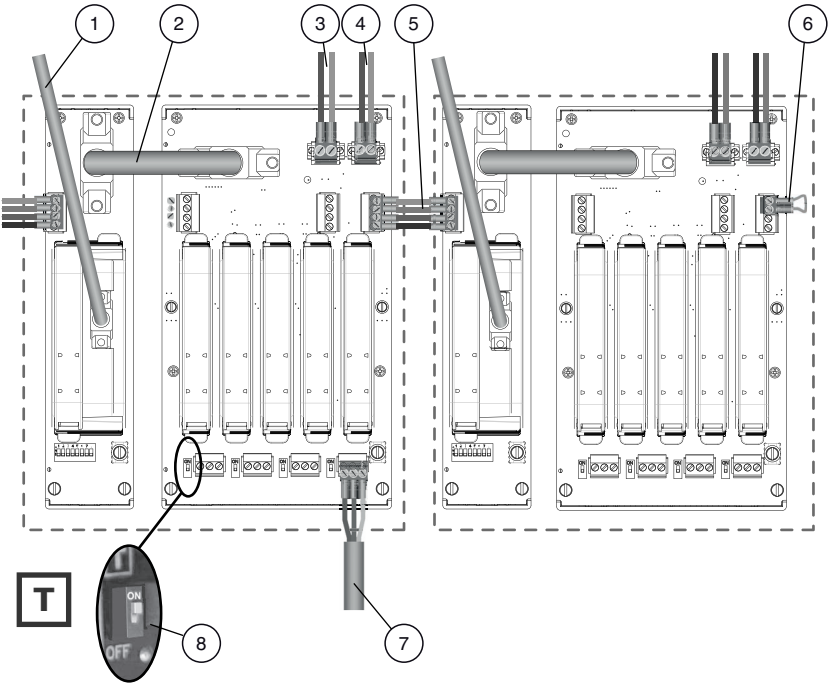


Figure 3.1: Connections of the PROFIBUS Power Hub system

1 PROFIBUS DP connection
2 ACC-MB-HGC link cable connecting Gateway motherboard and Power Hub motherboard
3 Primary power supply connection
4 Secondary power supply connection
5 ACC-MB-HDC diagnostic link cable connecting neighboring Power Hubs (optional, read following note)
6 Final motherboard link (optional, read following note)
7 Trunk
8 Terminator

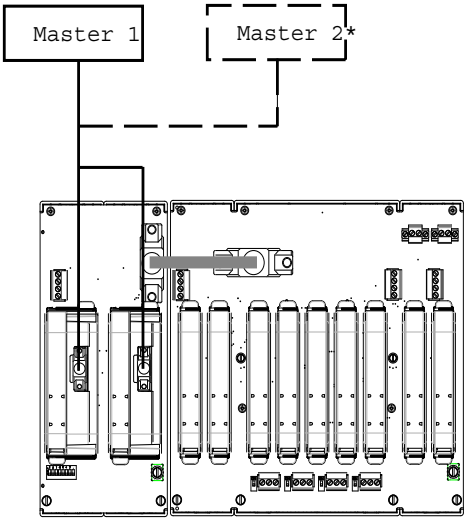
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Note

Normally, diagnostic information from the diagnostic module HD2-DM* is transmitted via the gateway. You do not need to connect neighboring Power Hubs.
Alternatively, you may bypass the gateway and transmit the diagnostic information via a separate bus. Only in this case do you need to connect neighboring power hubs using the ACC-MB-HDC diagnostic link cable. The last Power Hub in a row has to be fitted with a final motherboard link (see figure 3.1).

3.3.1 Master Connection to a Redundant PROFIBUS Power Hub System



*Flying Redundancy

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4 Installation in Hazardous Areas

4.1 Installation in Zone 2 Category 3G

The PROFIBUS Power Hub Segment Coupler may be installed in Zone 2 Category 3G. The protection class is EEx nA C (non-arcing) gas group IIC, IIB, IIA. Depending on the type of Power Modules used, different topologies and Zone 2 installations can be implemented.

The Fieldbus trunk is always categorized as EEx nA for Zone 2 applications. Connecting the PROFIBUS Power Hub with the Pepperl+Fuchs Segment Protector (SPs) allows hot swapping of field devices.

Special safety instructions

EC type examination certificates and EC Certificates of Conformity and/or the manufacturer's Declaration of Conformity must be observed. It is especially important to observe the "Special Conditions" included in these documents.



Warning

Connections of non-energy-limited circuits under voltage may only be made or disconnected during installation or maintenance or for repair purposes.



Warning

If it is mounted in the hazardous area of Zone 2 Category 3G, the device must be mounted in a housing, corresponding to at least protection class IP 54 in accordance with EN 60529 and suitable for this type of installation.



Warning

The possibility of an explosive atmosphere occurring during installation, maintenance or repairs is evaluated as improbable in Zone 2.



Warning

Devices that have been operated in general electrical plants must not be used again after that in electrical plants that are connected to hazardous areas.

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5 PROFIBUS Commissioning

5.1 Assigning a Device Address

After the module is mounted, a slave address must be assigned to the Built-In-Slave of Gateway HD2-GTR-4PA. This assignment is performed only via the DIP switch on the Motherboard.

The DIP switch consists of 8 switches positioned next to each other. They can be used to assign addresses from 0 to 255 in binary form (2^8=256).

Note

In non-redundant operation, Built-In-Slave addresses are permitted in the range from 0-125; in redundant operation, addresses between 0 and 61 are permitted.
Assigning an invalid address for the type of operation in question causes the Built-In-Slave to be deactivated.

Note

In redundant operation, an address must be assigned to the Built-In-Slave.

Assigning the Built-In-Slave Address

To assign an address to the Built-In-Slave of the Gateway HD2-GTR-4PA, follow these steps:

1. Place the eight individual switches of the DIP switch in the correct positions to generate the desired address of the Built-In-Slave as the sum of powers of two from left to right (see the label on the Gateway Module).
2. Restart the Gateway by disconnecting it from the power supply or by unplugging the Gateway Module and reconnecting it.

The Built-In-Slave address is assigned.

Note

In the case of redundant coupling, both Gateways need to be restarted at the same time.

5.2 Commissioning of Cyclic Data Exchange

An appropriate configuration tool is required to configure cyclic data exchange (defining the slave, effective data, etc.) with a PROFIBUS-DP Master Class 1.

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PROFIBUS Commissioning

Commissioning of Simplex System and Redundant System

The following section describes communication start-up of the HD2-GTR-4PA:

1. If necessary, convert existing GSD files of PA slaves with the P+F-GSD converter and then integrate them into the configuration tool
2. Integrate the GSD file of the HD2-GTR-4PA into the configuration tool

Note

Because the DP/PA-Gateway is already a DP slave, its device GSD does not need to be converted. The GSD file of the HD2-GTR-4PA is available for download at www.pepperl-fuchs.com.

3. Add Built-In-Slave (BIS) of the HD2-GTR-4PA to the DP bus configuration
4. Assign the BIS address set on the Motherboard DIP switch to the HD2-GTR-4PA on the DP bus
5. Adjust the Watchdog. Rough value: 5 seconds (see chapter “Additional Information about Watchdog time” on page 35)

Additional steps for Redundant Coupling

Attention

PA slaves do not take part in cyclic data exchange
The Built-In-Slave (BIS) of the first DP/PA Gateway must take part in cyclic data exchange. If it does not the connected PA slaves will also not enter into cyclic data exchange.
Add the BIS of the Gateway to the DP bus configuration!

The following additional steps are required for redundant coupling:

1. Add the Built-In-Slave (BIS) of the second DP/PA Gateway to the DP bus configuration
2. Assign the BIS address set on the DP bus (the address of the first BIS + 64) to the second DP/PA Gateway on the DP bus.

Additional steps for use of fiber-optical zones

If Coupling is designed redundantly and the DP bus uses optical fiber as a communication medium, the following additional steps must be performed:

Adjust the retry limit according to the baudrate (see chapter “Additional Information on Adjusting Retry” on page 37).

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5.2.1 Information on the GSD Conversion

Because coupling is transparent, PROFIBUS PA nodes are treated like PROFIBUS DP slaves by the PROFIBUS DP Master. This also applies to start-up and configuration.

The GSD file must be integrated in a configuration tool before it can be used to configure and operate a PROFIBUS PA slave.

The following distinctions are important to recognize in GSD files for PROFIBUS PA slaves:

- Is the file a profile GSD or a manufacturer-specific GSD?
- is the GSD designed for communication via the RS 485 interface (DP-GSD) or by the interface in conformity with IEC 61158-2 (PA-GSD)?

If a profile GSD is being used, the filename indicates whether it is a DP-GSD or a PA-GSD. For example, file PA039733.gsd is the profile GSD for 4 binary outputs. The "PA“ in the filename means it is a PROFIBUS PA slave. The following "0“ indicates it is a DP-GSD. The filename of the PA-GSD for the same profile is PA139733. The "1“ after the PA abbreviation identifies it as a PA-GSD.

If manufacturer-specific GSDs are used, for example to make use of functionality that falls outside the profile, the following convention identifies whether it is a DP-GSD or PA-GSD:

- If you have not done so already, integrate the GSD into your configuration tool.
- Check in your configuration tool what baud rates are supported.

If a baudrate of 31.25 kBd is supported, the file is a PA-GSD. Normally only baudrates of 31.25 kBd, 45.45 kBd and 93.75 kBd are supported by the PA-GSD.

If transmission rates in accordance with the PROFIBUS specification are used (IEC 61158), i.e. baudrates of 9.6 kBd to 1.5 MBd or 12 MBd, the file is a DP-GSD. Some PROFIBUS PA field device manufacturers do not offer any PROFIBUS DP-GSDs. In this case the existing PROFIBUS PA-GSD must be converted. The conversion software (GSD converter) is available at no cost from www.pepperl-fuchs.com. The purpose of this conversion software is exclusively to enter missing transmission rates and to set specific bus parameters to values that allow for problem-free operation of the PROFIBUS DP.

Converting the GSD file imposes the following functional restrictions if that was previously supported by the original GSD file:

- FREEZE and SYNC functionality is deactivated. These functions are used in PROFIBUS DP for synchronization of sensors/ actuators. Since work is possible on the PROFIBUS DP side

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(Host side) at transmission speeds of up to 12 MBd and on the PROFIBUS PA side (field side) at a rate of 31.25 MBd, problem-free operation cannot be guaranteed.

Some PROFIBUS functions are not currently supported. If the field device is intended to support one or more of the following functions, a warning will point out that this will no longer be the case after the conversion. This affects the following functions:

- Master class 1 acyclic access

The following functions of PROFIBUS DP V2:

- Data Exchange Broadcast (Publisher/Subscriber)
- Isochronous mode, i.e. cycle-synchronous transmission

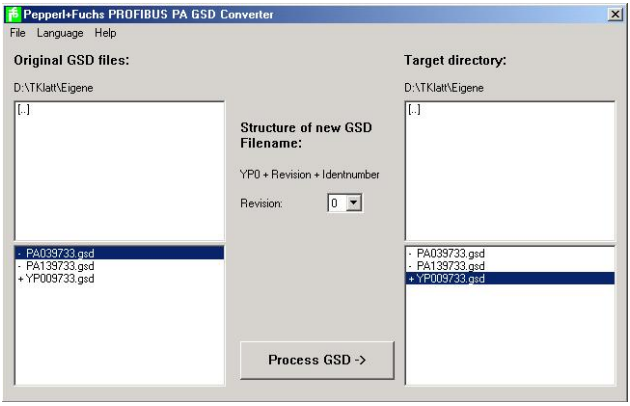
Using the Pepperl+Fuchs GSD converter

Note

The Advisory Board of the PROFIBUS User Organization has agreed that certified GSD files changed by the Pepperl+Fuchs GSD converter software will not lose their certificate.

To convert GSD files, follow these steps:

1. Start program PFGSDCX.EXE
   The following dialog appears:



2. Select the directory that contains the GSD files you wish to convert.
3. Select the GSD files you wish to convert.

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Note

You can select one or more files for conversion by pressing the CTRL or SHIFT keys. Files preceded by a "+" symbol are the result of a previous conversion. These files cannot be converted again and an error message appears if an attempt is made to do so. Files beginning with a "-" symbol have not been converted and can be if required. Double-click to open and view or edit a file.

4. Select the directory where you would like to store the converted GSD files.
5. Convert the GSD files by clicking on the "Process GSD -->“ button

Another window appears with information about the result of the conversion process.

5.2.2 Additional Information about Watchdog time

PROFIBUS devices can activate a mechanism that monitors each time interval in the cyclic data exchange process (also referred to as user data exchange) to ensure that the PROFIBUS master is still active. The time is measured in the PROFIBUS slave.



Warning

Watchdog reprogramming during cyclic communication!

DPV1 slaves leave cyclic communication because the DPV1 standard does not permit any Watchdog change during operation.


Note

The BIS of the DP/PA Gateway performs diagnostics in the DTM and cyclically to determine whether the Watchdog time (TWD) is sufficient.

If the response monitor is active and the time (T_{WD}) since the last cyclic polling process has expired, the device stops the cyclic data exchange, reverts to its original status (Wait_prm) and secures the status of the outputs.

The time value T_{WD} and the signal for activating the response monitor are transmitted from the PROFIBUS master to the PROFIBUS slave in the parameter telegram at start-up (transmitted during the cyclic data exchange). The time T_{WD} is generally defined specific to the user (not device-specific, not in the GSD). Lesser values are limited by the cycle times.

The time T_{WD} is usually entered via the configuration tool. The watchdog setting in the DP/PA gateway is transparent. On some configuration tools, the response monitor is preset once for the PROFIBUS master.

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While on other tools, the response monitor is preset individually for each PROFIBUS PA participant. The response monitor value does not change in any way.

Many tools calculate the time T_{WD} automatically with a corresponding baud rate based on the cycle time of the master.

If the baud rates at the PROFIBUS DP end are high (e.g. 12 MBd), the cycle times of the PA end may be 300 times longer. If a PROFIBUS PA device has been programmed directly with a time T_{WD} calculated at a higher master baud rate (DP), this is usually shorter than the PA cycle and the device does not exchange data.

The following bus parameters should be used to ensure the DP/PA gateway operates reliably:

- only one watchdog time T_{WD} is programmed for the entire PROFIBUS system. The longest delay period must be determined in order to define T_{WD}
- one watchdog time T_{WD} is programmed for each individual slave.

The preset (parameterized) time T_{WD} must be greater than the maximum occurring delay period T_{V_max}.

Two types of Watchdogs can be configured on the HD2-GTR-4PA in cyclic or acyclic data exchange (chapter “Watchdog Time in the DTM” on page 50):

- Transparent Watchdog: The Watchdog time on the DP side is the same as on the PA side (= default setting).
- Fixed Watchdog: A Watchdog time is set on the HD2-GTR-4PA for the PA side that is different than the DP side.

Note

The HD2-GTR-4PA measures the current cycle time of each PA segment and generates a diagnostic message if the Watchdog time is too short. Then the Watchdog time must be increased. The Gateway diagnostics are based on the following formula: 2 x $T_{Cycle_PA_Channel}$ + 500 ms

5.2.3 Information about I/O Cycle Time

The overall I/O data cycle time from a DP master via HD2-GTR-4PA to a PA slave can be approximated as follows:

$T_{Cycle_IO_Data} = T_{Cycle_DP} + T_{Cycle_PA_Channel}$
where:

$T_{Cycle_PA_Channel}$ = Cycle time of the PROFIBUS PA channel

T_{Cycle_DP} = Cycle time of the PROFIBUS DP

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The PA cycle time $T_{Cycle_PA_Channel}$ depends on:

- the number n of nodes on a channel
- the effective data length L

The effective data length L is a unitless variable calculated as the sum of input and output effective data quantity (in bytes) of all devices.

The cycle time is calculated approximately as follows:

Nonredundant system:
$T_{Cycle_PA_Channel}$ = (0.256 ms * L) + (n * 12 ms) + 40 ms
Redundant system:
$T_{Cycle_PA_Channel}$ = (0.256 ms * L) + (n * 12 ms) + 100 ms



Cycle time discrepancy in real application
This is the basic cycle time for ideal conditions. In reality acyclic communication, retries and diagnosis data can increase the cycle time so an additional safety margin has to be added. For the calculation of a overall cycle time (Change of a measured signal until reaction of an Actuator) additional parameters like the measurement cycle time of the PROFIBUS PA devices and IO Processing cycle of the controller must be considered.

5.2.4 Additional Information on Adjusting Retry

If the coupling from DP to PA is designed redundantly and the DP bus uses optical fiber as a communication medium, Pepperl+Fuchs recommends increasing the retry limit of the DP master.

Recommended retry limits corresponding to various baudrates:

Baudrate	Retry limit
45.45 kBd	2
93.75 kBd	2
187.5 kBd	2
1.5 MBd	2
3 MBd	4
6 MBd	6
12 MBd	7

5.3 DTM Software Installation and Commissioning

System requirements for installation, commissioning and operation of the DP/PA Gateway DTM:

- Hardware requirements based on your frame FDT
- FDT frame application (FDT specification 1.2)
- Latest version of HD2-GTR-4PA-DTM

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- 40 MB free hard drive storage

Installation of DTM Package with PACT*ware*™ as an Example

To install the DTM package on your system, follow these steps:

1. Install the P+F-FieldConnex® DTM package
2. Start the PACT*ware*™ program

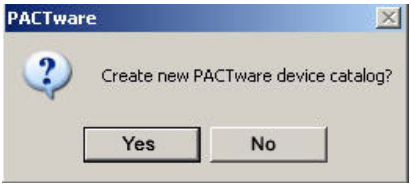
Note

Make sure that all PACT*ware*™ projects are closed.

3. Update the device catalog



The ***Create New Device Catalog*** window appears:



4. Confirm with ***YES***

The DTM is installed and ready for operation.

Create the project tree

To create the project tree, proceed as follows:

1. Start PACT*ware*™

Note

Make sure the latest DTM version is installed and that the device catalog is updated.

2. Open the appropriate project or create a new one
3. Open the device catalog (***View/Device Catalog*** or press ***F3***)

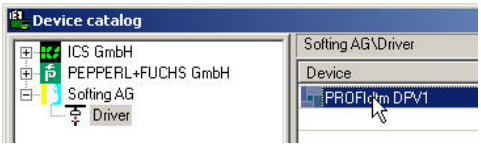
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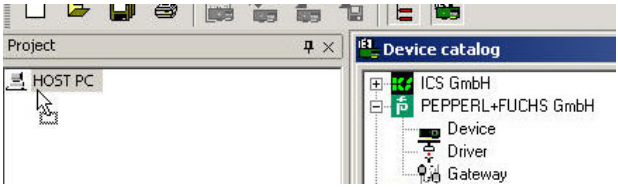
4. Open the menu entry Softing AG



5. Select the entry ***Drivers/PROFIBUS Driver***



6. Drag and drop the ***PROFIBUS Driver*** to your project window/Host PC

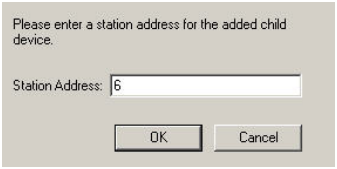


7. In the Device Catalog, open menu item ***Pepperl+Fuchs GmbH/ Device/HD2-GTR-4PA***



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8. Drag the HD2-GTR-4PA into the project window into the ***PROFIdtm DPV1*** node. The window Add station address will appear.



9. Enter the station address (BIS address of the Gateway) and confirm with OK.

   Your project tree should now look like this:



Enter assigned BIS address in the DTM

To enter the BIS address (which has been assigned on the Gateway-motherboard) into the DTM, proceed as follows:

1. Rightclick on ***PROFIdtm DPV1*** in the project tree and choose ***Additional Functions/Edit DTM Station Addresses.***
2. Enter the BIS address set on the Gateway Motherboard and confirm with ***Apply***:



Note

In rare cases, the FDT application may not immediately display the address change in the project window even though the change has been made.
In that case, save the project once to update the display.

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Advanced Diagnostic Module Engineering

Attention

Data loss
The Advanced Diagnostic Module can be engineered in both the offline and the online dialog. Make sure to load the data from the device or to the device after engineering.

To integrate an Advanced Diagnostic Module HD2-DM-A via PROFIBUS PA, proceed as follows:

1. In the device catalog, open ***PEPPERL+FUCHS GmbH/Device/HD2-DM-A***
2. Drag&Drop HD2-DM-A into the project window's HD2-GTR-4PA node

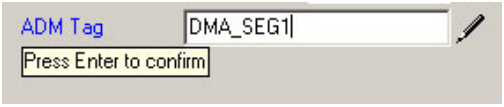
Note

The ADM address is being detected automatically and is displayed symbolically by „999". There is no need to assign an address.

Your project tree should now look as follows:



3. To assign a tag to the Advanced Diagnostic Module, open the offline dialog of HD2-GTR-4PA.
4. Enter a device description into the field **ADM Tag** and confirm with ***Enter***



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6 Operation

In PROFIBUS, two types of communication exist:

- cyclic and
- acyclic data exchange.

In cyclic data exchange, user data is exchanged between the Master (Process Control System) and Slave (field device) at regular intervals. User data includes measurement values, limit position feedback and output data, etc. The bus cycle time depends essentially on the number of nodes and the amount of data being transmitted.

In acyclic data exchange, "service" data, for example device parameterization or diagnostic information, is transmitted.

A number of parameters of the HD2-GTR-4PA Gateway Module can be adjusted both through acyclic parameterization (using the DTM) and via the Process Control System. The advantage of parameterization via the Process Control System is the simplification of device replacement since no additional effort is required in addition to replacing the physical device.

6.1 Built-In-Slave (BIS) Description

The Gateway has an integrated slave (Built-In-Slave or "BIS“) with a DP address that can be configured with the DIP switch on the Motherboard. As a device participating in cyclic data exchange, the BIS returns function monitoring and diagnostic data to the Master.

6.1.1 Cyclic Data Exchange

The BIS is a modular DPV1 slave with one slot. Two modules are available, each with a one-byte input and one-byte output. The input provides a combined status message for the Gateway. The status message is coded as a PA Profile Status Byte (0x00: Bad unspecific, 0xA4: Good Maintenance Required, 0x80: Good). For the actual value of the byte under certain diagnosis conditions, please refer to table “Device Diagnosis Parameters” on page 44. If multiple diagnosis events are present, the priority is as follows: Bad (highest priority), Good Maintenance required, Good (lowest priority). A dummy byte (0x00) must be sent as an output data item.

6.1.2 Parameterization Options (Channel Assignment)

The three configuration modules Default, PA-BUS Configuration and PA-BUS Configuration + Diag allow the parameterization of the following values:

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Default
none

PA-BUS Configuration
Watchdog Time
PA Retry limits
Number of activated PA segments

PA-BUS Configuration + Diag
Watchdog time
PA Retry limits
Number of activated PA segments
Diagnosis (ADM Alarm Observer)



Note

If the PA bus configuration module is set, values that are set with this module cannot be changed with acyclic access during cyclic communication.

6.1.3 Diagnostics (Slave Diagnostics)

The BIS returns the following of the diagnostic blocks described in the GSD:

- Device Diagnosis
- 0- 4 x Segment Diagnosis (Channel Diagnosis)
- RedState-Block

Device Diagnosis provides specific diagnostic information about the Gateway. This information is parsed directly by the Process Control System and displayed for the user. In redundant configuration, all diagnosis information is also available for the redundancy partner. Device Diagnosis includes:

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Device Diagnosis Parameters	EXT_DIAG	InputData
Gateway primary device	No	GOOD
Redundancy not operative	Yes	BAD
Redundancy is syncronizing	Yes	BAD
Redundancy gateway missing	Yes	BAD
Hardware error detected	Yes	BAD
Redundancy link error	Yes	BAD
No baudrate detected	Yes	BAD
BuiltIn-Slave not in data exchange	No	GOOD
Firmware version mismatch	Yes	BAD
Firmware updated, need reboot	Yes	BAD
A PA Masters not in token ring	Yes	BAD
PABus parameters write locked	No	GOOD
Segment MAU error	Yes	BAD
ADM error or module missing	Yes	BAD
ADM: system maintenance required	Yes	GOOD Maintenance required
ADM: system out of specification	Yes	BAD
ADM: segment maintenance required	Yes	GOOD Maintenance required
ADM: segment out of specification	Yes	BAD

All Device Diagnostic parameters marked with „Yes“ in the EXT_DIAG column cause the EXT_DIAG to be set in the slave diagnosis. The Process Control System then marks that slave as defective.

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Channel Diagnostics returns specific diagnostic information about each individual segment. These error messages are prioritized and set to preferred by the BIS depending on their ranking. The following table represents diagnostic information according to its ranking.

Channel Diagnostic parameters
Hardware Error
No slave in live list
DP Watchdog time too short
Duplicate slave address
PA master not in token ring
ADM: segment out of specification
ADM: segment maintenance required

The **RedState Block** is a standardized diagnostic block, it is inserted when the slave receives a PRM command.

6.2 Coupled Slaves

This section applies to coupled slaves on non-redundant Masters and to Flying Redundancy Masters.

All coupled PA slaves behave as non-redundant DP slaves after the GSD conversion, so that every PA slave appears directly on the DP bus. The PA slaves are **not** merged to one single slave.

Both cyclic and acyclic communication is coupled.

As many C2 connections are coupled to the slaves as they support, altogether a maximum of 500.

From the Master's point of view, redundancy switching of the Gateway has no effect on PA slaves. They do not drop out of communication.

The FREEZE and SYNC modes are coupled, but because DP communication and PA communication are incompatible in terms of time, they are not relevant for practical purposes.

Identification & Maintenance (I&M) Functions are supported.

6.3 Acyclic Data Exchange with BIS via DTM

The BIS supports four acyclic connections. Three dialogs are available in acyclic mode via the DTM (Device Type Manager):

- the Offline Dialog
- the Online Dialog
- the Diagnostics Dialog

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In the Offline dialog, all parameters can be set locally without having any direct effect on communication or the device. Data can be written to the device after all settings have been made. Current parameters can also be read in from the device, processed and saved.

Attention

Data Loss

Settings made in the Online Dialog are not automatically transferred to the Offline Dialog.

To save online settings, load the data into the Offline Dialog ***(function: Read Data from Device)***.

In the Online Dialog, you directly effect device parameters. Your entry is written to the device immediately, as soon as you press the Return key. The Online Dialog additionally offers diagnostic information about the Gateway and the PA-segments connected to the Power Hub.

The Diagnostic Dialog shows the current device parameters and diagnostic information, changes to the data cannot be made in this dialog.

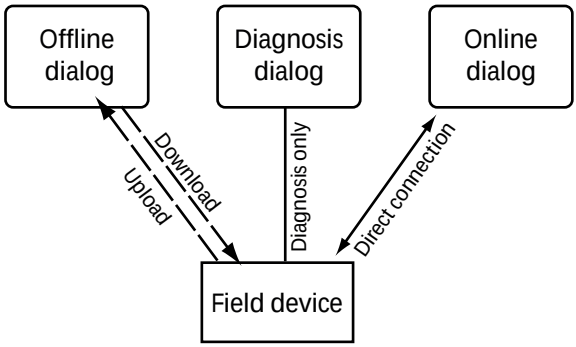


Figure 6.1: Functional overview of dialogs

6.3.1 Brief introduction to DTM with PACT*ware* TM as an Example

Connect DTM to the HD2-GTR-4PA

Make sure all settings have been made correctly (the device address, etc.)

1. Right click in the project tree on HD2-GTR-4PA
2. Select ***Connect***

A rhomb (#) next to the device icon in the project tree indicates that the connection exists.

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Open Offline Dialog

To open the Offline Dialog:

1. Right click in the project tree on HD2-GTR-4PA
2. Select ***Parameters/Offline Parameterization***

Open Online Dialog

Make sure the HD2-GTR-4PA is connected.
To open the Online Dialog:

1. Right click in the project tree on HD2-GTR-4PA
2. Select ***Parameters/Online Parameterization***

Open Diagnosis Dialog

Make sure the HD2-GTR-4PA is connected.
To open the Diagnosis Dialog:

1. Right click in the project tree on HD2-GTR-4PA
2. Select ***Diagnostics***

Print Diagnostic Information

To print Diagnosis information:

1. Open the Diagnosis or the Online Dialog (see above)
2. Press the "Print Button“ in the DTM header



The diagnostic report Print Preview window appears

3. Click ***Print*** in the footer of the Print Preview window

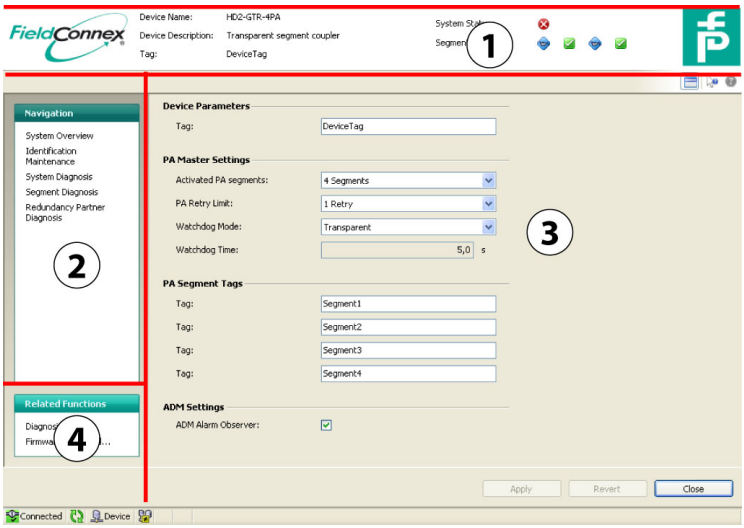


The Printer Driver Selection menu appears

4. Select your printer and confirm the print job

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6.3.2 Overview of the DTM User Interface



1 Identification area
2 Navigation area
3 Work area
4 Quick start

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6.3.3 Structure Diagram

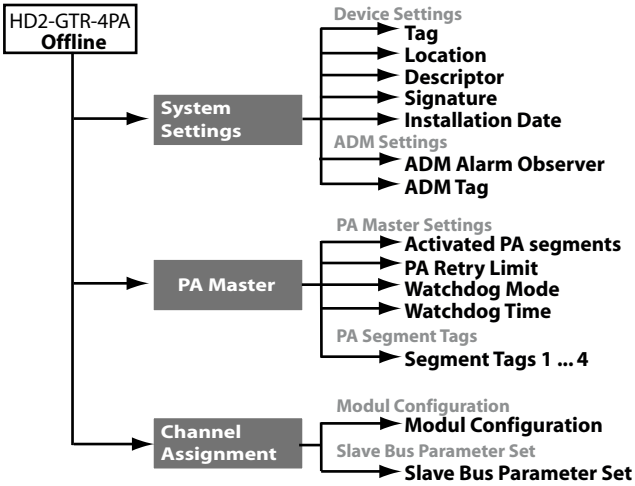


Figure 6.2: DTM structure - Offline Dialog

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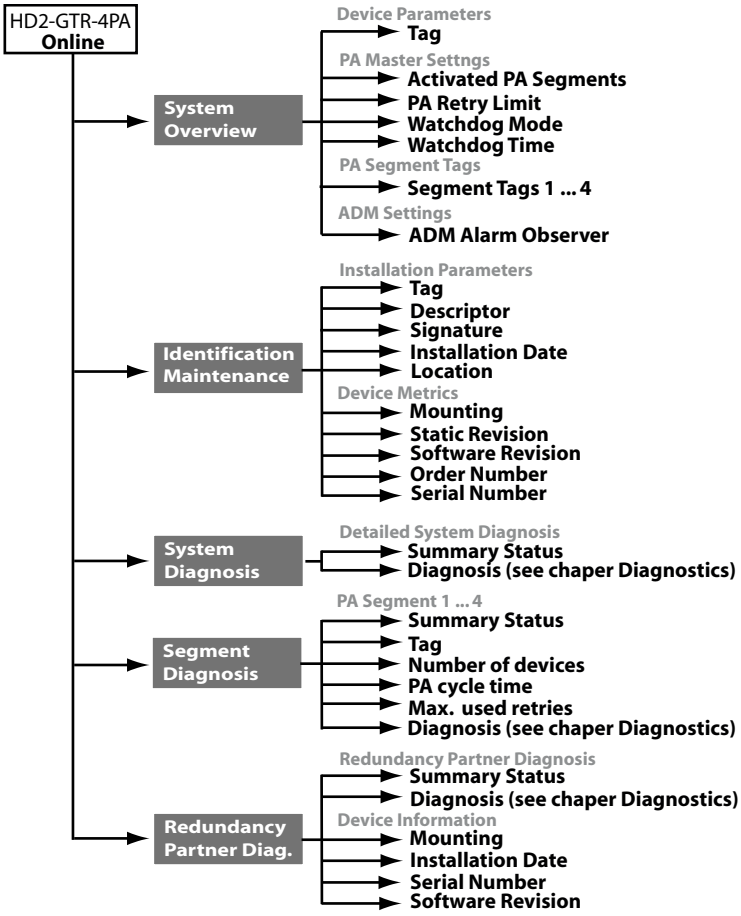


Figure 6.3: DTM structure - Online Dialog

6.3.4 Watchdog Time in the DTM

The HD2-GTR-4PA has two Watchdog time settings:

- Transparent: The Watchdog time on the DP side is the same as on the PA side.
- Fixed value: A Watchdog time is set on the HD2-GTR-4PA for the PA side that differs from the time of the DP side.

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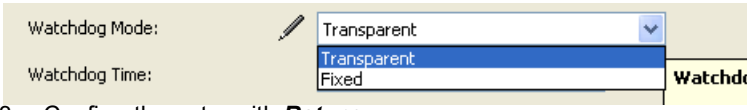
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When the HD2-GTR-4PA is delivered, the Watchdog setting is set by default to transparent. You can find further information in chapter “Additional Information about Watchdog time” on page 35.

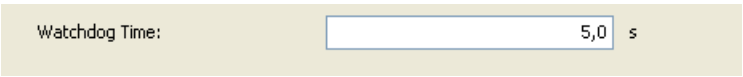
Set Fixed Watchdog Time via DTM

To change the Watchdog setting:

1. Open the Online or Offline dialog
2. Select "Fixed" from the drop-down list



3. Confirm the entry with ***Return***
4. Enter the Watchdog time and confirm with ***Return***



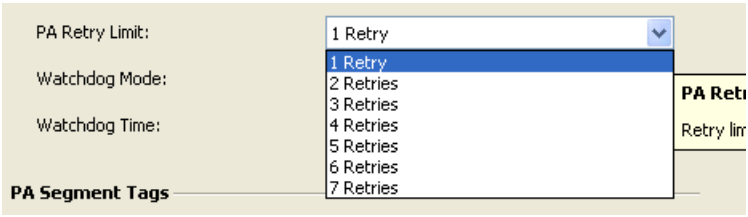
6.3.5 PA Retry Limit Setting

Parameters can also be set for the PA side retry limit in acyclic data exchange.

Set the PA Retry Limit via DTM

To set the PA retry limit in the DTM :

1. Open the Online or Offline Dialog



2. Select the retry limit from the drop-down list
3. Confirm your entry with ***Return***

6.3.6 Restart Functions, Redundancy Switchover and Firmware Update

The HD2-GTR-4PA-DTM offers three additional functions:

- Restart,
- Restart with Default Values and
- Firmware Update.

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Operation

Perform Restart

Loss of communication
If the coupling is simplex or redundancy is not available, all coupled PA slaves drop out of the cycle.

Attention

The function reboots the HD2-GTR-4PA.

1. ***Right click*** on HD2-GTR-4PA
2. Select ***Additional Functions/Restart***

Restart is performed after confirmation.

Perform Restart with Default Values

Loss of communication
If the coupling is simplex or redundancy is not available, all coupled PA slaves drop out of the cycle.

Attention

With redundant coupling, the device that has just restarted takes over all configurations from the other device that is still active. To be able to reset to default values in a redundant system, the restarted Gateway must be mounted alone on the Motherboard.

Note

The restart with Default Values function boots the HD2-GTR-4PA with its default values. All manually configured data such as device tags, Watchdog times and retry limits are lost.

To perform a restart with default values, proceed as follows:

1. Right click in the project tree on HD2-GTR-4PA
2. Select ***Additional Functions/Restart with Default Values***

Restart is performed after confirmation.

Redundancy Switchover

Loss of communication
If redundancy is not available, all coupled PA slaves drop out of data exchange.
Before performing a switchover, check whether redundancy is available.

Attention

The primary and secondary device exchange roles. The active BIS drops out of communication. All coupled PA slaves remain in the data exchange.

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To perform Redundancy Switching, proceed as follows:

1. Right click in the project tree on HD2-GTR-4PA
2. Select ***Additional Functions/Force Redundancy Switchover***

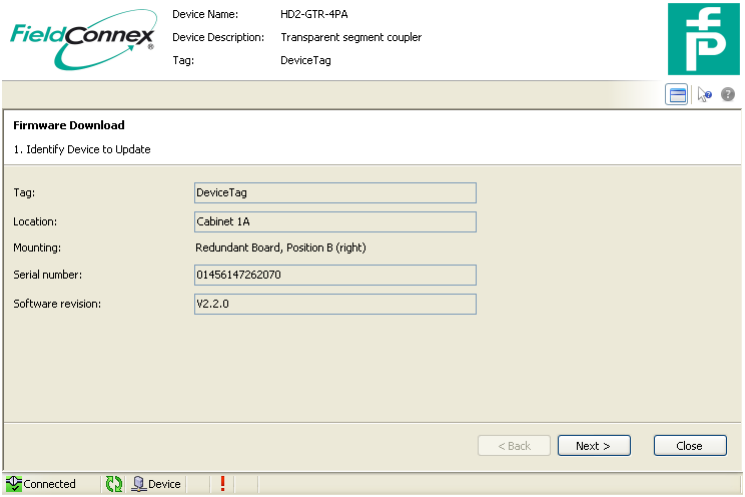
After confirmation the function is performed.

Firmware Update

Attention

Loss of communication
In the case of simplex coupling or if redundancy is unavailable, all coupled PA slaves leave cyclic communication.

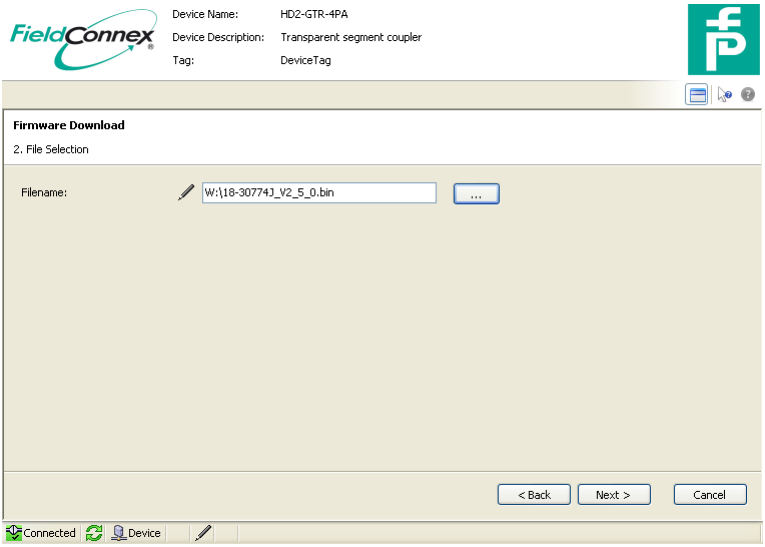
1. Right-click on HD2-GTR-4PA in the project tree
2. Choose ***Additional Functions/Firmware Download***
3. Device identitfy appears, press ***Next***



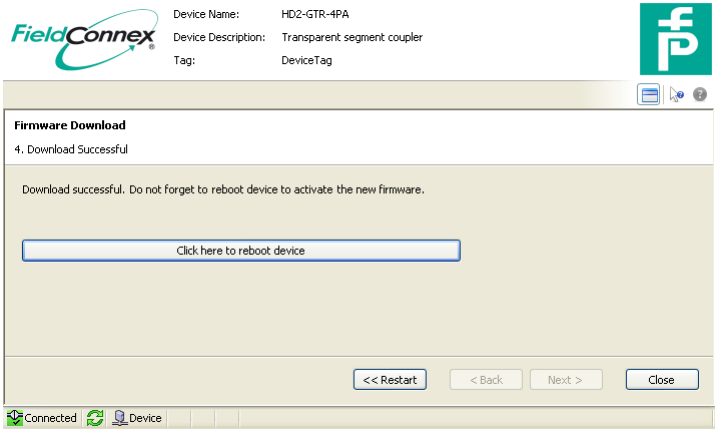
4. Choose the new Firmware file

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5. Confirm the installation windows which follow by clicking ***Continue***



6. Restart the Gateway



Note

In the case of redundant coupling, a redundancy switchover occurs when the Gateway is restarted. After this redundancy switchover has occurred, update the firmware (steps 1-5) for the second Gateway as well.

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6.4 Redundant Operation

6.4.1 Redundancy Behavior

During redundant operation, the Gateway simulates PA slaves for the DP-BUS. From the point of view of the DP bus, Redundancy Switchover has no visible effect on the Master. All slaves remain in the cycle. This Transparent Redundancy (TR) differs from normal Flying Redundancy (FR) behavior, which allows slaves to drop out of the cycle for a defined time.

The HD2-GTR-4PA supports all Masters that work on the Flying Redundancy principle as well as all non-redundant Masters.

The BIS automatically detects whether the DP master is using a redundancy concept. If the DP master is working according to the Flying Redundancy concept, the Gateway automatically adjusts itself accordingly. No settings of any kind need to be made.

With Transparent Redundancy, exchange of user data remains intact. In the worst case, only non-critical acyclic data exchange will drop out.

6.4.2 System Environment for Redundant Operation

In redundant operation, both BISs (Primary and Backup Gateway) should be in cyclic data exchange. Assigning bus addresses to both Gateways makes it easy to monitor both BISs with the Master, which detects the failure of one of the two BISs and reports the relevant slave address.

The PROFIBUS Power Hub provides redundant Coupling of PA segments in the following system environments:

- with use of non-redundant Master and
- in a Flying Redundancy system.

Non-redundant Masters do not see any effect on PA slaves from Redundancy Switchover. The Backup Gateway takes over communication seamlessly. Both Gateways participate in general Token Ring operation: Primary Gateway = PA Master Address 1, Backup Gateway = PA Master Address 2. Participation in Token Ring operation thus allows use of handhelds for diagnostic purposes.



Note

The BIS must participate in cyclic data exchange.

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In the FR environment all PA slaves are configurated as normal non-redundant slaves. The BIS can be configurated as an FR slave. For additional information, see chapter “Redundancy Concepts” on page 65.

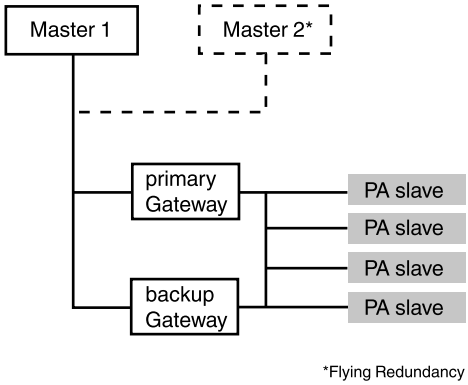


Figure 6.4: Integration into Flying Redundancy and non-redundant system

6.4.3 Applications with Redundant Operation

Redundancy is available if:

- both Gateways are in operation with no errors
- both Gateways detect DP baudrates and
- there are no errors in PA communication.

Note

If redundant operation is not available, that will be reported by slave diagnostics.

Possible reasons for Redundancy Switchover are:

- Hardware error in the primary Gateway.
- Loss of baudrate (cable break, etc.).
- BIS drops out of the cycle (because of an unlock from the Master or the Watchdog time has expired, etc.).

Redundancy Switching has taken place if:

- both BISs have dropped out of communication and
- the primary BIS comes up again on the bus immediately or
- the BISs on the DP-BUS have changed roles.

The Primary Gateway is identifiable by:

- its LED „Red.“ (Redundancy) is flashing or being lit.

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If a Backup Gateway is plugged into the Motherboard:

- its BIS boots and
- it takes over all configurations from the Primary Gateway.


Attention

Data loss
The reinstalled Gateway normally takes all configurations from the first Gateway. All previous configurations of the new Gateway are overwritten.

- The primary and secondary BISs are synchronized to each other.

If a Gateway is separated from the redundant Motherboard:

- the primary device generates the diagnostic message "Redundancy not available, redundancy partner missing“.

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7 Advanced Diagnostics with the PROFIBUS Power Hub

In conjunction with the Advanced Diagnostic Module HD2-DM-A, the PROFIBUS Power Hub offers extensive analytic and monitoring possibilities for a PROFIBUS fieldbus installation. This diagnosis, from now on called "Advanced Diagnostics", covers, among other things:

- proactive plant monitoring
- analysis of the Fieldbus Physical Layer (jitter, noise etc.)
- assistance during the complete fieldbus life cycle
- wizards for commissioning and fault detection
- integrated oscilloscope function

Further information regarding Advanced Diagnostics can be found in the manual „Advanced Diagnostic Module HD2-DM-A“. You can download this manual from www.pepperl-fuchs.com.

7.1 Advanced Diagnostics Infrastructure

In general, the Advanced Diagnostics setup comprises a number of different hardware (PROFIBUS Power Hub, Advanced Diagnostic Module) and software components (FDT, DTM). Depending on your requirements and your hardware and plant infrastructure, this setup can vary (see also Advanced Diagnostic Module HD2-DM-A manual).

In order to integrate the Advanced Diagnostic Module HD2-DM-A into a PROFIBUS Power Hub installation, two different setups can be implemented:

- direct connection via PROFIBUS DP (recommended) or
- via the diagnostic bus of the Power Hub motherboard.

7.1.1 Advanced Diagnostics Connection via PROFIBUS DP

In the case of a direct connection of the diagnostic module, communication between the Diagnostic Manager (DTM) and the diagnostic module takes place via PROFIBUS DP and the PROFIBUS Gateway HD2-GTR-4PA. The Gateway in this case acts as an interface and a data access coordinator for the diagnostic module.

No further components are necessary, the diagnostic module is being addressed within the DTM using "Plug&Play". With this type of connection, one diagnostic module is statically assigned to one Gateway each. Thus, this diagnostic module appears as a child node of its corresponding PROFIBUS Gateway in the DTM project.

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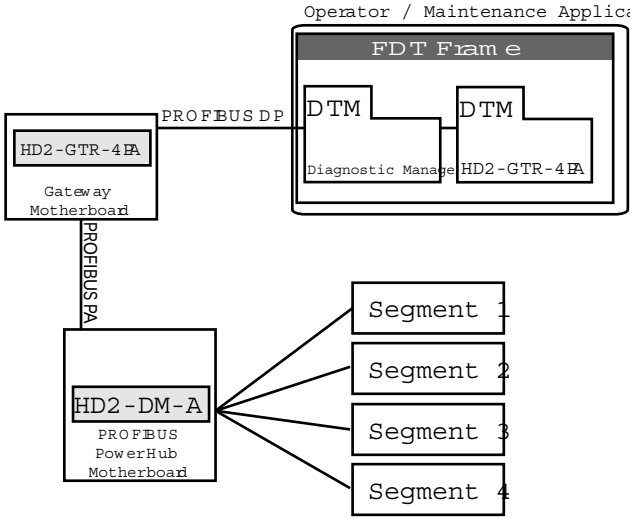


Figure 7.1: Schematic topology of direct connection of diagnostics

Hardware	Description
Segment 1...4	PROFIBUS PA segments
HD2-DM-A	Advanced Diagnostic Module (ADM) on Fieldbus Power Hub Motherboard.
HD2-GTR-4PA	Gateway Module on Gateway Motherboard.
Operator / Maintenance Application	Depending on setup and structure, FDT can either run on the maintenance application or the operator application.

Software	Description
FDT (Field Device Tool)	The FDT specification defines the interaction of DTMs with host computers or software. An FDT frame application is a PC-based software including many DTMs for configuration monitoring and programming of field devices. Both the Diagnostic Manager DTM and the Gateway DTM run in an FDT environment.

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Software	Description
DTM	A DTM is a device configuration and management software. It contains a graphic user interface and configures and diagnoses devices. DTMs are embedded in an FDT frame application, such as PACT*ware* ™ or in a DCS with an FDT interface. The DTM for the Advanced Diagnostic Module is called Diagnostic Manager.

7.1.2 Advanced Diagnostics Connection via Diagnostic Bus

This type of diagnosis connection with a PROFIBUS installation is mainly used to forward diagnostic information to an OPC system. Communication of the Diagnostic Managers (DTM) with the Diagnostic Module takes place via a further software module, the FieldConnex® Diagnostic Server (FDS), and a further hardware component, the COM-Port converter. In contrast to direct connection via PROFIBUS DP, the FDS here serves as an interface and a data access coordinator for the Diagnostic Module as well as an OPC-DA server, the converter provides the connection to the RS 485 diagnostic bus of the motherboards.

The Diagnostic Modules which are part of a DTM project are not firmly allocated to one Gateway. Rather, all HD2-DM-A modules connected to the FDS appear at the FDS node. Alarms and warnings of all Diagnostic Modules are analyzed centrally in one single window, the so-called System Diagnostic Window.

You can find further information regarding the FDS and the setup, configuration and commissioning of the Diagnostic Module in the manual "Advanced Diagnostic Module HD2-DM-A“.

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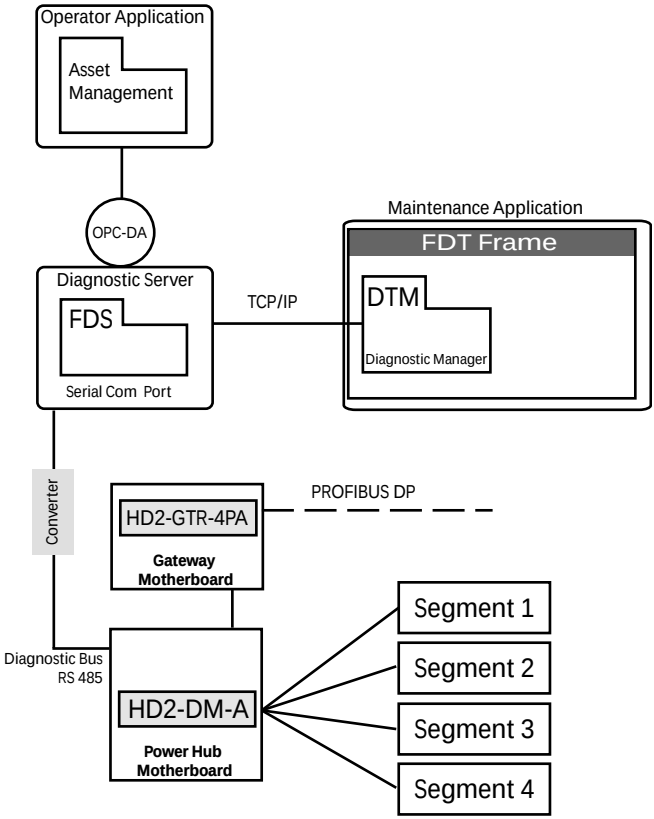


Figure 7.2: Topology of diagnostic connection via diagnostic bus

Hardware	Description
Segment 1...4	PROFIBUS PA segments
HD2-DM-A	Advanced Diagnostic Module (ADM) on Fieldbus Power Hub Motherboard.
HD2-GTR-4PA	Gateway Module on Gateway Motherboard.
Diagnostic Server	Server or Cabinet PC on which the FieldConnex^{R} Diagnostic Server (FDS) is running. The Server is connected to the Advanced Diagnostic Module via the RS-485 diagnostic bus.

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Hardware	Description
Operator Application	Application on which the plant management or operator system is running. An OPC-DA client can also be running here.
Maintenance Application	Host application for the FDT frame.
Converter	Device which provides the connection between serial Ethernet and RS 485. Since the FDS works on a serial COM port, a converter is needed to connect the FDS with the RS 485 diagnostic bus in the cabinet.

Interface	Description
OPC-DA	Standardized interface allowing access to DCS data (OPC = OLE for Process Control). Integrated into the FDS.
TCP/IP	Communication protocols used on the Internet and on most commercial networks.

Software	Description
FDS	The FieldConnex^{R} Diagnostic Server works as an interface and a data access coordinator for the Diagnostic Module HD2-DM-A, it includes the OPC-DA service.
FDT	The FDT specification defines the interaction of DTMs with host computers or software. An FDT frame application is a PC based software including many DTMs for configuration monitoring and programming of field devices. Both the Diagnostic Manager DTM and the Gateway DTM run in an FDT environment.
DTM	A DTM is a device configuration and management software. It contains a graphic user interface and configures and diagnoses devices. DTMs are embedded in an FDT frame application, such as PACT*ware* ^{TM} or in a DCS with an FDT interface. The DTM for the Advanced Diagnostic Module is called Diagnostic Manager.

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7.2 PROFIBUS Advanced Diagnostics Integration

If the Advanced Diagnostic Module HD2-DM-A is connected via PROFIBUS DP, the PROFIBUS-Gateway HD2-GTR-4PA acts as the interface and the data access coordinator for diagnostic messages to the DCS and the DTM if the function "Alarm Observer" has been activated.

If the Alarm Observer is activated, basic warnings and alarms of the Diagnostic Module are integrated into the slave diagnosis and can be parsed by the DCS via cyclic data exchange. Additionally, these warnings and alarms also appear directly in the DTM diagnostic dialog (Online Parameterization) of the PROFIBUS Gateways.

The Alarm Observer can be switched on both acyclically via the DTM and cyclically via DCS Gateway configuration.

Activating Alarm Observer in the DTM

1. Open the window Offline or Online Parameterization
2. Choose Alarm Observer ***Enabled*** from the DropDown list and confirm with ***Return***



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7.2.1 Advanced Diagnostic Messages in the Gateway DTM

Due to the integration of basic alarms and warnings into the slave diagnosis of the Gateway, the DTM diagnosis dialog of the Gateway has been extended by the following entries:

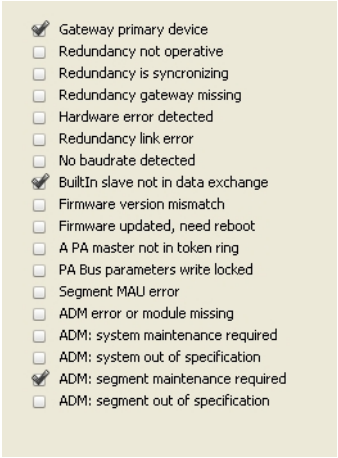


Figure 7.3: Device-specific messages

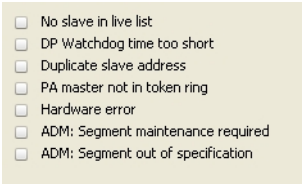


Figure 7.4: Segment-specific messages

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8 Basic Principles

8.1 Redundancy Concepts

8.1.1 Overview

Two redundancy concepts have become established on the market: Flying Redundancy and System Redundancy. These redundancy implementations are described below.

8.1.2 Flying Redundancy

Under this concept, both slave and master instances are connected to the same physical bus so there is only one DP cycle. The Address of the Primary Slave incremented by 64 is assigned to the Backup Slave:

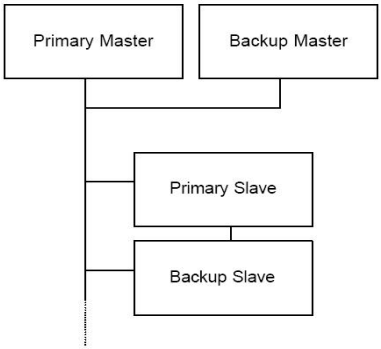


Figure 8.1: Flying Redundancy

This concept involves the disadvantage that in the event of a fault on the bus, all communication is interrupted. If Redundancy Link Modules (RLM) are used, this can be avoided by means of so-called Media Redundancy. As the following topology illustrates, a fault is only relevant to the corresponding bus:

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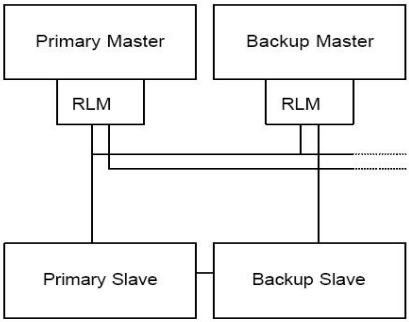


Figure 8.2: Flying Redundancy combined with Media Redundancy

This structure represents a common "Flying Redundancy“ concept. It demonstrates that the Primary Slave and Backup Slave do not need to be connected to the same physical bus.

8.1.3 System Redundancy

Under the concept of "System Redundancy" there are two Masters, each one of which performs its own PROFIBUS cycle on two different lines. The redundant Slave instances are connected to each other with the corresponding cables:

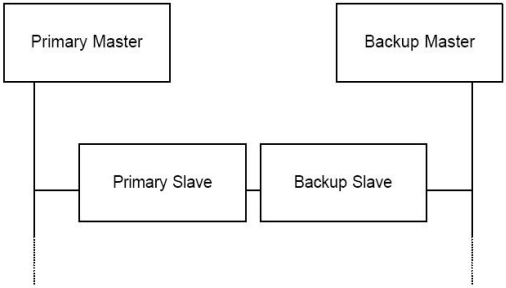


Figure 8.3: System Redundancy

The main disadvantage of this concept is that non-redundant Slaves can only be used if Y-Links are also used. System Redundancy is usually found in combination with the Siemens S7. The Pepperl+Fuchs HD2-GTR-4PA Gateway does not support "System Redundancy".

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9 Appendix 1 / Glossary

This appendix gives explanations concerning the explosion protection declarations used in this manual. It also contains a glossary of terms often used in connection with Fieldbus applications.

Fieldbus Glossary:

Term	Explanation
Acyclic data exchange	Event-driven communication used to read or write parameters into or out of a field device
Advanced Diagnostic Module	Module of the FieldConnex™ System which is plugged onto the Power Hub Motherboard and which delivers diagnostic functions such as advanced Physical Layer Diagnostics.
Basic Diagnostic Module	Module of the FieldConnex™-Systems which is plugged onto the Power Hub Motherboard and delivers basic diagostic information such as redundant supply of segments, supply voltage failure of a module etc.
CREST	Crosstalk and Resonance Suppression Technology. Prevents signal overlay and resonance, increases the signal-to-noise-ratio and thus maintains a high signal quality level.
Crosstalk	Signal overlay. Signals of one segemtn partly appear on another. Can be caused by capacitive coupling. Remedy: Drilled cable connections, CREST.
Cyclic data exchange	cyclic exchange of process data and setpoint values between Master and sensors/actuators which are connected over the fieldbus.
Daisy chaining	Series connection of devices
DIP Switch	Switch used to assign an address for configuration of a device.

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Appendix 1 / Glossary

Term	Explanation
DTM	Device Type Manager. Software which allows parametization and Diagnosis of field devices via a GUI. Parameterization can be done online, i.e. with instant effect of changes, or offline.
Earth leakage	Short circuit via earth. Causes signal deviations (asymmetry) in case of redundant supply.
Galvanic isolation	Physical separation of circuits. Charge carriers cannot flow from one circuit into another
GSD converter	Software from Pepperl+Fuchs which converts GSD files from PROFIBUS DP to PROFIBUS PA
GSD file	Text file which describes communication behavior and supported functions of a PROFIBUS device
Intrinsic Safety	Safety concept. Uses energy limitation to ensure that no temperatures or sparks are present which could lead to ignition of an explosive atmosphere. Current, Voltage and Power in an intrinsically safe circuit are so low that ignition cannot take place in case of short circuit, circuit breakage or earth leakage. Intrinsically safe devices can be removed from or added to circuits during operation.
Jitter	Deviation from ideal timing of an event. Here: Deviation from the ideal zero passage of the signal as compared to the last zero passage
Mobile Advanced Diagnostic Module	Modul which offers the functionality of the Advanced Diagnostic Module but which is designed for mobile use in the field since it is USB powered
Noise	Often caused by overlay of a number of disturbances. Leads to signal deterioration

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Term	Explanation
Physical Layer	Layer 1 of the OSI 7 layer model. This is where physical data exchange takes place
Power Conditioner Module	Not galvanically isolated Power Hub Module for segment supply
Power Hub Module	Term under which Power Supply Modules and Power Conditioner Modules as well as Diagnostic Modules are subsumed
Power loss	Energy produced during device operation which is let off in form of heat into surroundings
Power Supply Module	Galvanically isolated Power Hub Module which limits votage to a given value and supplies the segment with this voltage
PROFIBUS DP	PROFIBUS Decentralized Periphery. Most often used PROFIBUS protocol using transmission rates between 9,6 kbit/s and 12 Mbit/s.
PROFIBUS MBP	PROFIBUS Manchester-Coded Bus Powered. New Term for PROFIBUS PA
PROFIBUS PA	PROFIBUS Process Automation. PROFIBUS protocol using a transmission rate of 31,25 kbit/s. Unlike PROFIBUS DP, PROFIBUS PA can be used in intrinsically safe circuits
Redundant Coupling	Coupling which is implemented twice, thereby offering increased reliability. Coupling is performed by two Gateway Modules on the Gateway Motherboard
Redundant Supply	Supply which is implemented twice, thereby offering increased reliability. Per segment, two Power Modules supply field devices
Retry limit	Number of retries which are undertaken before a field device is interpreted as non-existent by the host

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Appendix 1 / Glossary

Term	Explanation
RS 485	Communication protocol on the PROFIBUS DP segment
Segment Protector	Junction Box by Pepperl+Fuchs with implemented short circuit protection
SegmentChecker	Software for designing, calculating and checking for plausibility of entire fieldbus installations using a GUI.
Spur	A usually short cable which connects the field device to the trunk
Static Revision Counter	Counter which is increased by one everytime a substantial change of state occurs. Can be used for status monitoring
transparent Coupling	Coupling in which all PA slaves appear on the DP bus as if they were DP slaves
Trunk	Main line of a fieldbus segment. Leads from the supply to the Junction Box, where the spurs go off
Watchdog time	Time after which a device is taken out of the cyclic data exchange
Zone 0	Zone in which a hazardous, potencially explosive atmosphere comprised of air and inflammable gases, fumes or fog is present permanently, over longer periods of time or frequently.
Zone 1	Zone in which during normal operation a hazardous, potentially explosive atmosphere comprised of air and inflammable gases, fumes or fog is occasionally present.
Zone 2	Zone in which a hazardous, potentially explosive atmosphere comprised of air and inflammable gases, fumes or fog is normally not or only present for short periods of time.

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10 Parameter Reference List

10.1 General Parameters

Name	Description
TAG (device)	Device TAG; Default EMPTY
Reserved	-
Mounting location	Mounting location of the device; Default EMPTY
Software version	Software version of the device
Serial number	Serial number of the device
Static revision	"Static revision“ counter is incremented when non-volatile values are changed.
Information	Device information in a bit field Bit 0 = Board Type • 0 = Non-redundant Motherboard • 1 = Redundant Motherboard Bit 1 = Device position on Motherboard* • 0 = Left device • 1 = Right device *0 for non-redundant Motherboard
Totals status	Combined device status message (good: 0x00; bad. 0x80)
Number of activated PA segments	Number of active PA segments (1...4)

10.1.1 PA Master Parameters

Name	Description
PA Retry Limit	Retry limit of PA Master (valid values: 1...7) Default: 1 (firmware 2.6.0 or older) Default: 3 (firmware 2.6.1 or newer)
Watchdog mode	Value of / working with Watchdog time (WDt): • 0 = Transparent WDt • 1= Fixed WDt* *Valid values 2...25 sec.; Default: 50* 100 ms

Work on the bus (for example connecting or disconnecting field devices) can cause malfunctions on the bus, which may cause other field devices to fail. To counteract this problem, the retry limit can be increased. Increasing the retry limit increases the cycle time under some circumstances.

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10.1.2 PA Segment Parameters

Name	Description
TAG	Segment TAG; Default EMPTY
Number of nodes	Number of devices on this segment (Masters + slaves)
PA bus cycle time	Value of the last PA bus cycle time in ms

10.2 Diagnostic Parameters

Diagnostic parameters represent the current status of the device/segment as a bit field.

10.2.1 Device Diagnostic Parameters

Bit	Description
0	0: Backup device 1: Gateway is primary redundant device (always with non-redundant layout)
1	Redundancy status (only with redundant layout): 0: OK 1: Redundancy not operative
2	Synchronization status (only with redundant layout) 0: OK 1: Redundancy is synchronizing
3	Redundancy device status (only with redundant layout) 0: OK 1: Redundancy gateway missing
4	Hardware error status 0: OK 1:Hardware error detected
5	Redundancy communication status (only with redundant layout) 0: OK 1: Redundancy link error
6	DP baudrate status 0: OK 1: No baudrate detected
7	Built-In slave status 0: OK 1: Built-in slave not in Data-Exchange state
8	Firmware versions in both gateways differ 0: False 1: True

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Bit	Description
9	Firmware was updated, reboot required 0: False 1: True
10	A PA master is not participating the token ring 0: False 1: True
11	Cyclic bus parameters write locked 0: False 1: True (Watchdog. Retry Limit, Segment Status)
12	A segment MAU error has been detected 0: False 1: True
13	Diagnostic Module (ADM) state 0: OK 1: Diagnostic module error or module missing
14	System maintenance required 0: False 1: True
15	System out of specification 0: False 1: True
16	Segment maintenance required 0: False 1: True
17	Segment out of specification 0: False 1: True

10.2.2 PA Segment Diagnostic Parameters

Bit	Description
0	Live list status: 0: OK 1: No PA slave detected in segment live list
1	Watchdog status: 0: OK 1: DP Watchdog time too short
2	Device address status: 0: OK 1: Double slave address (other device or BIS)
3	Reserved

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Bit	Description
4	Master diagnostic status: 0: OK 1: PA master not in token ring
5	Hardware state: 0: OK 1: Segment MAU error
6	Segment maintenance required 0: False 1: True
7	Segment out of specification 0: False 1: True

10.2.3 Redundancy Partner Parameters

Name	Description
Software version (R)	Software version of the redundancy partner
Serial number (R)	Serial number of the redundancy partner
Static Revision (R)	"Static Revision“ counter of the redundancy partner.
Redundancy diagnostics	Diagnostic status of the redundancy partner
Redundancy information	Redundancy Information of the redundancy partner

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11 Troubleshooting

This chapter is designed to offer help in connection with your PROFIBUS Power Hub.


Note

In case a fault should occur, a good starting point is to make sure that the field wiring is complete, properly terminated and that all field spurs are attached. It is also advisable to check if the Gateway Module(s) and the Power Modules are properly plugged into the connection slots on their respective motherboards.

11.1 Faults Indicated via LEDs

Symptom	Possible cause	Remedy
LED „PWR“ is off	No power	Check Power Supply
	Gateway defective	Restart Gateway. If problem persists, send Gateway to Pepperl+Fuchs
LED „DP/ERR“ is flashing red	No data transmission on DP side	Check cables Check termination
	Master problem	Check Master
	Gateway defective	Restart Gateway. If problem persists, send Gateway to Pepperl+Fuchs
LED „DP/ERR“ is solid red	Hardware error	Restart Gateway. If problem persists, send Gateway to Pepperl+Fuchs
LED „Red.“ (Redundancy) is flashing yellow	Redundancy not available. Reason:	
	Synchronisation in progress	Not a fault. Wait a few seconds
	Second Gateway Module is missing on a redundant board	Plug in second Gateway Module
	Backup Gateway is defective	Send Gateway to Pepperl+Fuchs

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Troubleshooting

Symptom	Possible cause	Remedy
LED „RED“ is off	Gateway Module is plugged into Simplex-Motherboard	Use redundant motherboard
	Only one Gateway Module is plugged into redundant motherboard	Not a fault
	Redundant board is used and LED „Red.“ is solid yellow at primary Gateway	Not a fault. Gateway is backup device
LED „Seg 1“ ... „SEG 4“ are flashing red	Address collision:	
	The same address is assigned to field devices on two segments	Change address of PA slave
	BIS address collision:	
	The same address is assigned to a field device and one of the Built-In-Slaves (in case of redundant board: address or address + 64)	Change address of PA slave
LED „Seg 1“ ... „SEG 4“ is solid red AND LED „DP/ERR“ is solid red	Hardware error	Send Gateway to Pepperl+Fuchs
Redundancy switchover occurs for no apparent reason	Built-In-Slave has left data exchange	Not a fault. See PROFIBUS specification
	Inactivity/startup toggle	Not a fault. While not used, redundant slaves constantly change their roles (see PROFIBUS specification)

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Symptom	Possible cause	Remedy
No redundancy even though two Gateway Modules are used	Gateway Module is defective	Send Gateway to Pepperl+Fuchs

11.2 Faults Indicated via DTM

Symptom	Possible cause	Remedy
Redundancy switchover occurs for no apparent reason	Built-In-Slave has left data exchange Inactivity/startup toggle	Not a fault. See PROFIBUS specification Not a fault. While not used, redundant slaves constantly change their roles (see PROFIBUS specification)
„Redundancy partner missing“	No second Gateway Module plugged into motherboard Secondary Gateway Module has failed	Plug second Gateway Module into motherboard Replace second Gateway Module
No redundancy even though two Gateway Modules are used	Gateway Module is defective	Send Gateway to Pepperl+Fuchs
„Firmware version mismatch“	Devices use different firmware versions	Harmonize firmware versions
„Firmware updated“	Device has not been rebooted	Reboot device. Firmware is not active until device has been rebooted
„Hardware error“	Poor signal quality Hardware error	Perform Physical Layer Diagnosis Send Gateway in

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Troubleshooting

Symptom	Possible cause	Remedy
PA-Bus-Master parameters (WD mode, WD time, No. of retries, Segment No.) cannot be written	PA-Bus-Master parameters are write-protected because Built-In-Slave has been taken into cyclic data exchange using PA bus configuration module	Use different module to configure cyclic data exchange
Diagnostic module error or module missing	Diagnostic Module is defekt or has been removed (by active ADM Alarm Observer only).	Replace Diagnostic Module Switch off ADM Alarm Observer
ADM reports system maintenance required	At least one monitored system value has violated the preset limit	Execute diagnosis with DTM Diagnostic Manager for detail information (for further information see Advanced Diagnostic Module HD2-DM-A manual).
ADM reports system out of specification	At least one monitored system value has violated the specification limit	
ADM reports segment maintenance required	At least one monitored segment value has violated the preset limit	
ADM reports segment out of specification	At least one monitored segment value has violated the specification limit	

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11.3 Faults Indicated via DCS

In case faults are indicated via the control system, make sure the Built-In-Slaves of your PROFIBUS Power Hub System is integrated into the engineering tool correctly.

Symptom	Possible cause	Remedy
PA slaves keep leaving cyclic data exchange	Termination problem on PA side	Check Termination
	Fault on PA bus	Eliminate fault on PA bus
	Poor signal quality on PA side	Perform Physical Layer Diagnosis on PA side with Advanced Diagnostic Module
	Watchdog time too short	Increase watchdog time
PA slaves and DP slaves keep leaving cyclic data exchange	Fault on DP bus	Eliminate fault on DP bus
	Poor signal quality on DP side	Check DP signal quality
Device diagnosis: No redundancy even though two Gateway Modules are used	Poor signal quality	Perform Physical Layer Diagnosis on PA side with Advanced Diagnostic Module
	Gateway Module defect	Contact Pepperl+Fuchs
Device diagnosis: „Redundancy partner missing“	No second Gateway Module plugged into motherboard	Plug second Gateway Module into motherboard
	Secondary Gateway Module has failed	Replace second Gateway Module
Device diagnosis: „Hardware error“	Poor signal quality	Perform Physical Layer Diagnosis
	Hardware error	Send Gateway in
Device diagnosis: „Firmware version mismatch“	Devices use different firmware versions	Harmonize firmware versions

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Troubleshooting

Symptom	Possible cause	Remedy
Device diagnosis: „Firmware updated“	Device has not been rebooted	Reboot device. Firmware is not active until device has been rebooted
PA slaves do not take part in cyclic data exchange	Redundant system, but Built-In-Slave has not been added to cyclic data exchange	Add Built-In-Slave to cyclic data exchange
PA-Bus-Master parameters (WD mode, WD time, No. of retries, Segment No.) cannot be written	PA-Bus-Master parameters are write-protected because Built-In-Slave has been added to cyclic data exchange using PA bus configuration module	Use different module to configure cyclic data exchange
Slave not visible in DCS	Respective segment is deactivated Poor signal quality on PA side	Harmonize number of PA segments at Gateway and actual number of existing segments Perform Physical Layer Diagnosis on PA side with Advanced DIagnostic Module
ADM error or module missing	Diagnostic Module is defekt or has been removed (by active ADM Alarm Observer only).	Replace Diagnostic Module Switch off ADM Alarm Observer
ADM: system maint. required	At least one monitored system value has violated the preset limit	Execute diagnosis with DTM Diagnostic Manager for detail information (for further information see Advanced Diagnostic Module HD2-DM-A manual).
ADM: system out of spec.	At least one monitored system value has violated the specification limit	
ADM: segment maint. required	At least one monitored segment value has violated the preset limit	
ADM: segment out of spec.	At least one monitored segment value has violated the specification limit	

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11.4 Problems with Gateway Operation

Symptom	Remedy/Background
Built-In-Slave does not accept the address assigned via the DIP switch on the Motherboard	Reboot Gateway. In case of redundancy: Restart BOTH Gateways AT THE SAME TIME. Caution: No redundancy available while booting!
Default values are not taken over when restart with defaults is performed	In case of Redundancy: boot BOTH Gateways AT THE SAME TIME. See chapter “Restart Functions, Redundancy Switchover and Firmware Update” on page 51. Caution: No redundancy available while booting!
PA-Bus-Master parameters are write-protected	Built-In-Slave has been added to cyclic data exchange using PA bus configuration module. Remedy: Use different module to configure cyclic data exchange
PA slaves do not take part in cyclic data exchange	Add Built-In-Slave to cyclic data exchange.
Unusual Gateway behavior and irregular recurring diagnosis messages	Possible cause: address collision with master of backup Gateway (address 2) Remedy: Change address of the colliding slave

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