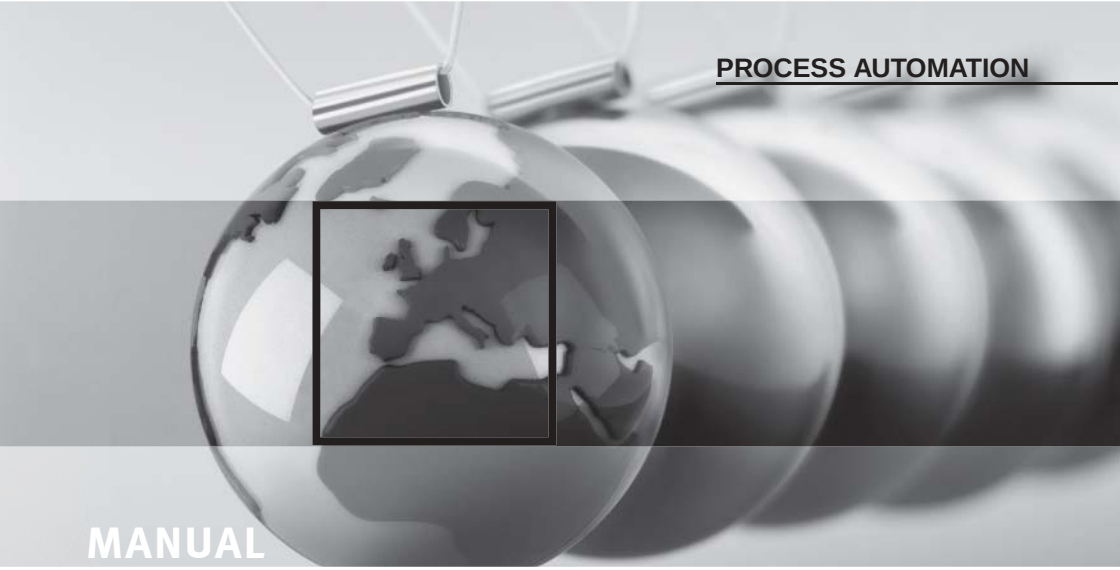

MANUAL

HD2-DM-A / DM-AM

ADVANCED DIAGNOSTIC SOLUTIONS

FieldConnex®

CE Ex

ISO9001

PEPPERL+FUCHS

PROTECTING YOUR PROCESS

List of content

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1 Explanation of Symbols

1.1 Safety-relevant Symbols

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.

1.2 Informative Symbols

Note

This symbol brings important information to your attention.

This symbol marks an acting paragraph.

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2 Introduction

This manual describes the following products:

- The Advanced Diagnostic Module HD2-DM-A, for mounting locally on a FieldConnex^{R} Power Hub motherboard.
- And the Mobile Advanced Diagnostic Module DM-AM, the mobile solution for selective analyzing, monitoring and troubleshooting in the field.

The Advanced Diagnostic Modules are specially designed to analyse signal and segment parameters. They also let you monitor and measure specific system, segment and field device values. The continuous live monitoring of all relevant physical layer parameters enables the constant validation of the signal quality and to proactively detect degradations before the segment communication fails.

The Diagnostic Modules are part of the diagnostic system, which consists of different hard- and software components that act as a whole (see chapter 5.1 and chapter 6.1).

In conjunction with the FDT/DTM based Diagnostic Manager both Diagnostic Modules provide analysis of signal and segment parameters as well as measurement of specific system and field device physical layer values. The integrated powerful oscilloscope function visualizes the current communication at each segment.

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Quick Device Comparison

Function	HD2-DM-A	DM-AM
Preferred type of usage	Lifecycle support, long term supervision and proactive services of complete Fieldbus plants or parts of it.	Commissioning, validation, troubleshooting, lifecycle support and long term supervision for individual segments.
Device supply	via motherboard	USB-powered
Number of monitored segments	4	1
Connection to PC	Com-Port Converter	via USB
Physical-Layer-Diagnosis	YES	YES
Bulk-Power-Supply monitoring	YES	NO
Segment supply monitoring	YES	YES
OPC integration	YES	NO
Powerful oscilloscope function	YES	YES
LED indication	YES	YES

For detailed information about the whole Pepperl+Fuchs Fieldbus Installation Technology and Fieldbus Power Hub product range please refer to the comprehensive system manuals and data sheets or contact your local Pepperl+Fuchs representative.

This described products are developed and manufactured in compliance with applicable European standards and guidelines.

Note

A corresponding Declaration of Conformity may be requested from the manufacturer.

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The manufacturer of the product, Pepperl+Fuchs GmbH in D-68307 Mannheim, has a certified quality assurance program in accordance with ISO 9001.

The described devices must only be operated by trained professionals in accordance with this manual.

It is assumed that the user has technical knowledge of and experience with FOUNDATION Fieldbus and/or PROFIBUS PA technology, explosion protection, as well as planning and installing FOUNDATION Fieldbus/PROFIBUS PA systems. This document does not provide a complete introduction to FOUNDATION Fieldbus, PROFIBUS PA or explosion protection for inexperienced users.

The Statement of Conformity, Certificate of Compliance and data sheets are considered as an integral part of this manual. The data sheets contain the electrical data of the Statement of Conformity and the Certificate of Compliance.

Laws and/or regulations governing the use or intended use must be observed. The described devices are only approved for proper professional use in accordance with the intended purposes. Improper handling will void any claim made under the warranty as well as any manufacturer's liability.

All Pepperl+Fuchs specific documents are available at www.pepperl-fuchs.com or from your local Pepperl+Fuchs representative.

2.1 Intended Use

The Advanced Fieldbus Diagnostic solutions are designed to analyse signal and segment parameters for monitoring and measuring of specific system, segment and field device values.

Protection of operating personnel and the system is not ensured if the module is not used in accordance with its intended purpose.

Warning

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Warning

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

Warning

If devices are operated in general electrical systems they must not thereafter be operated in electrical systems that are connected with hazardous areas.

Warning

The delivered transport case of the Mobile Advanced Diagnostic Module and some of its content must not be taken into hazardous areas.

2.2 Maintenance and Service

The measurement properties of the described devices are stable over long periods of time. For this reason, regular adjustment or service or the like is unnecessary.

2.3 Fault Elimination

Warning

Devices being operated in connection with hazardous areas must not be changed or manipulated.

Warning

In case of defect, the device must be removed and replaced with a new one.

2.4 Disposal

Disposal of devices and their packaging material must be performed in compliance with the applicable laws and guidelines of the corresponding country.

The devices contain no batteries which must be disposed of separately from the devices.

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3 Product Specifications HD2-DM-A

3.1 Functional Description

The HD2-DM-A is the motherboard mounted diagnostic solution for four fieldbus segments.

The preferred type of usage is lifecycle support, long term supervision and proactive services of complete Fieldbus plants or parts of it with extended demands on reliability and continuity.

A special developed FDT/DTM based Diagnostic Manager enables fast and easy commissioning and validation of Fieldbus installations as well as easy every day handling.

3.2 Marking

Advanced Diagnostic Module
Pepperl+Fuchs
D-68307 Mannheim
HD2-DM-A
TÜV 04 ATEX 2500 X
II 3 G EEx nA II T4

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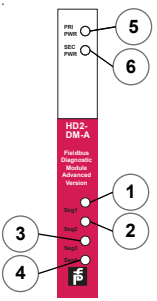
3.3 Technical Data

Advanced Diagnostic Module HD2-DM-A	
Supply	
Rated voltage	19.2 to 35 V
Rated current	110 to 30 mA
Power loss	max. 2 W
Fieldbus interface	
Number of segments	4
Rated voltage	9 to 32 V
Ambient conditions	
Ambient temperature	-40 to 60 °C (-40 to 140° F)
Storage temperature	-40 to 85 °C (-40 to 185° F)
Shock resistance	15 g 11 ms
Vibration resistance	1 g, 10 to 150 Hz
Humidity	<95 % non-condensing

Note

For complete technical data please refer to the corresponding data sheets.

3.4 LED Indication



1 LED status segment 1
2 LED status segment 2
3 LED status segment 3
4 LED status segment 4
5 LED Primary power connection
6 LED Secondary power connection

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3.5 Basic Troubleshooting

LED indication	Fault type	Fault clearance
PRI PWR and/or SEC PWR LEDs are off	Supply power failure: possible reasons: • no primary and/or secondary supply power is available • supply power is less than 19.2 V • supply power is higher than 35 V (32 V if at least one non-isolated power module is plugged-in or configured)	**Connect diagnostic PC and carry out a complete system diagnosis:** Bulk power supply switched on and healthy? Verify that the wiring is secure: • Tug on the wires/cable-clamps • Measure the DC voltage at the terminal block connector to the bulk power supply
One segment LED is flashing red (on/off with 2 Hz)	Any segment/field device alarm is active.	**Connect diagnostic PC and carry out a complete system diagnosis:** • DC unbalance • too high jitter level • too high noise level Bus segment... • ...badly terminated? • ...miswired (shield connections)? • ...short circuit overload? Power supply/conditioner modules healthy and well mounted?
All segment LEDs are flashing red (on/off with 2 Hz)	Any system alarm is active	**Connect diagnostic PC and carry out a complete system diagnosis:** Bulk power supply voltage correct? Board type configuration correct? Board redundancy configuration correct?
Any (or all) segment LEDs lights solid red	A hardware fault inside HD2-DM-A is detected	Replace the device with a new one!

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Product Specifications HD2-DM-A

3.6 HD2-DM-A Voltage Free Contact Activation

All Power Hub Motherboards (expecting MB-FB-1R) containing a common alarm voltage free contact. By affecting a relay general failure status is given, for further information see chapter „Fieldbus Power Hub Basic Diagnostics“ at the Fieldbus Power Hub System Manual. As the Basic Diagnostic Module the Advanced Diagnostic Module HD2-DM-A sets the relay contact, too. While no alarm occurs the contact is closed. The check outs with the corresponding relay status are given in the table below.

	Relay status	
Check out	**Maintenance alarm**	**Out-of-Specification alarm**
Bulk Power Supply Voltage High / Low		
Segment Voltage High / Low		
Segment Current High / Low		
Power Supply Module mismatch	n.a.	
Power Supply Module failed	n.a.	
Fieldbus Signal level High / Low		
Unbalance		
Noise		
Jitter		

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3.7 Order Information

Order name	Part.#	Description
HD2-DM-A	131000	Advanced Diagnostic Module allows, in conjunction with the FDT/DTM based Diagnostic Manager, analysis of signal and segment parameters as well as measurement of specific system and field device physical layer values.
Basic DTM		Free of charge Basic Diagnostic Manager with limited functionality. Available at www.pepperl-fuchs.com.
DTM-FC.AD	192767	Professional Diagnostic Manager, for up to or including 100 segments per production plant. Offers the full functionality including trending, report generation, oscilloscope function and an easy to operate Wizard for diagnostic commissioning.
DTM-FC.AD.1	192911	Professional Diagnostic Manager, for more than 100 segments per production plant. Offers the full functionality including trending, report generation, oscilloscope function and an easy to operate Wizard for diagnostic commissioning.

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Product Specifications HD2-DM-A

3.8 Dimensional Drawings

Note

The HD2-DM-A Module can be mounted on different Fieldbus Power Hub motherboards. For dimensions of the mounted systems, please refer to the corresponding motherboard data sheet.

Note

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

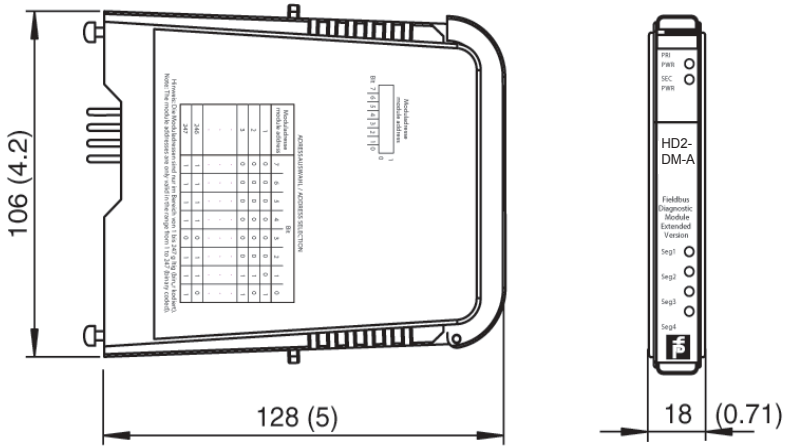

Figure 3.1: HD2-DM-A

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4 Product Specifications DM-AM

4.1 Functional Description

The Mobile Advanced Diagnostic Module DM-AM is a USB-powered tool to analyze the physical layer parameters of one fieldbus segment at a time.
The preferred type of usage is commissioning and validation of new or reworked Fieldbus segments as well as the fast troubleshooting of a respective segment in the case of a failure.

Specially developed FDT/DTM based Diagnostic Manager enables fast and easy commissioning and validation of Fieldbus installations as well as reliable troubleshooting on the spot.

4.2 Marking

Mobile Advanced Diagnostic Module
Pepperl+Fuchs
D-68307 Mannheim
DM-AM
TÜV 05 ATEX 2923 X

II 3 G EEx nA [nL] IIC T4

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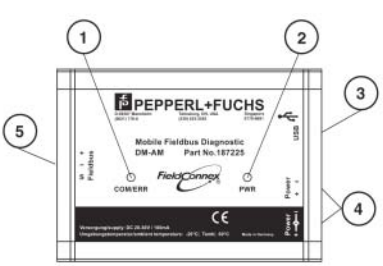
4.3 Technical Data

Mobile Advanced Diagnostic Module DM-AM	
Supply	
Rated voltage	20 to 30 V
Rated current	70 to 30 mA
Power loss	0.7 W
Fieldbus interface	
Number of segments	1
Rated voltage	9 to 32 V
Ambient conditions	
Ambient temperature	-40 to 60 °C (-40 to 140° F)
Storage temperature	-40 to 85 °C (-40 to 185° F)
Shock resistance	15 g 11 ms
Vibration resistance	1 g, 10 to 150 Hz
Humidity	<95 % non-condensing

Note

For complete technical data please refer to the corresponding data sheets.

4.4 Device Component Overview



1 LED Segment Communication/ Error
2 LED Power supply indication
3 USB interface
4 Power supply connections
5 Fieldbus connection

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4.5 LED Indication and Basic Troubleshooting

LED indication	Fault type	Fault clearance
LED PWR is off	Supply power failure: no supply power is available or supply power is less than 20 V or supply power is higher than 30 V	USB-supply less than 150 mA? • Use an externally-supplied USB-Hub Verify that the wiring is secure: • Tug on the wires/cable-clamps • Measure the DC voltage at the terminal block connector of the bulk power supply or use the delivered AC/DC adapter
LED COM/ERR is flashing red (on/off with 2 Hz)	A segment/field device alarm is active.	**Connect diagnostic PC and carry out a complete system diagnosis**: • DC unbalance • jitter level too high • noise level too high Bus segment... • ...badly terminated? • ...miswired (shield connections)? • ...short circuit overload?
LED COMM/ERR lights solid red	A hardware fault inside the DM-AM is detected	Replace the device with a new one!

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4.6 Order Information

Order name	Part.#	Description
DM-AM-KIT	191195	The Mobile Advanced Diagnostic Kit scope of delivery: • Transport case • Mobile Advanced Diagnostic Module DM-AM • USB 2.0 cable • Fieldbus cable with test clamps and DM-AM Fieldbus connector • Mounting clip • Software package
DM-AM-WPS	193182	AC/DC adapter / Wall Power Supply
Basic DTM		Free of charge Basic Diagnostic Manager, comes with the Diagnostic Module. This Tool-suite reads generic physical layer information of the fieldbus segments.
DTM-FC.ADM	192769	Professional Diagnostic Manager, offers the full functionality including alarming, trending, report generation and the oscilloscope function.

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4.7 Dimensional Drawings

Note

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

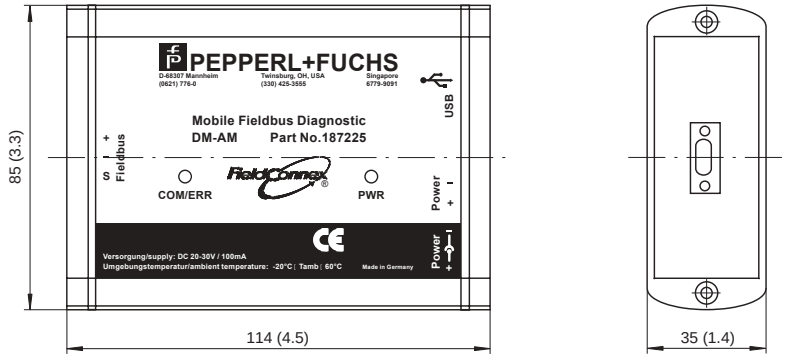

Figure 4.1: DM-AM

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5 Application Engineering HD2-DM-A

5.1 Schematic Diagnostic Structure HD2-DM-A

In general the diagnostic infrastructure is made up of different hardware (e.g. Diagnostic Modules, Fieldbus Power Hub motherboards) and software (e.g. FDS, Diagnostic Manager) components.

The figure 5.1 gives a stylized overview of all included components and how they interact in the whole composition.

The real assembly depends on your hardware and plant infrastruture. It also depends on your individual requirements. It may therefore vary from the diagram shown below. You can, for example, build a local application structure where the diagnostic server and the maintenance application are running on the same PC. For further engineering details, see chapter 5.2).

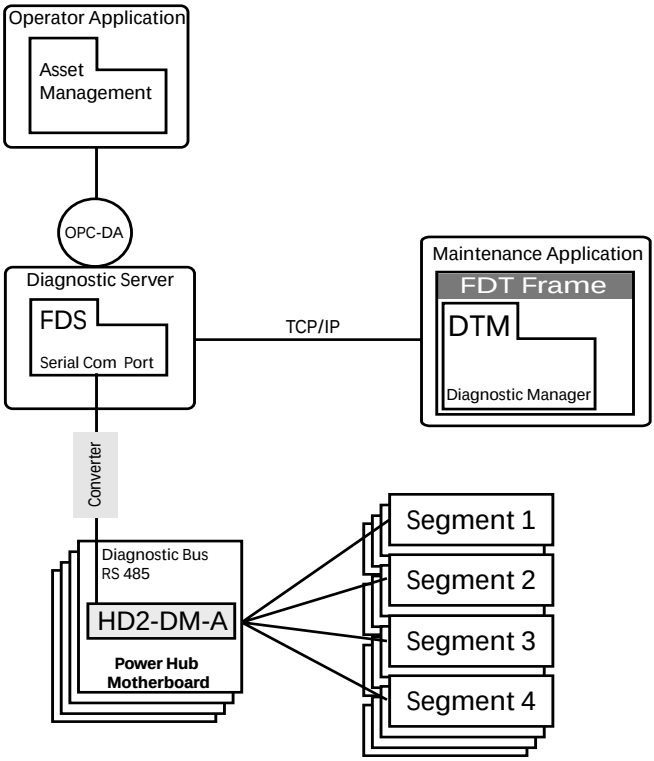

Figure 5.1: Schematic structure HD2-DM-A, see legend below

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Hardware	Description
Segment 1...4	FOUNDATION Fieldbus or PROFIBUS PA segments
HD2-DM-A	Advanced Diagnostic Module plugged onto the Fieldbus Power Hub 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 Modules via RS 485 diagnostic bus.
Operator Application	Application on which the Asset Management or Operator System are running. An OPC-DA client may run on this Application.
Maintenance Application	Host Application for the FDT-Frame application.
Converter	Device that provides serial Ethernet to RS 485 connectivity. Because the FieldConnex^{R} Diagnostic Server (FDS) is working on a serial Com Port only, a converter is required to connect the FDS to the RS 485 Diagnostic Bus in the field cabinets. The common solution is a connection via Ethernet/RS 485 Converter.

Interface	Description
OPC-DA	Standardized interface to access data from a process control system (OPC = OLE for Process Control). Integrated within the FDS.
TCP/IP	Set of communication protocols used on the Internet and on most commercial networks.

Software	Description
FDS	FieldConnex^{R} Diagnostic Server is acting as an interface and a data access coordinator for the HD2-DM-A/DM-AM, includes the OPC-DA service.

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Software	Description
FDT	Field Device Tool is a specification defining how the DTM interacts with a host computer or software. An FDT frame application is a PC-based software tool which contains many DTMs for configuration, monitoring and programming field devices. The Diagnostic DTMs are run by this application.
DTM	Device Type Manager that represents the FDS, ports and connected HD2-DM-A modules. A DTM is the device's configuration and management software. It contains the graphic user dialogues and undertakes device configuration and diagnosis. A DTM is embedded into a FDT frame application, e.g. PACT*ware*™ or in control systems with FDT interfaces. The DTM for the Diagnostic Modules is called Diagnostic Manager.

5.2 Typical Applications

Depending on the kind of usage Pepperl+Fuchs recommends two different kinds of diagnostic application structures:

- The local application structure should be used for smaller fieldbus plants where OPC integration is not necessary and supervision is performed from all-in-one maintenance PC.
- The remote application structure should be used for large fieldbus plants with permanent OPC integration and supervision taking place from several maintenance PCs throughout the plant.

5.2.1 Local Application Structure

By performing a complete installation of the FieldConnex® Diagnostic Manager and PACT*ware*™ 3.0 SP 4 all software components are running on the same Windows PC (maintenance PC).

The Com Port Converter is addressed via Ethernet. It converts the signal from Ethernet to the RS 485 powered Diagnostic bus (see chapter 5.3.2). The local application structure comprises of:

Required Software Components:

- PACT*ware*™ 3.0 SP 4
- FieldConnex® Diagnostic Manager

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Required Hardware Components:

- Windows™ PC
- Com Port Converter
- Advanced Diagnostic Module on Power Hub Motherboard
- Diagnostic bus

Required Interfaces

- Ethernet

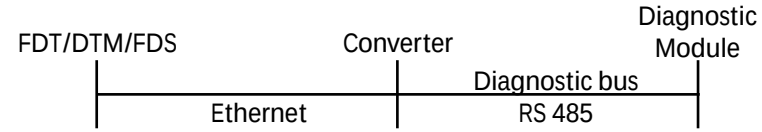

Figure 5.2: Local application data flow

5.2.2 Remote Application Structure

In a remote application structure, the software components run on different stations: PACT*ware*™ and the Diagnostic Manager are running on a Windows PC, which is connected to the FDS running on a server or cabinet PC via TCP/IP .

The FDS responds to the Com Port Converter via Ethernet. The Com Port Converter supplies the protocol conversion from Ethernet to the RS 485 powered Diagnostic bus (see chapter 5.3.2). The remote application structure comprises of:

Required Software Components:

- PACT*ware*™ 3.0 SP 4
- FieldConnex® Diagnostic Manager

Required Hardware Components:

- Server or cabinet PC
- Windows PC
- Com Port Converter
- Diagnostic module on Power Hub Motherboard
- Diagnostic bus

Required Interfaces

- Ethernet
- TCP/IP

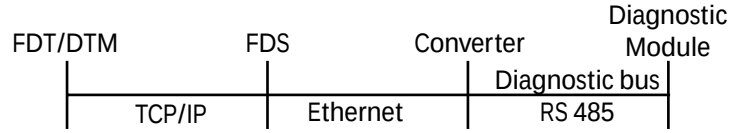

Figure 5.3: Remote application data flow

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Note

An FDS can be connected to one frame application at a time, only.

5.3 Hardware Installation and Commissioning

5.3.1 Device Address Assigning, Mounting and Dismounting

Before mounting the module on the motherboard, a device address must be assigned to the HD2-DM-A. This assignment is performed only via the DIP switch on the device.

The DIP switch consists of 8 switches positioned next to each other. They can be used to assign addresses from 0 to 247 in binary form.

Assigning the Device Address

To assign an address to the HD2-DM-A, proceed as follows:

Place the eight individual switches of the DIP switch at the left module side in the correct positions to generate the desired address (see the label on the Module).

The device address is assigned.

Attention

The device address used here has to be assigned in the Diagnostic Manager as well (see chapter 5.4).

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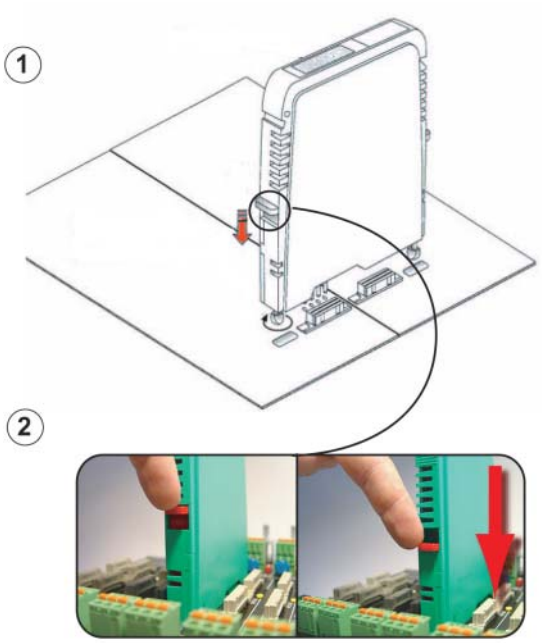
HD2-DM-A Mounting on Motherboard

Attention

The Diagnostic Module HD2-DM-A must only be mounted on the respective slot. The Mounting slot is marked with „Diagnostic Module only“ The housing of HD2-DM-A meets the degree of protection class IP 20. It is intended for mounting on the Fieldbus Power Hub motherboards MB-FB-*.

1. Carefully center the polarisation holes and mate the two connectors, then gently press down the module (figure 1).
2. Push down the red „Quick-LOK“ tabs on each side of the module to fix it to the panel (no tools required, see figure 2).

The module is mounted.



Dismounting the modules

1. Push the red „Quick-LOK“ tabs upwards and
2. Lift off the entire module gently

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5.3.2 Buildup the Diagnostic Bus

The Diagnostic Bus is the connection between the different Diagnostic Modules /Fieldbus Power Hub motherboards in the field cabinet.

The Diagnostic Bus between the motherboards is built up with a 2-line wire e.g. use the additionally ACC-MB-HDC link cable. The maximum length of one complete Diagnostic Bus must not exceed 30 meter and include more than 31 Diagnostic Modules.

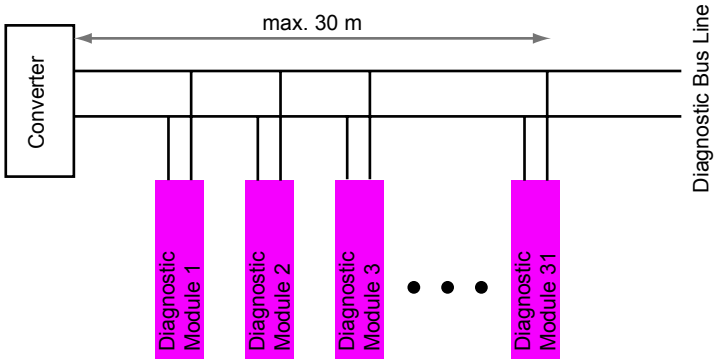

Figure 5.4: Stylized view on the Diagnostic Bus

Attention

Communication problems!

Within EMC sensitive areas use shielded wires for the Diagnostic Bus. Connect the cable shield to ground on the side of the Com Port Converter.

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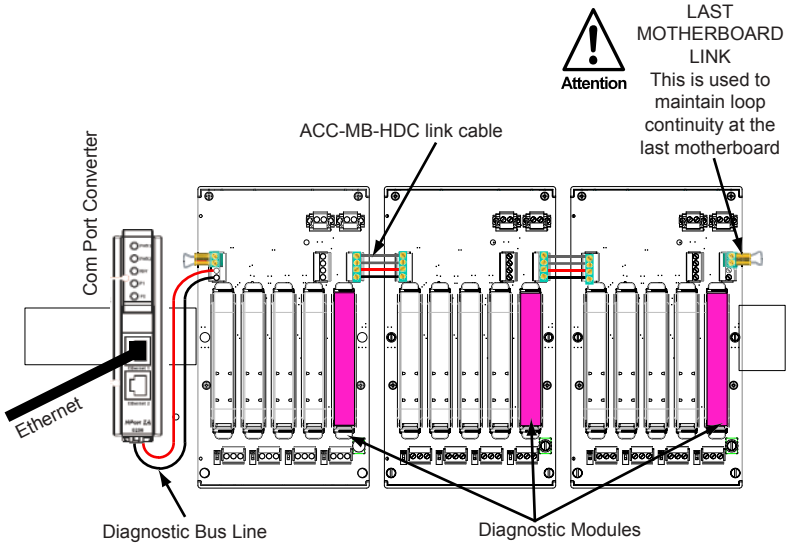

Figure 5.5: Cabinet installation example with Ethernet/RS 485 converter

5.3.3 Com Port Converter Additional Information

For installation, commissioning and troubleshooting issues of the Com Port Converter, refer to the manufacturer´s user manual.

After installation make sure that the setting ***RS 485 2-Wire*** is set within the Com Port Converters administration menu.

Technical specifications

Network load

FDS per Port basic load	ca. 1kByte/s
Max. Commuincation load	ca. 20 kByte/s per HD2-DM-A module

5.4 Software Installation and Commissioning

Software preconditions for successful installation, commissioning and operation of the Diagnostic Manager are:

- Windows™ 2000 or XP
- FDT frame application PACT*ware*™ 3.0 SP 4
- Microsoft® .Net-Framework Version 1.1
- The latest version of the Diagnostic Manager

Use the Pepperl+Fuchs installation CD or download all the appropriate Software from www.pepperl+fuchs.com and the Microsoft web page.

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Application Engineering HD2-DM-A

Diagnostic Manager Installation with PACT*ware*™ from CD

Note

If the driver signing function is enabled on your system, Windows™ will show some error messages like: „*no* Windows™ *certified driver software*“ during installation. Ignore such messages or disable the signing function and continue the installation process.

Attention

No network connectivity
Disable Windows™ Firewall for FieldConnex® Diagnostic Sever (FDS) after setup is completed and FDS is running for the fist time.

To install the FieldConnex® Diagnostic Manager, proceed as follows:

1. Start the setup
2. Select PACT*ware*™ 3.0 SP 4, Windows™ .Net-Framework 1.1 and FieldConnex® Diagnostic Manager for installation
3. Follow the instructions of the installation wizard
4. Run PACT*ware*™
5. Make sure that all PACT*ware*™ projects are closed
6. Update the device catalog

Figure 5.6: Update device catalog

The window ***Create a new*** PACT*ware*™ ***device catalog*** appears.

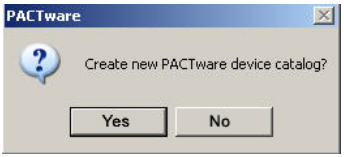

Figure 5.7: Create a new PACTware™ device catalog

7. Approve with ***Yes***.
8. Choose Extras/Options
9. Set option ***Use memory-optimized project management***

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The Diagnostic Manager is now installed and ready to run.

5.5 Commissiong of the Diagnostic Project with PACT*ware*™

There are two different ways to commission a diagnostic project for the first time:

- Manually, to build up the diagnostic project before the diagnostic bus is installed or if there is currently no active diagnostic bus.
- Automatically, if the diagnostic bus is installed and active.

5.5.1 Approved Tag Values

The Tags of FDS, Port, Diagnostic Module, Segment or field device must only contain the following characters and character classes (values between brackets): [0..9] [a..z] [A..Z] [-] [_] [$].

The Tags must also not contain blanks or let be empty.

5.5.2 Commissioning of the Diagnostic Project manually

For manual commissioning you have to perform three steps:

- Build the diagnostic topology manually
- Set the diagnostic devices addresses
- Set Snapshot archive location (see chapter 5.5.4)

Build the Diagnostic Topology manually

1. Start PACT*ware*™
2. Make sure that the FDS is running (see chapter 7.1)
3. Make sure that the latest Diagnostic Manager version is installed and that the device catalog is updated.
4. Create a new project
5. Open the device catalog ***View/Device catalog*** or press ***F3***
6. Open folder Pepperl+Fuchs GmbH

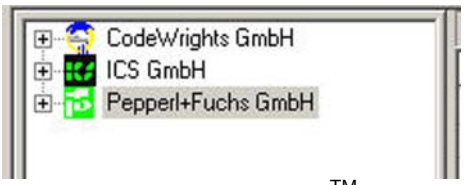

Figure 5.8: Device structure *PACTware*™

7. Choose ***Driver/FieldConnex Diagnostic Server***

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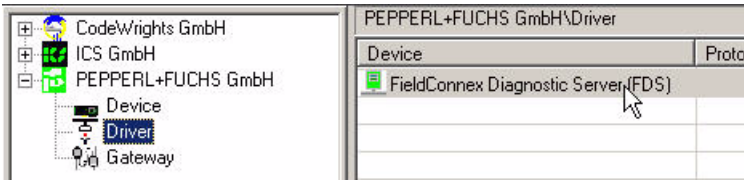

Figure 5.9: Device structure driver

8. Drag&Drop ***FieldConnex Diagnostic Server*** into your project window/HOST PC

Figure 5.10: Drag&Drop the FDS

9. Right-click on the FieldConnex^{R} Diagnostic Server in your project and select ***Parameter***

   The parameter window opens:

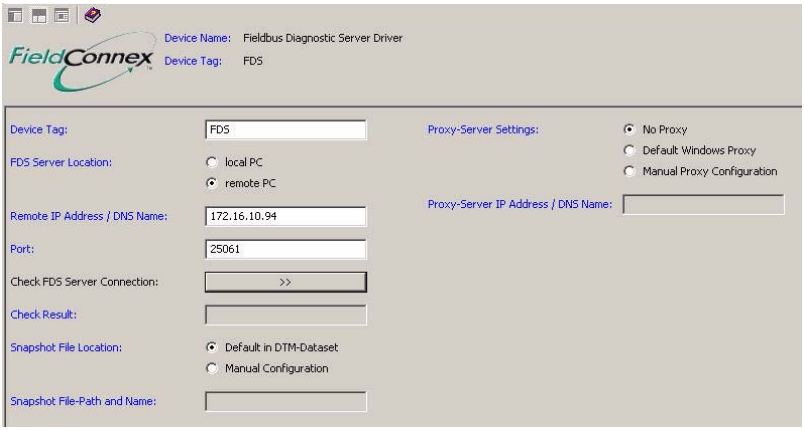

Figure 5.11: Fieldbus Diagnostic Server Parameter window

10. Enter the appropriate values of the PC on which the FDS is running (see chapter 7.4). If FDS is running on the same PC as the Diagnostic Manager, choose ***local***

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Figure 5.12: Settings when FDS is running on the same PC

11. Go back to the ***Device catalog*** and choose ***Gateway/FDSPort***
12. Drag&Drop ***FDS Port*** into your project to the FDS

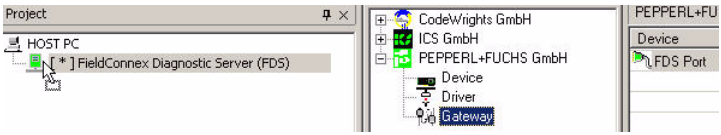

Figure 5.13: Drag&Drop the FDSPort

13. Right-click on the FieldConnex^{R} Diagnostic Server in your project and choose ***Additional functions/"Address/TAG Configuration"***
14. Choose the corresponding COM-Port address from the DropDown list

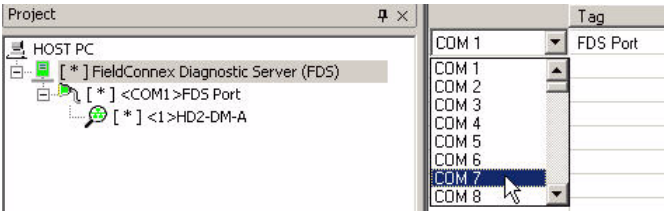

Figure 5.14: FDSPort settings

Note

The COM-Port address selects the serial interface to which the Diagnostic modules are connected.

15. Go back to the ***Device catalog*** and choose ***Device/HD2-DM-A***
16. Drag&Drop the ***HD2-DM-A*** modules into your project to the FDS Port

Now the diagnostic project looks like:

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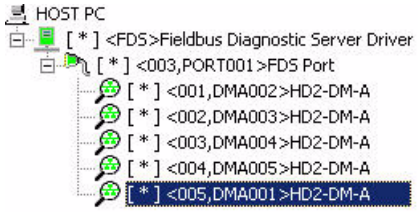

Figure 5.15: Diagnostic project

Note

For fast creation of projects with a huge number of Diagnostic modules: Build up one FDS Port with 31 Diagnostic Modules and use Copy&Paste to duplicate it within the project, if supported by the FDT-Software.

Note

Each FDS Port must not contain more than 31 Diagnostic Modules.

Set the Address Settings of the HD2-DM-A

Attention

The address has to be assigned via Dip-Switch at the Diagnostic Module, too (see chapter 5.3)

To set the device address settings of the HD2-DM-A, proceed as follows:

1. Right-click on the FDS Port in your project and choose ***Additional functions/"Address/Tag Configuration"***
2. Choose the corresponding device address from the DropDown list

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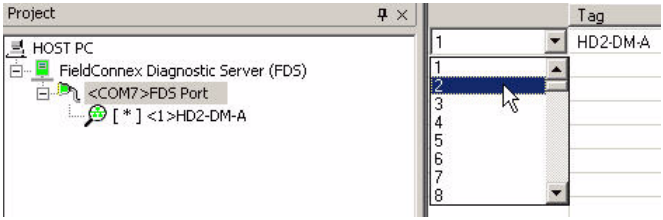

Figure 5.16: Device address settings

3. Confirm with ***OK***

5.5.3 Commissioning the Diagnostic Project automatically

For manual commissioning you have to perform three steps:

- Parametrize FieldConnex® Diagnostic Server (FDS)
- Perform Topology Scan
- Set Snapshot archive location (see chapter 5.5.4)

Parametrize FieldConnex® Diagnostic Server (FDS)

1. Start PACT*ware*™
2. Make sure that the FDS is running (see chapter 7.1)
3. Make sure that the latest Diagnostic Manager version is installed and that the device catalog is updated.
4. Create a new project
5. Open the device catalog ***View/Device catalog*** or press ***F3***
6. Open folder Pepperl+Fuchs GmbH

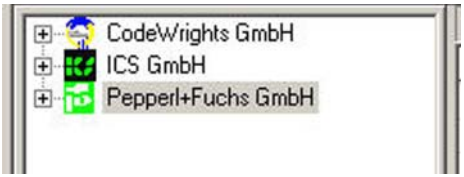

Figure 5.17: Device structure *PACTware*™

7. Choose ***Driver/FieldConnex Diagnostic Server***

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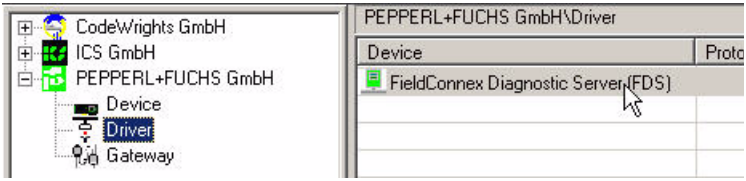

Figure 5.18: Device structure driver

8. Drag&Drop ***FieldConnex Diagnostic Server*** into your project window/HOST PC

Figure 5.19: Drag&Drop the FDS

9. Right-click on the FieldConnex^{R} Diagnostic Server in your project and select ***Parameter***

   The parameter window opens:

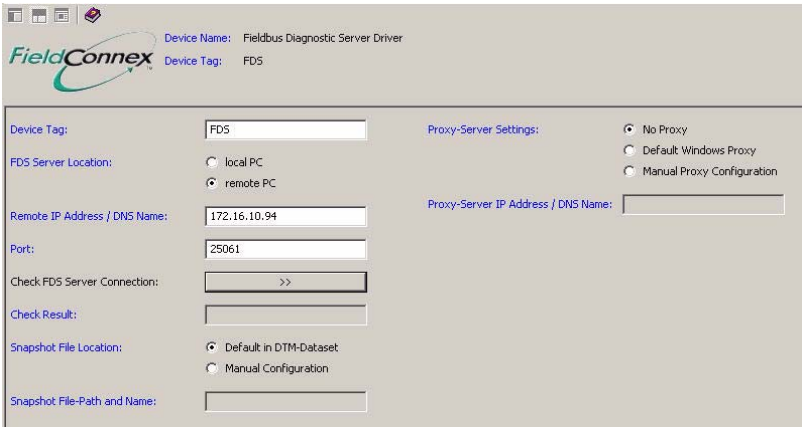

Figure 5.20: Fieldbus Diagnostic Server Parameter window

10. Enter the appropriate values of the PC on which the FDS is running (see chapter 7.4). If FDS is running on the same PC as the Diagnostic Manager, choose ***local***

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Figure 5.21: Settings when FDS is running on the same PC

Perform Topology Scan

1. Right-click on the ***FieldConnex Diagnostic Server*** (FDS) in your project and select ***Connect***
2. Right-click on FDS in your project and select ***Additional functions/Topology Scan***

   A list with all COM Ports FDS are connected to is shown.
3. Select the COM Ports you want to add to the project
4. Restrict the Diagnostic modules address range to speed up scanning

Note

An FDS Port must not contain more than 31 Diagnostic Modules thereby the addresses range between 1 and 31 within common installations.

5. Press ***OK***

The Topology Scan function scans the selected COM ports for Diagnostic Modules within the restricted adress range and builds up the diagnostic topology automatically.

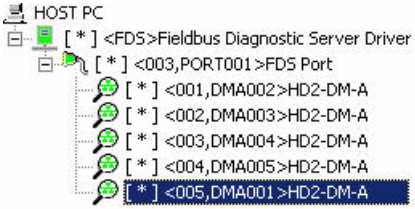

Figure 5.22: Diagnostic project

5.5.4 Set Snapshot Archive Location

Per default the generated snapshot files are stored within the Diagnostic Manager project file. At large fieldbus installations with many diagnostic

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devices and lots of snapshots created, this project file expands rapidly. Such a large project file may cause FDT loading problems, so it is advised to outsource the snapshots to an external file, if the expected number of snapshots reach 4000.

Set Snapshot Archive Location

To change the snapshot archive location, proceed as follows:

1. Right-click on the FieldConnex^{R} Diagnostic Server in your project and select ***Parameter***

   The parameter window opens:

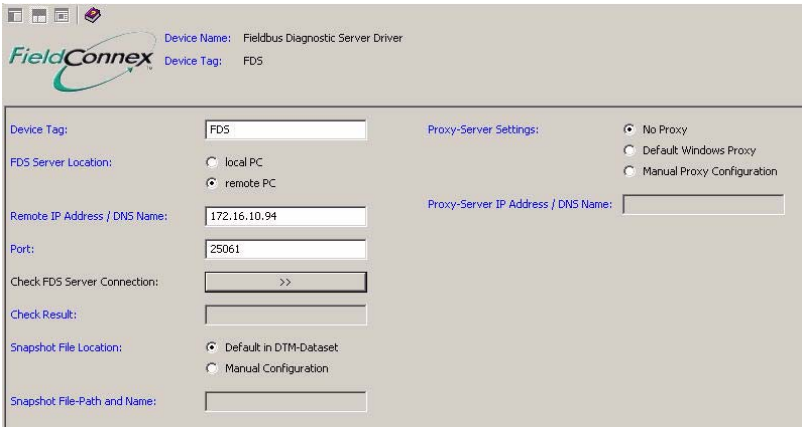

Figure 5.23: FieldConnex^{R} Diagnostic Server Parameter window

2. Choose ***Manual Configuration*** and confirm with ***Enter***

3. Enter path and directory

Note

Make sure that the directory exists and that the path is correct before confirming.

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4. Confirm with ***Enter***

A file „Snapshot.mdb“ containing the snapshot data is stored into the directory

Data loss
After outsourcing the snapshot file, it cannot be changed back to default value without loss of the external stored snapshots.

5.5.5 Diagnostic Manager Connection

Diagnostic Manager Connection to HD2-DM-A

Make sure that all parameters (e.g. COM-, device address) are set correctly and that the FDS-Server is running (chapter 7.1).

1. Start PACT*ware*™
2. Open the corresponding project
3. Right-click on the FDS in your project and choose ***Connect***
4. Right-click on the FDS in your project and choose ***Additional functions/Set FDS Topology***
5. Right-click on the Diagnostic Module in your project and choose ***Connect***

Communication Problems by Using a COM Port Converter
If communication problems between Diagnostic Manager and Diagnostic module occurs:
Activate the FIFO (First In First Out) cache on the COM Port Converter.

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6 Application Engineering DM-AM

6.1 Schematic Diagnostic Structure DM-AM

In general the diagnostic infrastructure is made up of different hardware (e.g. Diagnostic Module, Notebook) and software (e.g. FDS, DTM) components. The figure 6.1 gives a stylized overview of all included components and how they interact in the whole composition. In ordinary mobile use cases with the DM-AM all software components are installed on one Operator Notebook.

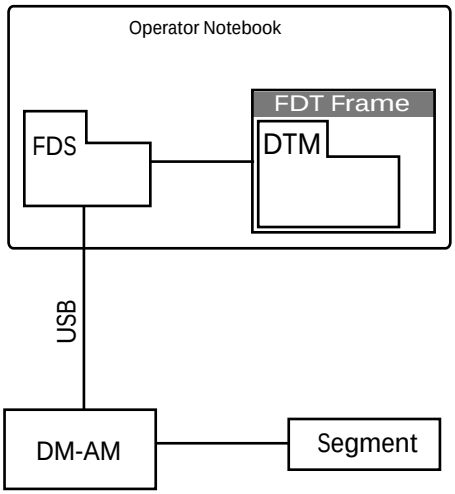

Figure 6.1: Schematic structure DM-AM, see legend below

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Hardware	Description
Segment	FOUNDATION Fieldbus or PROFIBUS PA segment
DM-AM	Mobile Advanced Diagnostic Module
Operator Notebook	Notebook where all software components like the FieldConnex^{R} Diagnostic Server (FDS), the FDT-Frame application and the FDT/DTM based Diagnostic Manager are running.

Software	Description
FDS	FieldConnex^{R} Diagnostic Server is acting as an interface and a data access coordinator between diagnostic device and DTM.(see chapter 7.2).
FDT (Field Device Tool)	FDT-Standard is the specification that define how the DTM will interact with a host computer / software. A FDT frame application is a PC-based software may contain different DTMs for configuration, monitoring and programming field devices. The Diagnostic DTMs are driven by this application.
Diagnostic DTM (Device Type Manager)	DTM that represents the FDS, ports and connected DM-AM device. A DTM is the device's configuration and management software. It contains the graphic user dialogues, undertakes device configuration and diagnosis. A DTM is embedded into a FDT frame application, e.g. PACT*ware*^{TM} or in control systems with FDT interfaces. The DTM for the Diagnostic Modules is called Diagnostic Manager.

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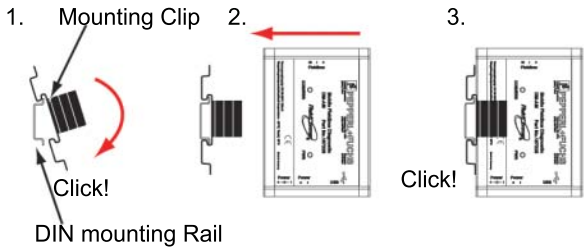
6.2 Mounting and Dismounting

The DM-AM can be used as a data logger. To this end, it has to be installed in a DIN rail within a cabinet.

DM-AM Mounting on DIN Rail with Mounting Clip

1. Hook the mounting clip into the DIN mounting rail
2. Press it down until it is locked in place
3. Press the DM-AM into the mounting clip until it is locked in place

The DM-AM is mounted.



Dismounting of DM-AM and the mounting clip is performed in the reverse order.

Attention

The mounting clip and the DM-AM must be fixed firmly on the rail.

Attention

Mounting of the DM-AM by using the mounting clip is only allowed for temporary measurements.
Do not use the mounting clip where vibration is present.

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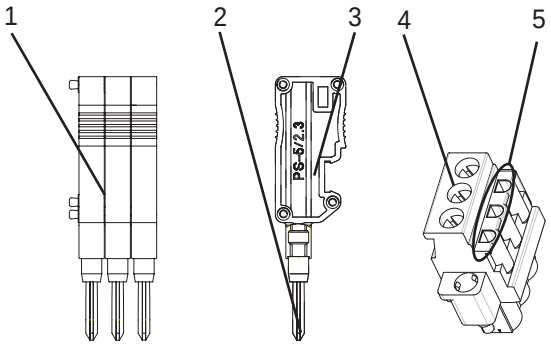
6.2.1 How to use the Test Plug

A modular Test Plug comes with the Mobile Advanced Diagnostic Kit that fits into the test points of the Fieldbus plug sockets. To simplify connection to diagnostic devices test points are featured by many Pepperl+Fuchs Power Supplies and Segment Protectors. As the test points are not an industry standard yet they are not delivered ready to use, but with several steps you are able to assemble them by yourself. The Test Plugs can be mounted together to a 3-pin assembly.



1. Three combined Test Plugs
2. Metal part
3. Single modular Test Plug
4. Fieldbus plug socket
5. Test points

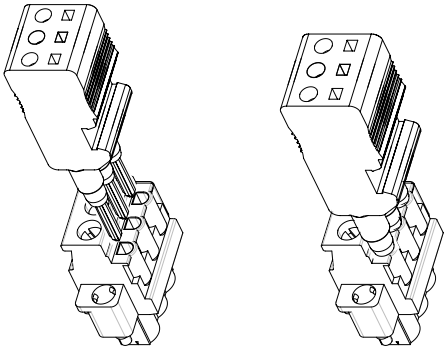


Figure 6.2: Connecting the Test Plug

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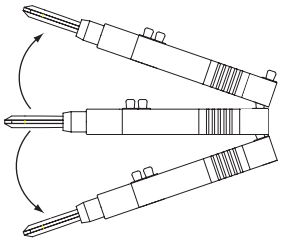
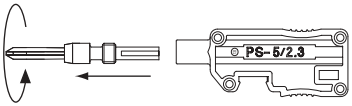
Application Engineering DM-AM

Assemble the Test Plug

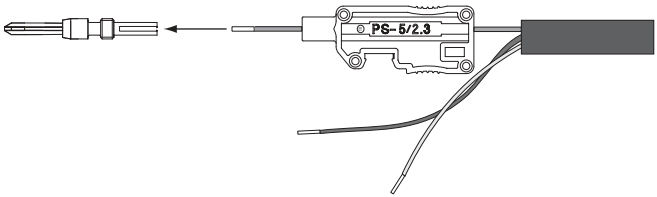
1. Disconnect the three Test Plugs.



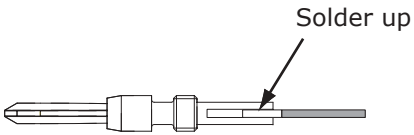
2. Remove the Metal Part from the Test Plug.



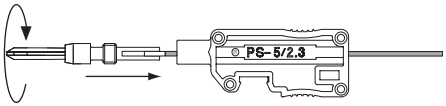
3. Stick one lead through the Test Plug into the Metal Part.



4. Solder up the lead within the Metal Part.



5. Repeat step 3 and 4 with all three leads.
6. Screw the Metal Parts back again into the Test Plugs.



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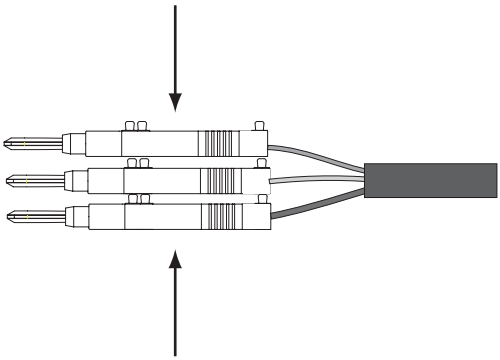
7. Stick the three Test Plugs together (general pin allocation +,-,S).



6.3 DM-AM Connection Details

The Mobile Advanced Diagnostic Module is powered via the USB port of your PC.

Note

For communication purposes the current supply via USB is necessary, the supply current from the Notebook USB-interface to the DM-AM must be at least 150 mA. Check your Notebook manual to find out the maximum power your Notebook can supply via its USB por. If your Notebook does not allow such a supply value use an externally-supplied USB-Hub.

By using the delivered AC/DC adapter or supply via Bulk Power supply the DM-AM works as a Data-Logger only. In this case no communicaton between the DM-AM and Diagnostic Manager takes place.

DM-AM Connection and Commissioning

1. Connect the fieldbus cable to the fieldbus segment
2. Plug the connection clamp of the fieldbus cable into the DM-AM
3. Connect the DM-AM via the USB-cable to your Notebook
   The DM-AM starts right away and the LED **POWER** lights solid red

Note

The DM-AM is a Plug-and-Play device. After connecting it to a Notebook Windows^{TM} automatically installs the DM-AM driver. The FieldConnex^{R} FDT/DTM Diagnostic Manager contains and installs all necessary driver software by itself.

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6.4 FDT/DTM Diagnostic Manager Installation and Commissioning

Software preconditions for successful installation, commissioning and operation of the Diagnostic Manager are:

- Windows™ 2000 or XP
- FDT frame application PACT*ware*™ 3.0 SP 4
- Microsoft® .Net-Framework Version 1.1
- The latest version of the Diagnostic Manager

Diagnostic Manager Installation with PACT*ware*™

Note

If the driver signing function is enabled on your system, Windows™ will show some error messages like: „*no* Windows™ *certified driver software*“ during installation. Ignore such messages or disable the warning function and continue the installation process.

Attention

No network connectivity
Disable Windows™ Firewall for FieldConnex® Diagnostic Sever (FDS) after setup is completed and FDS is running for the fist time.

To install the FieldConnex® Diagnostic Manager, proceed as follows:

1. Start the setup
2. Follow the instructions of the installation wizard
3. Run PACT*ware*™
4. Make sure that all PACT*ware*™ projects are closed
5. Update the device catalog

Figure 6.3: Update device catalog

The window ***Create a new*** PACT*ware*™ ***device catalog*** appears.

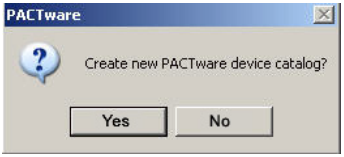

Figure 6.4: Create a new PACTware™ device catalog

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6. Approve with ***Yes***.

The Diagnostic Manager is now installed and ready to run.

DM-AM Commissioning with PACT*ware*™

To commission the DM-AM Diagnostic Manager proceed as follows:

1. Start PACT*ware*™
2. Make sure that the latest Diagnostic Manager version is installed and that the device catalog is updated (see above).
3. Open the corresponding project or create a new one
4. Open the device catalog ***View/Device catalog*** or press ***F3***
5. Open folder Pepperl+Fuchs GmbH

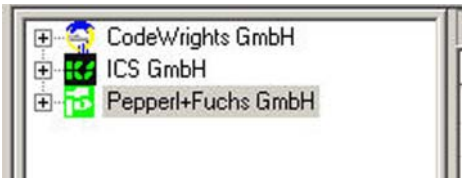

Figure 6.5: Device structure *PACTware*™

6. Choose ***Driver/FieldConnex Diagnostic Server (FDS)***

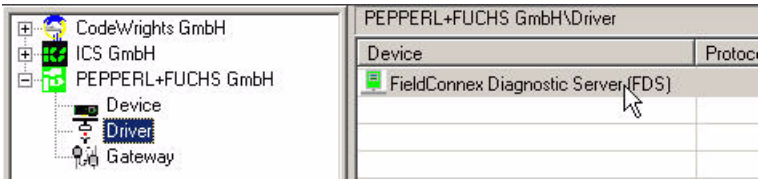

Figure 6.6: Device structure driver

7. Drag&Drop ***FieldConnex Diagnostic Server (FDS)*** into your project window/HOST PC

Figure 6.7: Drag&Drop the FDS

8. Go back to the ***Device catalog*** and choose ***Device/DM-AM***
9. Drag&Drop ***DM-AM*** into your project to the FDS

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Now the project tree looks like:

Figure 6.8: Project structure

6.4.1 Diagnostic Manager Connection

Diagnostic Manager connection to DM-AM

Make sure that all parameters (e.g. COM-, device address) are set correctly and that the FDS-Server is running (see chapter 7.2.1).

1. Start PACT*ware*™
2. Open the corresponding project
3. Right-click on the FDS in your project and choose ***Connect***
4. Right-click on the Diagnostic Module in your project and choose ***Connect***

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7 FDS and OPC Server

The FieldConnex^{R} Diagnostic Server (FDS) and the OPC Server are administrated with a small front end application named FDS-Control Center. An icon within the taskbar shows the FDS status:


Figure 7.1: FDS is running / not running

7.1 FDS-Control Center settings

No network connectivity
Disable Windows^{TM} Firewall for FieldConnex^{R} Diagnostic Sever (FDS) before the FDS is running for the fist time.

Attention

Start FDS Control Center

By default the FDS Control Center starts with Windows^{TM} (small icon within taskbar), if this did not happen, proceed as follows:

Choose Start/Programs/Pepperl+Fuchs/FDS Control Center

Change FDS Control Center start behavior

1. Right-click on the FDS icon in the task-bar
2. Choose ***FDS Control Center***
3. Choose ***Settings***

The following settings can be made:

Setting	Behavior
Start FDS Control Center automatically	Whenever the PC is started, the FDS Server is started too.
Minimize on Start	The FDS Control Center starts with a small icon in the Task-Bar without showing the front end application.

7.2 FieldConnex^{R} Diagnostic Server (FDS)

The FieldConnex^{R} Diagnostic Server is a background service that acts as an interface and a data access coordinator between the HD2-DM-A/DM-AM and the Diagnostic Manager (see chapter 5.1 and chapter 6.1).

7.2.1 FDS-Settings

Change FDS settings

To change the FDS start behavior proceed as follows:

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1. Right-click on the FDS icon in the task-bar
2. Choose ***FDS Control Center***
   window FDS Control Center appears

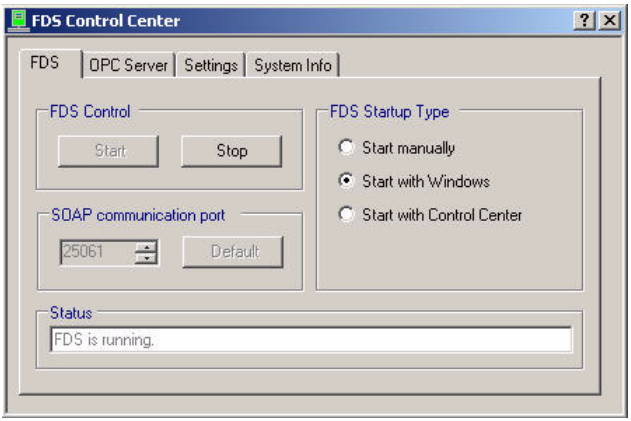

Figure 7.2: FDS Control Center

The following settings can be made:

Setting	Behavior
Start manually	The FDS Control Center has to be started manually every time.
Start with Windows™	The FDS Control Center is automatically started whenever Windows™ is loaded (no user login required).
Start with Control Center	Whenever the FDS Control Center is started, the FDS Server is started together with it.

Change FDS communication settings

To change the FDS communication settings, proceed as follows:

1. Right-click on the FDS icon inside the task-bar
2. Choose ***FDS Control Center***
   window FDS Control Center appears
3. Choose ***FDS***
4. Press the ***Stop*** button
5. Choose your corresponding SOAP communication port (Default port: 25061)
6. Press the ***Start*** button

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7.3 OPC Server

OPC servers provide a method for many different software packages to access data from a process control device. By default an OPC-DA server is installed together with the Diagnostic Manager. This OPC-DA server communicates with the FDS and provides data for access from several OPC clients.

To access the OPC-DA server the OPC-Package must be installed.

7.3.1 OPC Server Name Space

The name space of the OPC-DA server is structured as follows:

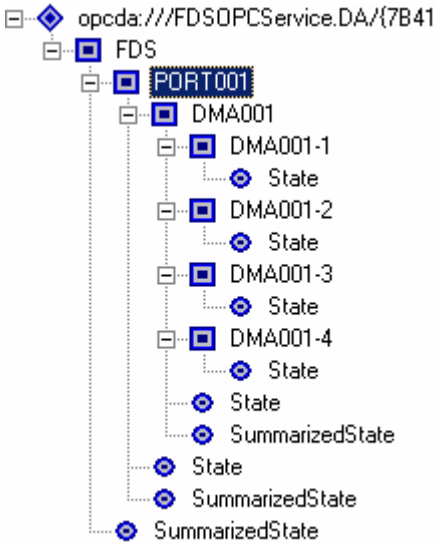

Figure 7.3: OPC name space structure

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FDS and OPC Server

Name	Meaning
FDSOPCService.DA	Name of the OPC service (PROG_ID)
FDS	TAG of the FDS server
Port	TAG of the FDS Port
DMA 001 (1-4)	TAG of the Diagnostic module and the appropriate segment
State	Describes the current status of the node by the following values: 0: Good 1: Maintenance Required 2: Out of Specification 3: Hardware Error 4: Communication Error (Meanings see below)
SummarizedState	Provides the highest prior State data value and the highest prior State data quality for the actual node and all subordinated nodes. (Priorities see below)

Value definitions and priorities

State value	Meaning
0	Good
1	Maintenance required
2	Out of Specification
3	Hardware error
4	Communication error

State Data Quality	Meaning
BAD, Comm_FAILURE	A communication error between OPC Server and FDS Server has occured.
BAD, NON_SPECIFIC	FDS Server has not polled the Diagnostic Module yet (temporary state)
BAD, OUT_OF_SERVICE	A segment is disabled
UNCERTAIN, NON_SPECIFIC	Occurs if the Diagnostic Module is connected via the FDS to a Pepperl+Fuchs Fieldbus Gateway, which also process alarms. This is an invalid operating state.
GOOD	None of the above applies.

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SummarizedState priority	State Data Quality
HIGH	BAD, Comm_FAILURE
	BAD, NON_SPECIFIC
	UNCERTAIN, NON_SPECIFIC
LOW	GOOD
Ignored	BAD, OUT_OF_SERVICE

7.3.2 OPC Server Settings

Change OPC Server start behavior

1. Right-click on the FDS icon in the task-bar
2. Choose ***FDS Control Center***
   window FDS Control Center appears
3. Choose ***OPC Server***

The following settings can be made:

Setting	Behavior
Start manually	The OPC Server has to be started manually every time.
Start with Windows™	The OPC Server is automatically started whenever Windows™ is loaded (no user login required).
Start with Control Center	Whenever the FDS Control Center is started, the OPC Server is started together with it.

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7.4 FDS Network Information

The menu System Info shows network information of the PC the FDS is running on. The host name and/or the IP- addresses is/are needed if you work with a remote application structure (see chapter 5.2.2). They must be entered within the Parameter window at the Diagnostic Manager during commissioning (see chapter 5.5.)

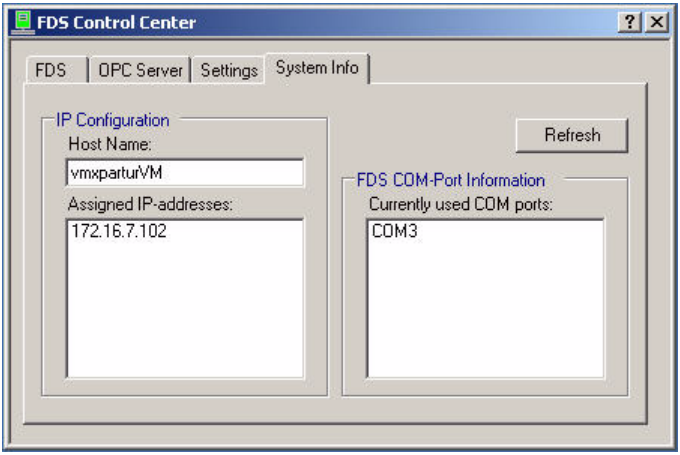

Figure 7.4: System Info Menu

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8 Operation with the Diagnostic Manager

The FDT/DTM based Diagnostic Manager is the graphic user interface between Diagnostic Module and user, it contains all configuration settings, diagnostic information and device functionalities.

The Diagnostic Manager offers the following main functions:

Commissioning Wizard (chapter 8.1)	Comfortable tool for fast and easy start-up with the Diagnostic Module. The wizard leads you step by step through a complete system and segment check-out with individual system and segment data calculation and value take over.
Diagnostics (chapter 8.2)	Shows all systems, segments or field devices an alarm has occurred at a glance.
Segment Monitoring (chapter 8.3)	Smart tool for fast validation of a new or reworked fieldbus installation. It shows a qualitative rating of all relevant segment and field device data. To save the results as a report a snapshot of currently measured values can be made.
Snapshot Explorer (chapter 8.4)	Special dialog for administration and printing of created snapshots/reports.
Detail Parametrization (chapter 8.5)	Menues for editing, saving and monitoring of current segment settings and fieldbus diagnostic information.
Long-Term History and Data Export (chapter 8.6)	Allows to collect and store data within preset time intervals and to export this data.
Fieldbus Oscilloscope (chapter 8.7)	Specialist tool for in-depth analysis of the fieldbus signal.
Firmeware Update (chapter 8.8)	Enables you to upload the latest firmeware version of the Diagnostic Module

Online and Offline Data Sets

Some functions store their settings within two different data sets:

- Online Data Set
- Offline Data Set

The Online Data Set is the current configuration the Diagnostic Module is working with. If the Diagnostic Module is exchanged for a new one all current settings of the segment are gone. To prevent data loss load all changes made within the Diagnostic Modules´ Online Data Set to the Offline Data Set.

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The Offline Data Set is used as a fast and easy way to parameterize Diagnostic Modules with prior or preset configuration data. The Offline Data Set is stored within the Diagnostic Managers project file, thus this data is independent from the Diagnostic Module and whose current settings.

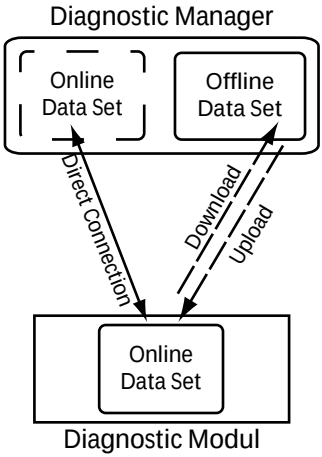

Figure 8.1: Online and Offline Data Set

8.1 Commissioning Wizard

The Commissioning Wizard is the comfortable tool for fast and easy start-up with the Diagnostic Module. By leading you step-by-step through a complete system and segment check-out all necessary individual system and segment data of your plant are determined. Based on this individual plant data, the Commissioning Wizard proposes limit values for all system, segment and device maintenance and failure alarm values. If necessary you can edit the proposed limit values or store them without changes to the Diagnostic Module.

After successful completion of the wizard, the Diagnostic Module is ready for plant supervision.

Open Commissioning Wizard

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Additional functions/Commissioning Wizard***

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Perform System Commissioning

1. Open the Commissioning Wizard
2. Press the button ***System Commissioning***
   Current motherboard and supply data is shown
3. Press the button ***Next***
   Snapshot recording occurs and current system data with automatically calculated maintenance and alarm limits are shown

Note

If necessary modify the limit values, before storing them to the Diagnostic Module.

4. Press button ***Next***
   System warning and alarm limit values are now stored to the Diagnostic Module

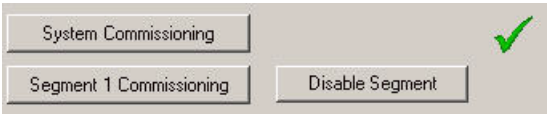

Figure 8.2: System commissioning successful

Perform Segment Commissioning

1. Open the Commissioning Wizard
2. Perform System commissioning (see above)
3. Press the button ***Segment Commissioning***
   Connected field devices are shown
4. Press the button ***Next***
   Current segment and field device data is shown

Note

If you are using a National Instruments Card (NI-Card), current Device tags can be take over by pressing the Read Tags button.

5. Press the button ***Next***
   Snapshot recording occurs and a printable report is generated and stored within the Snapshot Explorer (see chapter 8.4)
6. Press the button ***Next***
   Current system data with automatically calculated limits are shown

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Note

If necessary modify the limit values before storing them to the Diagnostic Module.
A Out of Specification alarm limit will be disabled, if the automatically calculated maintenance alarm limit value violates the Out of Specification limit.

7. Press the button ***Next***
   System warning and alarm limit values are now stored to the diagnostic device

Figure 8.3: Segment commissioning successful

8.2 Diagnostics

The Diagnostics functionality allows supervision of the whole production plant with only one action to do. It displays all systems, segments and field devices a alarm has occured at a glance. The last 500 alarms of each Diagnostic Module are shown. The alarm data is collected within a circular buffer.

You can launch the Diagnostic function separated for:

- the whole production plant (System Diagnostic window) or
- each single Diagnostic Module.

8.2.1 System Diagnostics Window

The System Diagnostic window shows all alarm status of each monitored segment sorted by Diagnostic Module. Press "Open" to display the Diagnostics window for the Diagnostic Module chosen.

Open System Diagnostics Window

1. Right-click on the Fieldbus Diagnostic Server in the project tree
2. Choose ***Diagnostics***

The System Diagnstics window appears.

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Tag	Segment	Status	Diagnosis	Reason
DMA001 ...		⚠	Open	Out of specification
	DMA001-1	⚠		Out of specification
	DMA001-2	✓		
	DMA001-3	■		Segment disabled
	DMA001-4	⚠		Out of specification

Figure 8.4: System Diagnostics window

8.2.2 Diagnostic Module Diagnostics Window

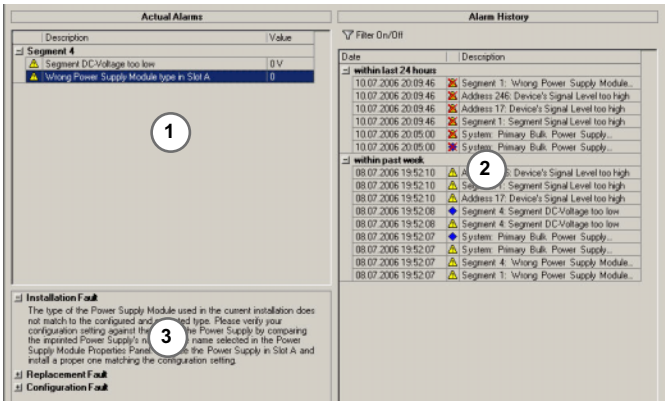
Within the Diagnostic Module Diagnostics window a history of all occurred Segment and Device alarms is shown, by setting the Alarm focus on a Segment, the actual Alarms of this Segment are analyzed in-depth and proposals for solutions are given.

Open Diagnostic Module Diagnostics Window

1. Right-click on the Diagnostic module in the project tree
2. Choose ***Diagnostics***

The Diagnostic Module Diagnostics window appears.

8.2.3 Diagnostic Module Diagnostics Window Overview



1 Actual alarm overview
2 Alarm history
3 Proposal for solution

8.2.4 Alarm Icon Description

Within the Alarm history column each occurred alarm is shown with date, time, address and type. The same icons used within the online di-

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alog (see chapter 8.5.6) indicates if the alarm is present or gone (crossed out icon). See example below:

The supervised signal level has violated the preset maintenance limit value and a Maintenance alarm occurred on 10.07.2006 at 22.02.52 o'clock at the device address 246.

The former occured Maintenance alarm at address 246 is gone on 10.07.2006 at 22.02.52 o'clock.

8.2.5 Diagnostics Filter Function

The filter function enables you to create different views on the alarm history. By default all failure types are shown, disable not wanted failure types to narrow the history down. For each segment the complete alarm history list can be exported.

The failure types are sorted within the Alarm Type DropDown menu in four categories as you can see on figure 8.5:

- filters for the system specific alarms,
- filter for the segment specific alarms,
- filters for the field device specific alarms
- and common filters, to choose non, all or only the current present alarms of the system, segment and field device alarms.

If any field device specific alarm filter is set, you can further reduce the view onto specific field devices within the Address Filter Dropdown menu.

The Filter On/Off button activates or deactivates the preset filtered view.

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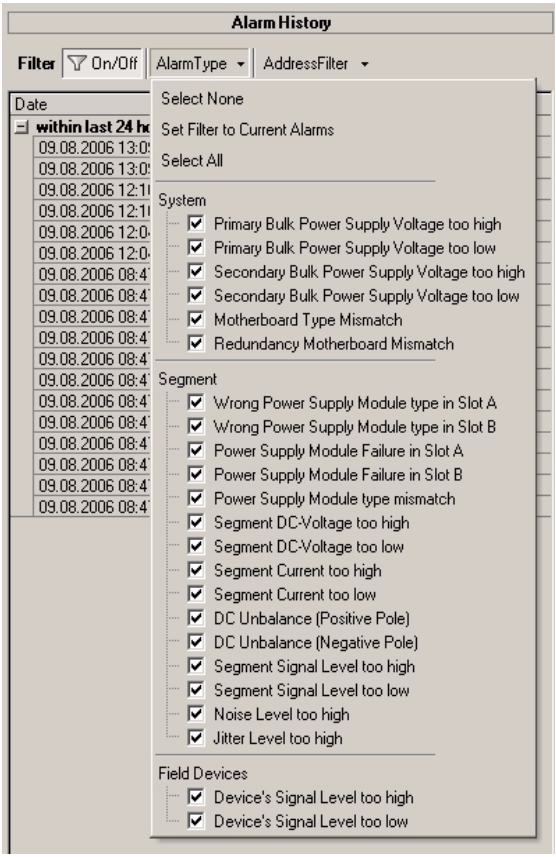

Figure 8.5: Filter default settings

Export Alarm History

1. Enable Segment Focus for the appropriate segment
2. Chose directory, filename and type
3. Press the Save button

Note

If you are creating a Alarm History Export file for the fist time, add or choose the document extension ".txt" for a Character Separated Value.

Note

The Export Alarm History function always saves the complete alarm history data, filter settings do not have any influence.

8.3 Segment Monitoring

Without former configuration the Segment Monitoring user interface gives a general idea of all relevant segment and field device data as well as the actual minimum and maximum values that have occured. Additionally, the Snapshot function captures snapshots from all relevant data to create Physical Layer measurement reports.

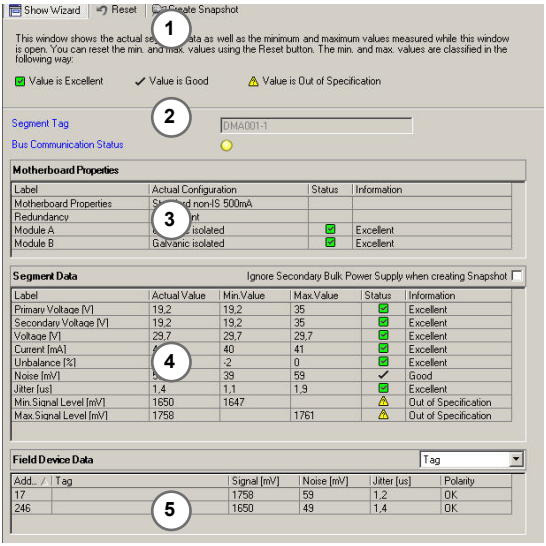

Figure 8.6: Segment Monitoring function screen overview

1 Information (switchable on/off by pressing Show Wizard)
2 System data table
3 Motherboard Properties Table (HD2-DM-A only)
4 Segment data table
5 Field device data table

8.3.1 Segment Monitoring Data Table Overview

While the Segment Monitoring window is open, the software continuously collects live data and displays it in two data tables:

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- the field device data table and
- the segment data table.

The field device data table shows the current noise, jitter and communication level values as well as the polarity of each field device and whose bus address.

Field Device Data Tag

Add...	Tag	Signal [mV]	Noise [mV]	Jitter [us]	Polarity
17		1758	59	1,2	OK
246		1650	49	1,4	OK

Figure 8.7: Field Device Data table overview

The Segment Data table summarizes the field device values and shows the current highest (noise, jitter, max. signal level) and lowest (min. signal level) field device values of the segment. It also shows the highest and lowest value which occurred during the measured time period (start of monitoring is when the Segment Monitoring window opens or the last reset was made).

Segment Data Ignore Secondary Power Supply in Snapshot

Label	Actual	Min	Max	Quality	Info
Voltage Pri [V]	24,7	24,7	24,7	☑	Excellent
Voltage Sec [V]	24,7	24,7	24,8	☑	Excellent
Voltage [V]	29,8	29,8	29,8	☑	Excellent
Current [mA]	15	15	15	☑	Excellent
Unbalance [%]	-2	-2	-2	☑	Excellent
Noise [mV]	15	10	20	☑	Excellent
Jitter [us]	1,3	1,2	1,3	☑	Excellent
Min.Signal Level [mV]	807	793		☑	Excellent
Max.Signal Level [mV]	807		807	☑	Excellent

Figure 8.8: Segment Data table overview

The Segment Monitoring function rates the quality of the minimum and maximum values that have occurred and indicates the results by icons.

Icon overview	
	Green = monitored Value is excellent
	Grey = monitored Value is good
	Yellow = monitored Value is out of specification

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Note

Real-life plant installations typically have "good" values. "Excellent" values are more common under laboratory conditions, i.e. where cables are short and disturbances absent.

If a value is rated as Out of Specification the violated limit is shown in the **Info** column.

Figure 8.9: Max. Signal Level violated

8.3.2 Physical Layer Measurement Reports (Snapshot)

The Snapshot function provides a detailed overview of the current segment settings and the communication quality. For data exchange, a Physical Layer Measurement report containing the current min/max Noise, Jitter and Signal level values of each device and the rated segment values can be exported or printed as an image, Text- or PDF-file.

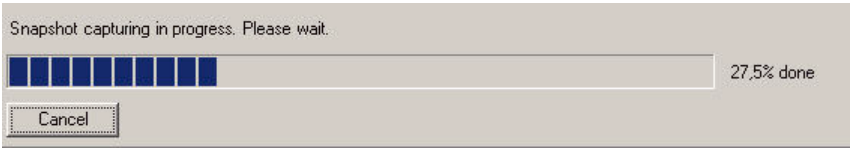
Open Segment Monitoring Function

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Additional functions/Segment Monitoring***

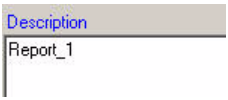
Start a new Physical Layer Value Recording (Snapshot)

To start the data recording and to generate a report, proceed as follows:

1. Press the button **Create Snapshot**
   Snapshot capturing in progress:



2. After capturing is completed, name the report in the input field **Description**



3. To save the current report, press button **Save**
   The Snapshot Explorer appears (see chapter 8.4)

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8.4 Snapshot Explorer

The Snapshot Explorer is the user interface for administration, printing and exchange of the created Physical Layer measurement reports. These reports can be exported as a text file or DMS-files for data exchange or be printed as an image or PDF.

Two different templates are selectable: a clearly arranged default template and the compact template, which contains the same information within less space.

Furthermore, the report can be directly launched with Microsoft® Excel. A special prepared Excel sheet containing all data allows you to create diagrams and to undertake several calculations.

Note

DMS is a special format for data exchange with Pepperl+Fuchs.

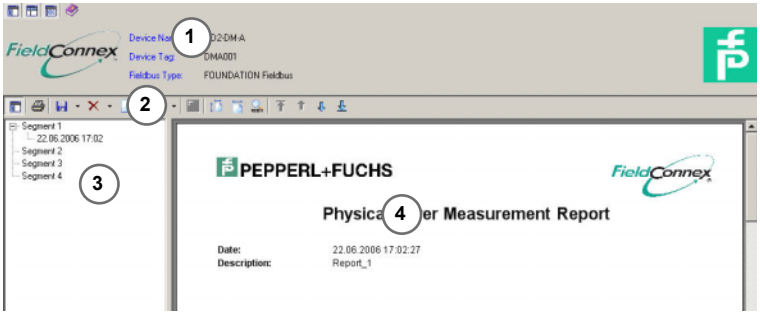

Figure 8.10: Snapshot screen overview

1 Snapshot administration panel
2 Preview navigation panel
3 Snapshot collection
4 Report preview

Open Snapshot Explorer

1. Right-click on the Diagnostic Module in the project tree
2. Choose **Additional functions/Snapshot Explorer**

Export Physical Layer Report as a DMS- or text file

Within the export menu you can choose between different file types. In addition to the DMS-format for exchange data with Pepperl+Fuchs, two

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text formats are offered. A standard Unicode RTF and a character separated TXT format. To export a report into one of these documents, proceed as follows:

1. Select the corresponding report from the **Snapshot Collection**
2. Press **Export**
3. Select file type, location and name
4. Approve with **Save**

Export Physical Layer Report as PDF-file

1. Select the corresponding report from the **Snapshot Collection**
2. Select paper size letter or A4 from the drop down menu
3. Press button **Export** in the preview navigation panel
4. Select file type PDF, location and name
5. Approve with **Save**

Launch Physical Layer Report with Microsoft® Excel

1. Select the corresponding report from the **Snapshot Collection**
2. Click on the Excel icon in the preview navigation panel

8.5 Detail Parameterization Interfaces

The Diagnostic Manager offers three different Detail user interfaces:

- the Offline parameterization interface
- the Online parameterization interface
- the Measured value interface

All settings made in the Offline interface have no direct influence on the Diagnostic Module's current measurements. All data is stored and saved locally. Limit values for different physical layer alarms can be preset here. When all settings have been made in the Offline interface, they can be sent to the Diagnostic Module. The other way round the current data can be loaded from the Diagnostic Module to the Offline interface and be saved there.
The Offline interface is used as a fast and easy way to parameterize exchanged Diagnostic Modules with preset configuration data.

In addition to the Offline parameters, the Online interface offers all current diagnostic values like supply power, jitter, noise values. All settings made in the Online interface have direct influence on the Diagnostic module. After confirming with the „enter“ key the edited value is directly stored to the Diagnostic Module.

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The Measured value interface shows all physical layer data and parameters for monitoring only. Values cannot be changed with this interface.

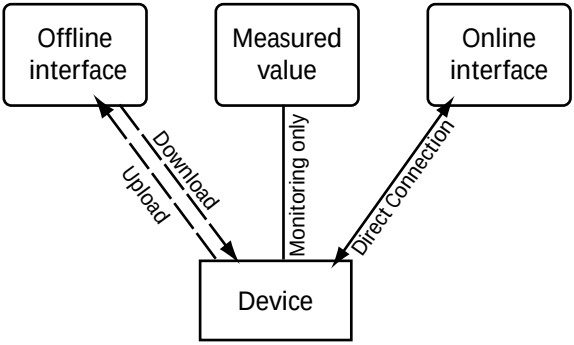

Figure 8.11: Online- Offline- and Measured value interface overview

Data Loss

Changes made in the Online interface are not automatically stored to the Offline interface.

Attention

To synchronize Online data, load data from the device into the Offline interface.

For further explanation of the different parameters please refer to chapter 9.

Open Offline Parametrization

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Parameter/Offline parametrization***

[<001,DMA001>HD2-DM-A # Offline parameterization]

Figure 8.12: Labeling in title bar

Open Measured Value Interface

Make sure that Diagnostic Manager is connected to the Diagnostic Module and the FDS is running.

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Parameter/Measured value***

[<001,DMA001>HD2-DM-A # Measured value]

Figure 8.13: Labeling in title bar

A small rhombus next to the device icon in the project tree indicates that the Diagnostic Manager is connected to the Diagnostic Module.

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Open Online Parametrization

Make sure that Diagnostic Manager is connected to the Diagnostic Module

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Parameter/Online parametrization***

Figure 8.14: Labeling in title bar

A small rhombus next to the device icon in the project tree indicates that the Diagnostic Manager is connected to the Diagnostic Module.

8.5.1 Diagnostic Manager User Interface Description

The following chapter describes the user interface.

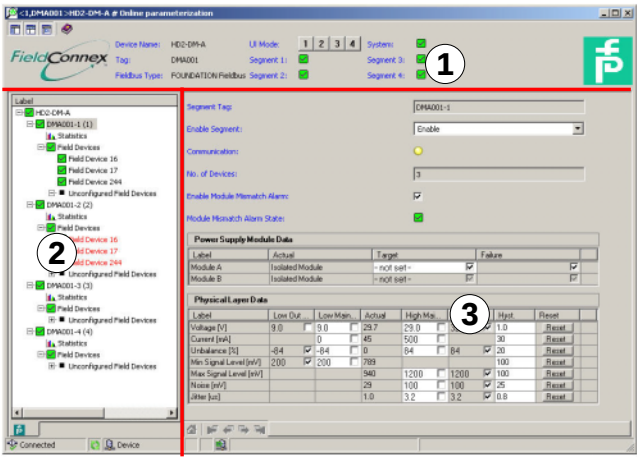

Figure 8.15: Diagnostic Manager user interface overview

1 Information Panel
2 Navigation area
3 Process area

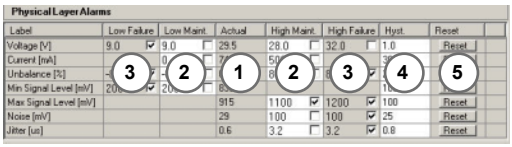

Figure 8.16: Process area overview

1 Actual value column
2 Maintenance alarm columns
3 Failure alarm columns
4 Hysteresis column
5 Reset column

8.5.2 Online/Offline Interface Menu Structure Overview

The navigation area contains an Explorer-like structure for fast navigation within the Diagnostic Manager's detail parameterization interfaces, the structure is shown below:

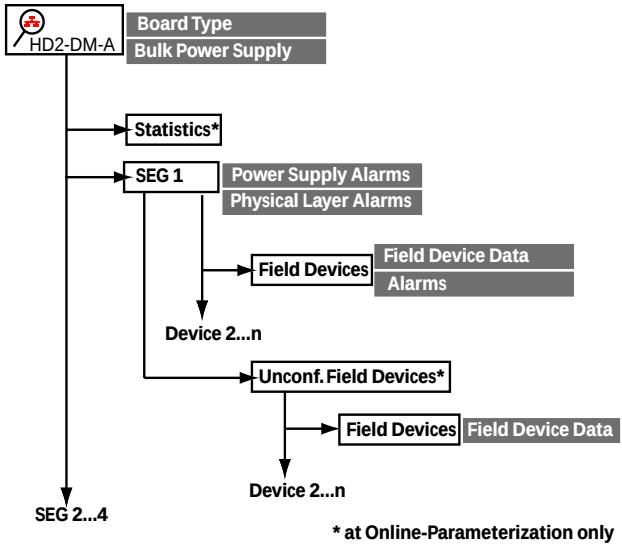

Figure 8.17: Menu structure HD2-DM-A

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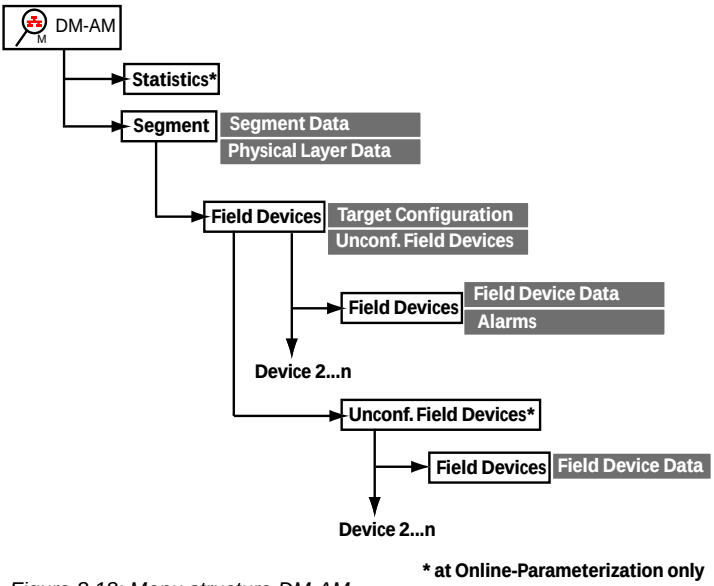

Figure 8.18: Menu structure DM-AM

8.5.3 HD2-DM-A Operation Modes

Measuring and collecting detailed data is performed within two modes:

- Segment Focus and
- Background mode.

Segment Focus must be activated by user for a specific segment. The Segment Focus is used for exact analysis of system, segment and device live data with the highest possible update rate. Segment Focus provides special live monitoring functionalities, e. g. oscilloscope monitoring of the bus signal. If Segment Focus is enabled for a segment background operations of the other segments may slow down or even be disabled (current data is frozen). Segment Focus can only be activated for one segment at a time.

While Segment Focus is disabled, the background mode is always active and monitors the status and health of all connected segments. System data is collected with a low update rate. If no fieldbus comunication is detected at a segment no alarm will be released for signal level data.

Enable Segment Focus

Click the corresponding Segment Focus button in the Information Panel.

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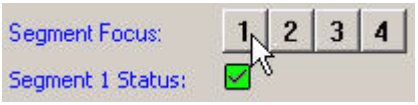
Segment Focus is enabled for segment 1 (indicated by bold letters in Navigation Area tree)

Disable Segment Focus

Click the Segment Focus button in the Information Panel of the corresponding segment



8.5.4 Field Device Handling

Within the Diagnostic Manager, the field device handling takes place in two different ways. Subject to the field device configuration status the Diagnostic Manager divides them into:

- Configured field devices and
- Unconfigured Field Devices.

Values and settings of devices stored in the Configured Field Device table can be loaded to the Offline interface and stored to the Online interface. At the Online and Offline interface, alarm and maintenance limits can be adjusted for each of them.

FOUNDATION Fieldbus field devices with unknown (not configured) bus addresses, when connected for the first time to the segment are also stored in the Unconfigured Field Device table (PROFIBUS field device handling see below).

Devices stored in the Unconfigured Field Device table cannot be loaded into the Offline parametrization interface. At the Online parametrization interface neither alarm limits nor other settings can be set or manipulated for unconfigured field devices.

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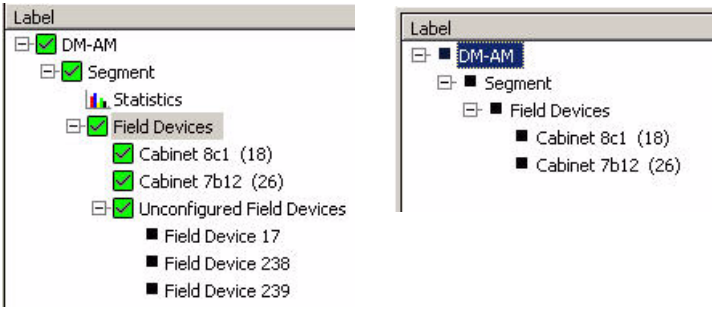
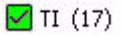


Figure 8.19: Field device view in Online and Offline interface

If a field device becomes inactive it will be marked in the different tables and panels (see below) but no alarm message will be released.

Field device activity status display Label area



Black letters = Field device active

Red letters = Field device not active

Field device activity status display Process area

Field device active

Field device not active

Note

Inactive Field devices do not cause an alarm annunciation within the Diagnostic Manager. Those alarms are released centrally by the Host / Master application.

Add New Field Device to Target Configuration

You can do this action in both the Online and the Offline interface.

1. Highlight **Field Devices** in the Label area
2. Press the button **Add a new Field Device to the Target Configuration** in the Process area

A new field device appears in the Target Configuration table

Add Unconfigured Field Device to Target Configuration

You can do this action in both the Online and the Offline interface.

1. Highlight **Field Devices** in the Label area

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2. Press the button **Add to target** in the Unconfigured Field Device table

Remove a Field Device from the Target Configuration

You can do this action in both the Online and the Offline interface.

1. Highlight **Field Devices** in Label area
2. Press the button **Remove** in the field device target configuration table

Remove all Inactive, Unconfigured Field Devices

You can do this action in the Online interface only.

1. Highlight **Field Devices** in the Label area
2. Press button **Remove all inactive, unconfigured Field Devices** in the Unconfigured Field Device table.

8.5.5 PROFIBUS Field Device Measurement Handling

A PROFIBUS device can take two different states:

- in Data Exchange and
- not in Data Exchange.

If at least one PROFIBUS Device is in Data Exchange, the measurement takes place exclusively for PROFIBUS masters and devices which are in Data Exchange only. All other devices are disabled for the measurement (shown by red letters and disabled activity status checkbox).

To analyze PROFIBUS devices which are not in Data Exchange use the Oscilloscope function (see chapter 8.7) and perform the „trigger events“ request to address or response from address.

8.5.6 Failure and Maintenance Alarm Handling

The Diagnostic Manager provides two different physical layer alarm categories:

- Maintenance alarms
- Out of Specification alarms

You can adjust the Maintenance alarms (in white table cells). All maintenance alarm limits can be adapted to the specific requirements of each segment. For each Physical Layer value, minimum and maximum limits can be set and activated, if the value violates the limit a maintenance alarm will be released at the Diagnostic Manager and via OPC

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interface at the operator application. By means of this proactive diagnosis, error sources can be found before communication fails.

Out of specification alarm limit values (in grey table cells) are derived from the IEC 61158-2 standard, they can be switched on and off but can not be adjusted by the user. If these limits are violated there is an increased risk of communication failure.

Both alarms are indicated as follows:

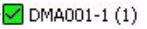
Identification area

Green = Monitored values healthy

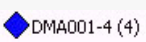
Blue = Maintenance alarm active

Yellow = Monitored value is Out of Specification

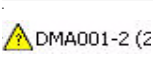
Navigation area



Green = Monitored values healthy



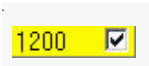
Blue = Maintenance alarm active



Yellow = Monitored value is Out of Specification

Process area

Grey cell = value within limits (fixed values)



Yellow cell = monitored value is Out of Specification

White cell = maintenance value within limits (adjustable value)

Blue cell= maintenance value beyond limits

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8.5.7 Alarm Hysteresis and Reset

The hysteresis range prevents that an activated alarm is repeatedly turned on and off, if a measured value oscillates around the limit value.

When the measured value exceeds the preset alarm value level the correspondent maintenance or Out of Specification alarm is activated. This alarm will not stop until the measured value falls below the preset alarm value minus the hysteresis range or you reset the alarm.

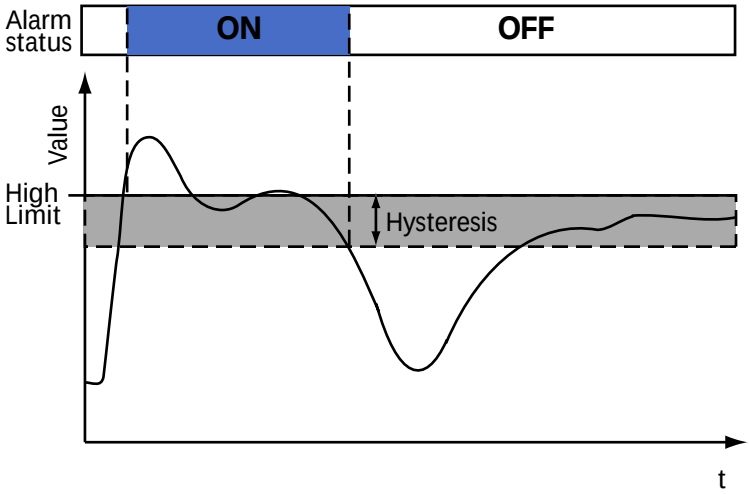

Figure 8.20: Hysteresis and alarms

Reset alarm announcement

To clear the alarm announcement while the measured value is within hysteresis range, proceed as follows:

Press button ***Reset***, within the measured value row.

8.6 Long-Term History

The Long-Term History function allows to collect and store data for preset time intervals. After expiration of an interval the minimum and maximum value of each measured value occurred is stored as one data set.

The period of data storage contains 100 data sets which are collected within a circular buffer, this means that the data set number 101 overwrites the data set number one. So the access is limited to the last 100 data sets recorded.

The interval range is settable between 4 hours and 7 days, thus the possible time range history data sets are stored for is between 17 days (4h*100 = 400h = ca. 17 days) and ca. 2 years.

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Set Long-Term History interval

You can do this action in both the Online and the Offline interface.

1. Open Online or Offline interface
2. Highlight the Diagnostic Module in Label area, you want to change the interval
3. Open DropDown menu Long-Term History setting at Process area
4. Choose time for your interval

5. Confirm with Enter

8.6.1 History Data Export

The History Data Export function lets you convert the collected and stored Long-Term History data to a different document format, so that you can edit them by yourself or use them to carry out your own calculations.

The data sets can be exported as an Exel-, txt- and his-file.

Export History Data

1. Right-click on the Diagnostic Module in the project tree
   Choose **Additional functions/History Data Export**
2. Select Export file type, segment and number of entries
3. Select the directory and name of the Export file you want to renew or enter a new file name
4. Approve with **Start**
5. After Export is complete close window or press ***Restart*** to export data form another segment.

Note

If you are creating a History Data Export file for the fist time, add the document extension ".txt" for a Character Separated Value, ".XLS" for Exel or ".HIS" for Binary History File to the file name.

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8.7 Fieldbus Oscilloscope Function

The built-in oscilloscope is a powerful tool to analyze the physical condition when a specific telegram type is detected or communication errors occur. In this case the signal level during the sampled period is analysed and shown afterwards.

Open Fieldbus Oscilloscope

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Additional functions/Fieldbus Oscilloscope***

8.7.1 Oscilloscope Screen Overview

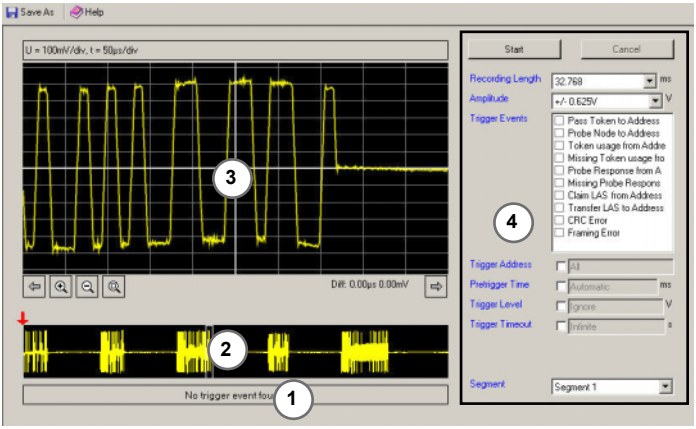

Figure 8.21: Oscilloscope screen overview

1	Result display
2	Content of sampled period
3	Zoom in view
4	Control panel

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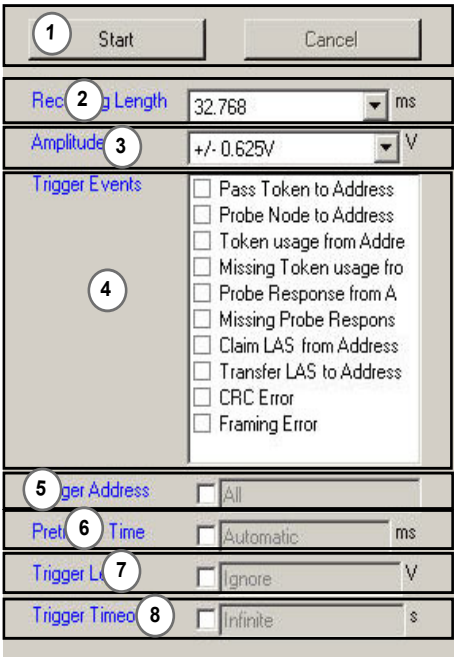

Figure 8.22: Control panel Overview

1 Start / Cancel signal recording (depending on the system a reaction delay of up to 5 sec. is possible)

2 Recording length, default value = 32.768 ms / sample rate = 2 MSample (64 KB/8 Bit, if you extend the recording length, the sample rate is reduced)

3 Sampled amplitude

4 Trigger events (see chapter Trigger events FF/PA)

5 Trigger address, usage of the Trigger events on a specific physical bus address / field device address)

6 Pretrigger time, selection of the recorded signal length before Trigger event occurs

7 Trigger level, selection of the triggered signal limit (-0.65 V...+0.65 V)

8 Trigger timeout

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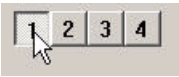
Start Fieldbus Oscilloscope

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Additional functions/Fieldbus Oscilloscope***
3. Choose the measured segment by using the Segment Focus button



4. Choose trigger events and confirm with enter
5. Press ***Start***

8.7.2 Trigger Conditions

To make sure that the triggered frame is valid, every trigger event occurs at the end of the frame.

Trigger events for FOUNDATION Fieldbus segments are:

- Pass Token to address
- Probe node to address
- Token usage from address
- Missing Token usage (next valid bus address is triggered)
- Probe response from address
- Missing probe response to address
- Claim LAS from address
- Transfer LAS to address

Trigger events for PROFIBUS PA segments are:

- Request from address
- Response from address
- Missing response from address (next valid bus address is triggered)
- Pass Token to address
- Missing Pass Token response from address

Other trigger events:

- CRC error
- Framing error
- Signal level

Note

Depending on the fault tolerances the CRC values of the Diagnostic Module and the host system can be different.

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8.8 Firmware Update

To benefit from the latest software developments of Pepperl+Fuchs a function is implemented within the Diagnostic Manager to update the Firmware of the Diagnostic Modules.

Firmware Update

Before performing Firmware update make sure, that:

all Diagnostic Manager windows are closed and

the appropriate Diagnostic module is connected and online.

1. Right-click on the Diagnostic Module in the project tree
2. Choose ***Additional functions/Firmware Update***
3. Choose the directory of the Fimeware File

4. Press button ***Next***
   A Firmware verification takes place

Connection Loss

Attention

In seldom cases a disconnection of the Diagnostic Module happens. Do not try to reconnect manually, the Diagnostic Module will reconnect automatically within a short time.

5. Press button ***Start***
6. Press button ***Restart***

Firmware update successful

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9 Measured Values / Parameters

Supply Voltage Supervisory

Voltage Level of the primary and secondary bulk power (not at DM-AM).

Type	Value
Precision	+/- 5 %

Board Type Detection

The type of the board on which the HD2-DM-A is installed is detected.

Board Redundancy Detection

Detects whether the HD2-DM-A is installed on a redundant board or not.

H1 Segment Voltage

The voltage at the segment input of the Diagnostic Module is measured.

Type	Values
Precision	+/- 5 %
Measuring Range	0-40 V
Default value	9 V ... 32 V

H1 Segment Current

The current supplied to the segment is measured.

Type	Value
Precision	+/- 5 %
Measuring Range	0-6.5 A (depends on the mother-board)
Default value	0 mA ... 500 mA

H1 Segment Communication

Communication activity is detected if any valid frames (Preamble, SOF, EOF) are detected. Loss of communication is detected if no valid signal is recognized for at least 4 seconds

Segment/Field Device Noise

Monitors the current field device noise level. To minimize alarm indications activated by tolerance influences during measurement, the HD2-DM-A/DM-AM indicates the first noise warning if the noise level exceeds the default noise level of 100 mV. This is an empirical value derived from practical experience, it can be modified for your system requirements.

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Type	Value
Precision	10 mV
Measuring Range	100 Hz ... 140 kHz
Default value	100 mV

Definition:
Noise is an undesired disturbance within the signal frequency band. Noise may appear with different characteristics. A high noise level may cause communication problems and a lack of operational reliability.

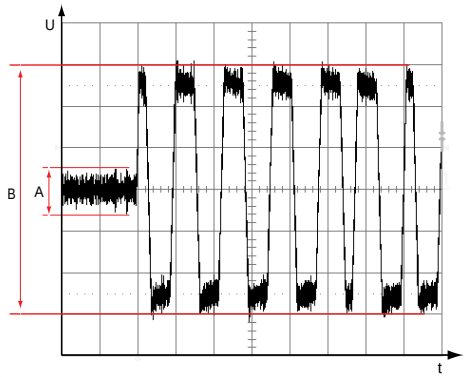

Figure 9.1: Communication noise

A	Noise level
B	Signal level

Causes
Noise can be caused by many elements including:

- bad wiring practice
- bad shielding/grounding practice
- a non-regulated supply can pass supply voltage glitches onto the bus
- a DC power supply injecting noise into the bus
- a regulated FOUNDATION Fieldbus supply injecting switching noise into the bus

Segment or Field Device Jitter

Monitors the current maximum jitter of all active devices attached to the segment. H1 jitter level is a value derived from the device jitter values. Due to noise levels caused by additional affects the HD2-DM-A/DM-AM indicates a first warning at 75 % (2.4 µs) of the maximum allowable jitter level. This is an empiric value which can be modified for your special re-

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quirements. If the jitter level exceeds 3.2 µs a final warning will be indicated.

Type	Value
Precision	0.1 µs
Measuring Range	0 µs ... 8 µs
Conforming standards value	3.2 µs
Default value	3.2 µs

Definition
Jitter is the deviation from the ideal timing of an event. In this case it is deviation from the ideal zero crossing point of the transmitted signal curve during the nominal bit duration, measured with respect to the previous zero crossing (reference event).

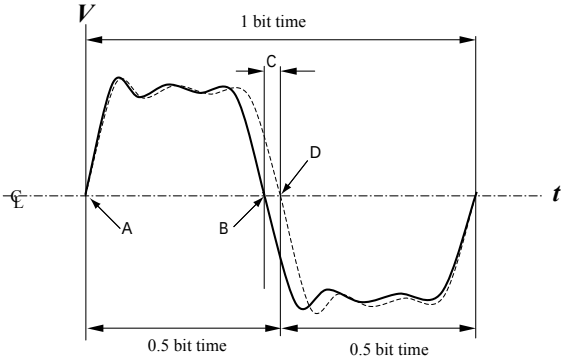

Figure 9.2: Bit cell jitter

A	Reference event; first zero crossing point
B	Actual zero crossing point
C	Bit cell jitter, deviation from the ideal timing
D	Ideal zero crossing point

Causes
Jitter is composed of many factors, e. g.:

- cross talk
- electromagnetic interferences (EMI)
- simultaneous switching outputs
- device dependency
- bad wiring practice

Value definition
A high jitter level may cause communication problems and a lack of op-

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erational reliability. The transmitted bit cell jitter shall not exceed 10 % of one bit time. E. g. at 31.25 kbits/s one bit time is 32 µs long. So the maximum bit cell jitter shall not exceed 3.2 µs. Indeed, your system may be able to run with a higher jitter level but with a reduced level of immunity against EMC influences.

H1 Active Field Devices

Provides the number of current active field devices and the associated field device addresses as well as a target configuration for the field devices.

DC Unbalance Detection (DCUD)

Detects DC unbalance between signal wire and ground (shield). This measurement signals an earth unbalance if any segment belonging to the same isolation group has a DC earth unbalance, e. g. short circuit from one signal line to shield.

Type	Value
Precision	1 %
Measurement range	-100 % (short against - wire) to +100 % (short against + wire)

Definition

A DC unbalance is the result of a capacitive or resistive connection between the Fieldbus signal wires and the ground (cable shield).

Causes

Miswiring/incorrect installation: In the installation scenario illustrated in figure 9.3 several devices have been incorrectly installed. One device on each of two independent segments has been wired with the negative data line tied to the shield and the shield is tied to earth ground.

Device influence: To increase EMC stability some facilities modify their Fieldbus devices with asymmetric capacitive connections between shield and their + or - fieldbus line. If such Fieldbus devices are connected to the plant they influence the balance of the specific field device or the entire segment.

Wire damage: a wire damaged by external influences is also able to create unbalance if there is short-circuit between a Fieldbus line and the cable shield.

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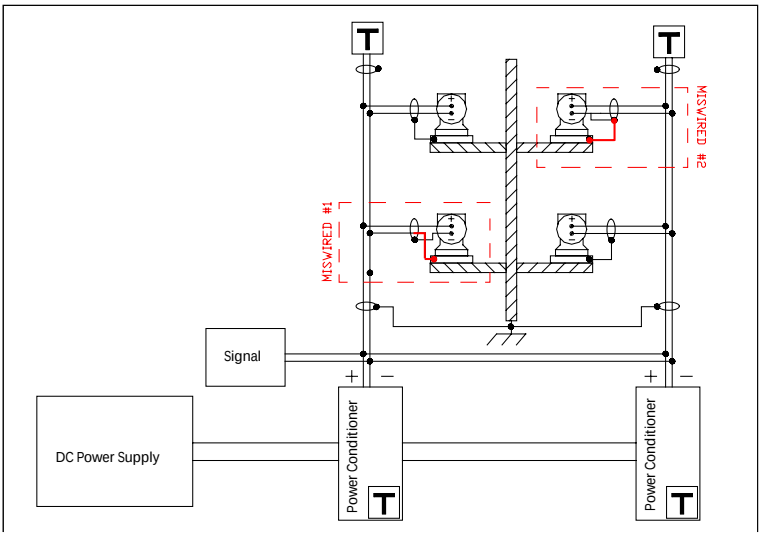

Figure 9.3: Fault wiring DC unbalance

An undetected DC unbalance may cause communication problems as well as a lack of EMC stability. In the worst case an undetected DC unbalance may harm the communication.

Note

A single pole-to-shield fault is not absolutely critical, but if a second pole-to-shield-fault happens at the same time, corruption of the communication signal and high crosstalk levels can occur between the two affected segments.

Communication Errors Statistic

Segment and field device specific error counters for example CRC errors, framing errors etc.

Field Device Polarity

Detects the polarity of the communication signal for every field device.

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Measured Values / Parameters

Field Device Communication Signal Level

The current minimum and maximum signal level of all network field devices is measured. H1 communication signal level is a value derived from the device signal levels, this data is important for termination fault indication. The actual signal level (peak to peak value) of the field device is measured.

Type	Value
Precision	+/- 10 mV
Conforming standards value	150 mV ... 375 mV
Default value	200 mV ... 1200 mV

History/Trending Function

Segment and field device specific physical layer values are stored and time stamped for a time period of up to 2 years in the Diagnostic Module to allow trending analyses.

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10 Use Cases and Troubleshooting

10.1 Use Cases

10.1.1 Diagnostics During Installation

This chapter describes the basic steps for validation and diagnosis of a FOUNDATION Fieldbus or PROFIBUS PA segment during installation and commissioning. For further information about possible topologies and more detailed installation information please refer to the FOUNDATION Fieldbus System Engineering Guidelines (AG-181) or the Pepperl+Fuchs „Wiring and Installation Guide for FOUNDATION Fieldbus“.

Initial Cable Checkout

Requirements

- Cables and junction boxes are installed
- No power supplies and field devices are connected to the segment

Possible Measurements/Checkouts

Using an external LCD meter or a Checkbox, you can measure:

- Connection between signal lines and cable shield
- missing Terminator
- exceeded cable capacity
- cable shields not connected to ground

Segment Checkout

Requirements

- Cables,
- Power Hub,
- HD2-DM-A and
- supply power

are connected to the segment.

Possible Measurements/Checkouts

- Type of motherboard
- Motherboard redundancy
- Primary and secondary supply power
- Type of Power Module (Power Supply/Power Conditioner)
- Correct Power Module configuration/combination
- Correct function of the power supplies
- Segment supply power
- Segment current consumption
- DC Segment unbalance

Network/Communication Checkout

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Requirements

- Cables,
- Power Hub,
- HD2-DM-A,
- supply power and
- Host

are connected to the segment.

Possible Measurements/Checkouts

- all measurements described in section above.

Background mode:

- Signal level on the bus (missing Terminator)
- Noise level on the bus
- Jitter on the bus
- Host signal polarity

UI-mode:

- number of transmitted telegrams
- number of Cyclic Redundancy Check faults (CRC)
- number of Pass Token Misses
- Oscilloscope monitoring of the bus signal
- Oscilloscope triggering of CRC or framing faults

If the Segment Focus is enabled for one segment, only the checks/measurements described at point 2 for the other three segments are possible.

If the Oscilloscope monitor is enabled, parallel to them only the checks/measurements described at point 2 are possible.

Oscilloscope monitors exclude each other. Only one can run at a time.

Host/Slave checkout

Requirements

- Cables,
- Power Hub,
- HD2-DM-A,
- Supply power,
- Host and
- Slaves

are connected to the segment.

Possible Measurements/Checkouts

- all measurements described before.

Background mode:

- Signal level of each slave on cyclic data exchange

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- Noise level before each slave on cyclic data exchange
- Jitter of each slave on cyclic data exchange
- Live list of the slaves on cyclic data exchange
- Live list appearances of the slaves on cyclic data exchange
- Signal polarity of each slave beeing in the cyclic data exchange

Segment Focus:

- Number or Passtoken Misses of the slaves at the cyclic data exchange

10.2 Troubleshooting

Warning

Devices being operated in connection with hazardous areas may not be changed or manipulated. In case of defect, the device must be removed and replaced with a new one.
If devices are operated in general purpose electrical systems, they must not thereafter be operated in electrical systems that are connected with hazardous areas.

10.2.1 Diagnostic Manager/Error Messages

System alarms

Fault Type	Fault Clearance
Bulk Power supply voltage errors	• Check bulk power supply status • Check bulk power supply wiring • Check bulk power supply output fuses
Board type configuration/board redundancy configuration	• Has the motherboard been replaced by another one? • Update module configuration

Segment/Field Device alarms

Fault Type	Fault Clearance
Module failure alarms	• Check power supply module error and power LEDs of affected segment • If the bulk power supply is flashing check bus segment for short circuit or overload • Replace power supply if green power LED is off • If in redundant power supply configuration only one power supply module is in error state, replace power supply module

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Use Cases and Troubleshooting

Fault Type	Fault Clearance
Module type/mismatch alarms	• Check power supply module configuration • Check that all power supply modules are correctly installed • Check that the configured power supply modules (isolated/non-isolated) are used • Check that on a redundant motherboard for each segment two power supplies of identical type (isolated/non-isolated) are plugged in • If it is intended to use a changed module configuration, adapt the module configuration
Segment voltage alarms	• Check that the correct power supply module type is used (17 V, 23 V, 30 V) • Check that the power supply modules work correctly • Modify the module configuration if it is intended to use a changed module configuration
Segment current warnings	• Check that the setup current is correct for the connected slaves • Check that no additional load has been connected to the bus segment • Check that all connected slaves are working correctly and that there is no hardware failure increasing the current consumption • Check that there is no miswiring (e. g. short circuit at the end of a long bus cable) • Check that there is no ingress of dirt water causing a resistive load on the bus segment (e. g. in a slave housing, junction box etc.)

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Fault Type	Fault Clearance
Segment DC unbalance alarms	• Check that the bus segment wiring is correct and that there is no pole-to-shield fault • Check that there is no ingress of dirt or water causing a resistive connection between a pole of the bus cable and the cable shield (e. g. in a slave housing, junction box etc.) • If an isolated system is used, it is possible to determine the defective segment directly • If a non-isolated system is used, all galvanically connected segments transmit an unbalance error; disconnect single segments to find out, which segment has caused the error (using a redundant system, it is possible, to exchange power conditioner modules segment by segment isolated power supply modules running, without shutting down the bus to find out, which bus segment is affected)
Segment/field device level high alarm	• Check if the bus segment is terminated correctly (one terminator at each end of the bus segment cable) • Check that the bus cable is healthy and that there is no disruption of the wiring • Check if the positions of the field devices have been changed (signal level is dependent on the field device position, due to bus cable resistance) • Check which field device address is causing the level alarm and if necessary replace the device • If you are using the DM-A connected to a spur line, repeat the measurement on the trunk. (In seldom cases doubled signal level occurs by measuring on a spur line) • Use the integrated scope function for further examination

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Use Cases and Troubleshooting

Fault Type	Fault Clearance
Segment level low alarm	• Check if the bus segment is terminated correctly (only two terminators) • Check that the bus segment wiring is correct • Check that there is no ingress of dirt water (resistive pole-to-pole load) • Check if the positions of the field devices have been changed (signal level is dependent on the field device position, due to bus cable resistance) • Check which field device address is causing the level alarm and replace the slave, if necessary • Use the integrated scope function for further examination
Noise level high alarm	• Check that the shielding and grounding of the bus cable is correct • Check if a correct potential equalization/grounding system is installed • Check that a correct bus cable type is used • Check that there are no cables with high AC currents (50/60 Hz or pulsed) near by the bus cabling as per good engineering practices • Check if there is an oscillation on the bus segment (caused by some few slave configurations) • Use the integrated scope function for further examination
Jitter level high alarm	• Check if the bus segment is terminated correctly • Check that the correct cabling type has been used • Check that a valid bus topology is used (maximum cable trunk and spur length, maximum number of field barriers) • FOUNDATION fieldbus only: check that a FF-831qualified power supply type is used (impedance) • Check which field device address is causing the jitter alarm and replace the device, if necessary • Check that two segments are not connected in parallel

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11 Installation in Hazardous Areas

11.1 Safety Instructions

The Statement of Conformity and Certificate of Compliance of the Fieldbus Power Hub must be observed. It is especially important to pay attention to any special conditions for safe use that are indicated.

Only devices which are suitable for operation in hazardous areas Zone 2/Div. 2 and the conditions present at the place of operation (see Statement of Conformity or Certificate of Compliance), are allowed to be connected to non-energy limited circuits in Zone 2, resp. Class I, Div. 2. or Class I, Zone 2.

Warning

In a Zone 2 installation, connection or disconnection of energized non-energy limited circuits is only permitted during installation, maintenance or for repair purposes since the presence of an explosive atmosphere during the short period of installation, maintenance or repair is considered as improbable.

In a Class I, Div. 2. or Class I, Zone 2 installation, connection or disconnection of the equipment at the trunk or changes at the switch components on the motherboard are only allowed if the area is known to be non-hazardous.

Warning

If devices are operated in general electrical systems they must not thereafter be operated in electrical systems that are connected with hazardous areas.

11.2 Installation of the HD2-DM-A in Conjunction with the Power Hub within Zone 2 or Class I Div. 2 or Class I, Zone 2

As a part of the Fieldbus Power Hub system the Advanced Diagnostic Module may be installed in Zone 2 and Class I Div. 2 or Class I, Zone 2 hazardous areas. The type of protection is EEx nA (non-arcing) for Zone 2 Gas Groups IIC, IIB, IIA, and non-incendive for use in Class I, Division 2 Gas Groups A, B, C and D or AEx nA for use in Class I, Zone 2. Depending on the type of Fieldbus Power Supply used in the Power Hub, different topologies and types of Zone 2/Div. 2 installations are possible.

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Installation in Hazardous Areas

11.2.1 Degree of Protection

If the device is used in Zone 2, Class I Division 2 or Class I, Zone 2 area it must be installed in a protection class IP 54 or better enclosure/control cabinet in accordance with EN 60529.

11.3 Installation of the DM-AM within Zone 2, Class I Division 2 Area or Class I, Zone 2

Under certain conditions the DM-AM may be installed in Zone 2 and Class I Division 2 hazardous areas. The type of protection is EEx nA [nL] (non-arcing) for Zone 2 Gas Groups IIC, IIB, IIA, and non-incendive for use in Class I, Division 2 Gas Groups A, B, C and D.

Warning

Before connecting the DM-AM to energy limited circuits, take the respective peak values into account from an explosion protection standpoint.

Warning

For fixed installation, the DM-AM must be installed in such a way that at least the degree of protection IP54 acc. EN 60529 is reached. This requirement does not apply if using the DM-AM for maintenance purposes.

Warning

Store the device in a clean and dry environment.

Warning

The delivered transport case of the Mobile Advanced Diagnostic Module and some of its content must not be taken into hazardous areas.
Do not use the delivered AC/DC adapter within hazardous areas.

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12 List of Referenced Documents

12.1 Norms

[IEC 61158-2]	Digital data communication for measurement and control - Fieldbus for use in industrial control systems - IEC 61158 ED.3 2002
[IEC 60079-14]	Electrical installatons in hazardous areas; third edition 2002-10
[EN 60079-15]	Type of protection „n“; second edition 2001-02; German version EN 60079-15:203
[IEC 60079-17]	Inspection and maintenance of electrical installations in hazardous areas; second edition 1996-12
[IEC 60078-27]	Fieldbus intrinsically safe concept (FISCO); first edition 2002-11
[IEC 60529]	Degrees of protection provided by enclosures (IP code):1989 + A1:1999; German version EN 60529:1991 + A1:2000

12.2 Guidelines

- FOUNDATION Fieldbus Application Guide, AG-163 Revision 2.0
- PROFIBUS PA User and Installation Guideline; Version 2.2, February 2003

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13 Quick Acting Reference List

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Notes

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