

MANUAL

DM-AM

Mobile Advanced Diagnostic Module



FieldConnex[®]

PF **PEPPERL+FUCHS**
PROTECTING YOUR PROCESS

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

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

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Explanation of Symbols

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

This symbol brings important information to your attention.



This symbol marks an acting paragraph.

2 General Function Description

Advanced physical layer diagnostics are monitoring tools for FOUNDATION fieldbus H1 and PROFIBUS PA that simplify the work with the fieldbus physical layer.

FieldConnex^R physical layer diagnostics consist of:

- The Advanced Diagnostic Module (ADM): It provides comprehensive measurement capabilities for up to four fieldbus segments.
- The Diagnostic Manager: This software works with most ADMs and displays the measurement values and provides functions and wizards, which simplify working procedures.

Together they ensure the best possible quality of the fieldbus physical layer through efficient working procedures reducing the amount of effort necessary. Only a very basic understanding about fieldbus is required to operate the diagnostic tools as they provide comprehensive information and fieldbus expertise to the user.

FieldConnex^R ADMs offer support for one or all of the three areas of application concerning the fieldbus physical layer in process plants. They are:

Commissioning:

After installation is complete and before loop check commences, the condition of the fieldbus segment is checked. A physical layer in good condition is the basis for a successful loop check and plant startup. The ADM and Diagnostic Manager check the fieldbus segment with only a few mouse clicks and simple-to-use automated procedures. The Diagnostic Manager records comprehensive physical layer values in a baseline report and suggests limit values to be stored in the ADM.

Online monitoring:

The ADM compares actual values to the limits set during commissioning, keeping an "extra set of eyes" on the fieldbus. Warnings indicate early on that a fault has occurred or that the quality of the installation is degrading. Proactive corrective action is possible preventing unwanted plant shutdowns.

Troubleshooting:

Messages with clear-text information direct maintenance people to possible causes for evaluation of the situation. Necessary repair work is planned and performed only when necessary. This significantly reduces time to repair and time spent in the field.

The Advanced Diagnostic Module is at the core of FieldConnex^R diagnostic solutions. Additionally, motherboards and accessories provide

General Function Description

the necessary options for applying advanced physical layer diagnostics in any process plant and with any type of fieldbus equipment improving productivity for FOUNDATION fieldbus H1 and PROFIBUS PA.

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.

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



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



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.

Warning

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.

General Function Description

2.3 Fault Elimination



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.

Warning

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.

3 Product Specifications DM-AM

3.1 Functional Description

The Mobile Advanced Diagnostic Module DM-AM-KIT is dedicated to fieldbus practitioners "on the go." As a stand-alone module, it connects in parallel to any fieldbus segment. Via USB, it communicates with the Diagnostic Manager installed on any PC or laptop. In conjunction with the Diagnostic Manager, it primarily supports two areas of application with its full measurement capabilities and complete portfolio of tools and wizards:

- Commissioning with software support
- Troubleshooting

Additionally, the mobile ADM can be installed temporarily in the control room cabinet and powered by 24 V DC for online monitoring.

3.2 Marking

Mobile Advanced Diagnostic Module

Pepperl+Fuchs

D-68307 Mannheim

DM-AM

TÜV 05 ATEX 2923 X



II 3 G Ex nA [nL] IIC T4

Product Specifications DM-AM

3.3 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

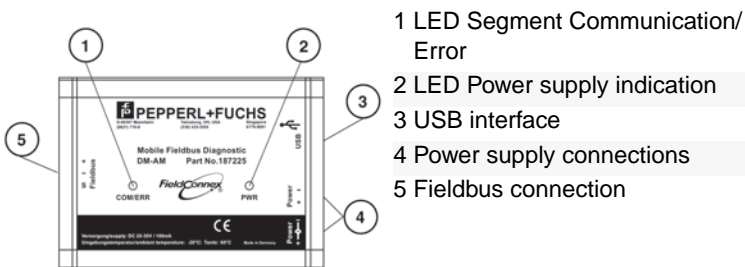
Number of segments	1
Rated voltage	9 to 32 V

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

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

3.4 Device Component Overview



187530

3.5 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? <ul style="list-style-type: none"> • Use an externally-supplied USB-Hub Verify that the wiring is secure: <ul style="list-style-type: none"> • 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 measured value is out of specification. Value is out of the ranges defined by IEC 61158 for a valid physical layer	Connect diagnostic PC and carry out a complete system diagnosis: <ul style="list-style-type: none"> • DC unbalance • jitter level too high • noise level too high Bus segment... <ul style="list-style-type: none"> • ...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!

Product Specifications DM-AM

3.6 Order Information

Order name Description

DM-AM-KIT	The Mobile Advanced Diagnostic Kit scope of delivery: <ul style="list-style-type: none"> • 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	AC/DC adapter / Wall Power Supply
Basic DTM	Free of charge Basic Diagnostic Manager, comes with the Diagnostic Module. This Toolsuite reads generic physical layer information of the fieldbus segments.
DTM-FC.ADM	Professional Diagnostic Manager, offers the full functionality including alarming, trending, report generation and the oscilloscope function.
DTM-FC.ADM.UPG	Upgrade license, activates a DTM version 2.x if a former 1.x version is activated on the system.

Compatibility information

Projects designed with the former Diagnostic Manager version 1.x are compatible with the new version 2.x of the Diagnostic Manager. By opening and saving the version 1.x project with the version 2.x Diagnostic Manager the project can not be opened with the Diagnostic Manager version 1.x any more.

3.7 Dimensional Drawings

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

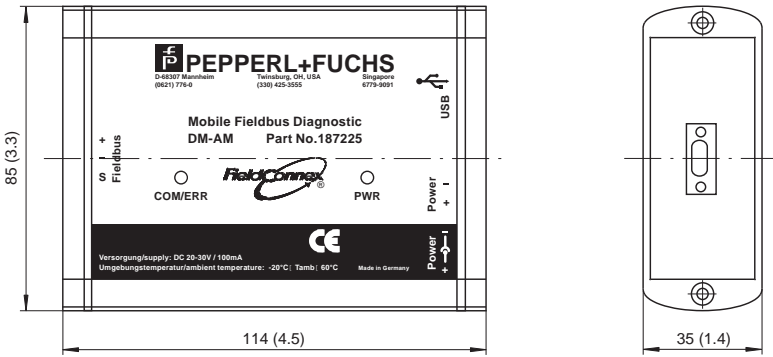


Figure 3.1: DM-AM

4 Engineering DM-AM

4.1 DM-AM Connection Details

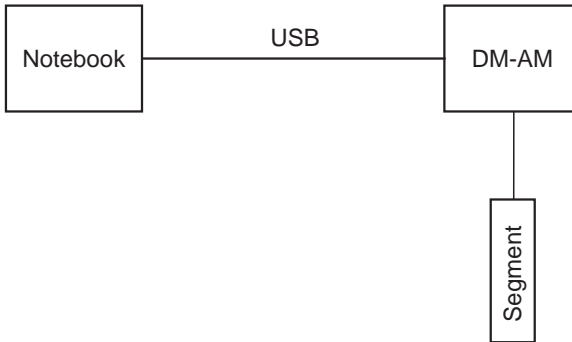


Figure 4.1: Stylized connections

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

For communication purposes power must be supplied using the USB port on your PC. 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 port. If your Notebook does not allow such a supply value use an externally-supplied USB-Hub.

DM-AM Connection and Start-up

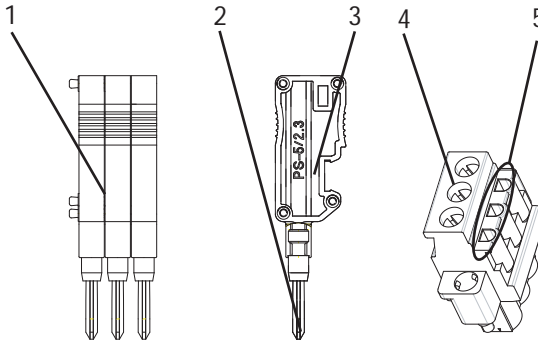
1. Connect the fieldbus cable to the fieldbus segment
2. Plug the connection clamp of the fieldbus cable into the DM-AM
3. Connect the DM-AM via the USB-cable to your Notebook

The DM-AM starts right away and the LED **POWER** lights solid green after the driver are loaded

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

4.2 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. These test points are not an industry standard so they are not delivered ready to use, but with several steps you can assemble them 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

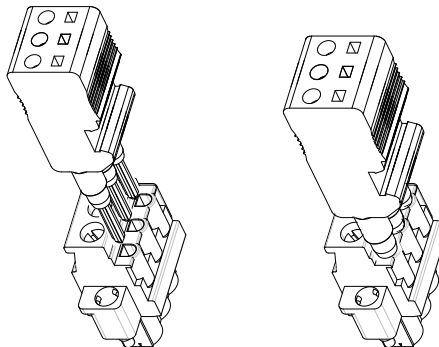
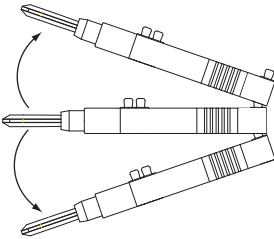


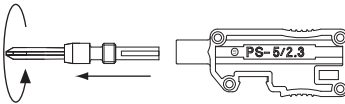
Figure 4.2: Connecting the Test Plug

Assemble the Test Plug

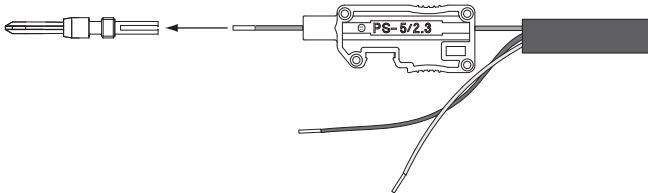
1. Disconnect the three Test Plugs.



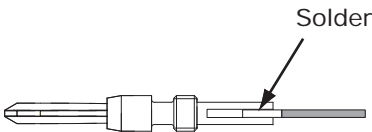
2. Remove the Metal Part from the Test Plug.



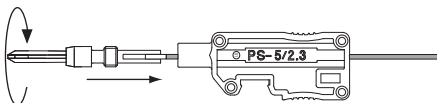
3. Stick one lead through the Test Plug into the Metal Part.



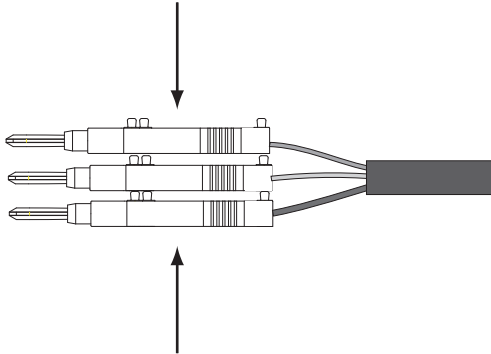
4. Solder the lead within the Metal Part.



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



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



4.3 FDT/DTM Diagnostic Manager Installation and Commissioning

4.3.1 Diagnostic Manager Installation



Diagnostic Manager Installation with PACT_{ware}TM

To install the FieldConnex^R Diagnostic Manager, proceed as follows:

1. Start the setup
2. Choose **Next** to proceed with the installation and follow the instructions of the installation wizard
3. Choose installation profile: „FDT/DTM Environment“
4. Choose installation for DM-AM (Mobile)
5. Run PACT_{ware}TM
6. Make sure that all PACT_{ware}TM projects are closed
7. Update the device catalog



Figure 4.3: Update device catalog

The window **Create a new PACT_{ware}TM device catalog** appears.

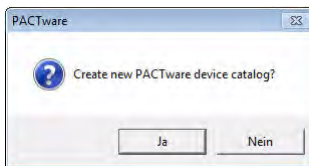


Figure 4.4: Create a new PACT_{ware}TM device catalog

8. Choose **Yes** to approve.

The Diagnostic Manager is now installed and ready to run.

4.3.2 Licensing

The FieldConnex® Diagnostic Manager that was installed is a basic version with reduced functionality. To activate the fully featured version a License Key is needed. The License Key is printed on the license certificate you have optionally received with the FieldConnex® Diagnostic Manager software package.

If you have downloaded the FieldConnex® Diagnostic Manager on the Internet a License Key can be ordered through your local Pepperl+Fuchs representative.

Upgrade information

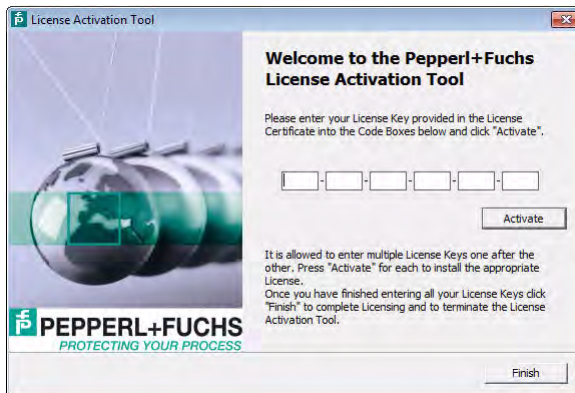
After upgrading from Diagnostic Manager Version 1.x to Version 2.x activate the new version with the upgrade license key.

After complete reinstallation of the Diagnostic Manager (e.g. installation on a new PC) enter both license keys form Version 1.x and 2.x one after the other into the License Activation Tool.



License Activation

1. Start the Pepperl+Fuchs License Activation Tool: Programs>Pepperl+Fuchs>ActivationTool
2. Enter your License Key into the 6 code boxes.



3. Press **Activate**
4. After activation is confirmed, press **Finish** to close the window
5. If Diagnostic Manager windows are open during licensing process, close and reopen them to get the new license activated.

4.3.3 Diagnostic Manager Connection



Diagnostic Manager connection to DM-AM

1. Start PACT_{ware}TM
2. Open the corresponding project
3. Right-click on the Diagnostic Module in your project and choose **Connect**

Operation with the Diagnostic Manager

5 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 following functions and features are available only if the latest firmware version is installed on the DM-AM.

By using an older firmware version some of the features may not be available. For information on how to install the latest firmware on your device see chapter 5.9.

5.1 Project Assembling

To work with the DM-AM diagnostic module you need to create a PACT_{ware}TM project that contains the diagnostic module (see below). It is possible to use only this single project for all of your segment measurements. But you will reach the best diagnostic results by creating and saving one separate PACT_{ware}TM project for every single fieldbus segment. This way, you can create complete Commissioning Wizard cycles for each fieldbus segment. So, a comparison of the current and former data is possible in the future.

The Diagnostic Manager rates the values because of the commissioning status of the segment. Because no Commissioning Wizard run was executed before, the segment has the status non-commissioned. The values are now compared against the IEC 61158-2 standard limits.

Non-commissioned:



Excellent: Excellent



Good: values within IEC 61158-2 limits, but with small security stock or values are not matching with values supposed because of the topology



Out of Specification: at least one value violated a IEC 61158-2 limit

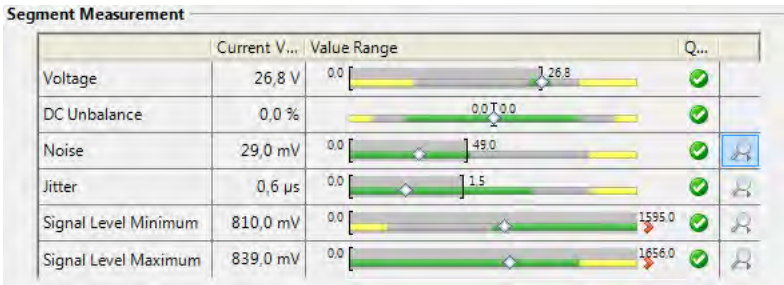


Figure 5.1: Value in non-commissioned status

If a Commissioning Wizard run was executed on this segment before, the segment received the status commissioned. The values are rated against the IEC 61158-2 standard limits and against the values measured during the commissioning run.

Commissioned:



No error



Maintenance Required. At least one value changed since commissioning



Out of Specification: at least one value violated a IEC 61158-2 limit

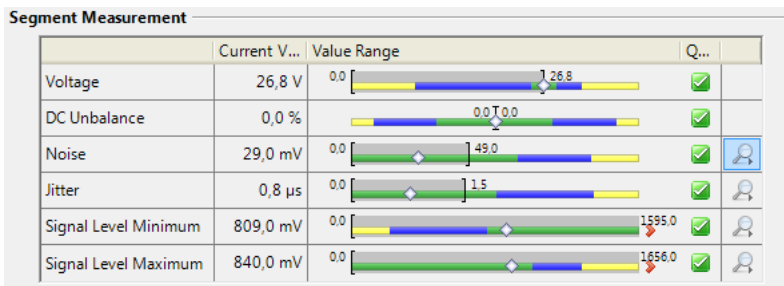


Figure 5.2: Value in commissioned status

Operation with the Diagnostic Manager

Create a DM-AM Project

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

1. Start PACT_{ware}TM
2. Make sure that the latest Diagnostic Manager version is installed and that the device catalog is updated
3. Create a new project
4. Open the device catalog **View/Device catalog** or press **F3**
5. Open folder Pepperl+Fuchs GmbH

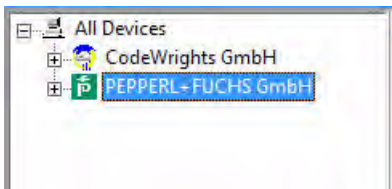


Figure 5.3: Device structure PACT_{ware}TM

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

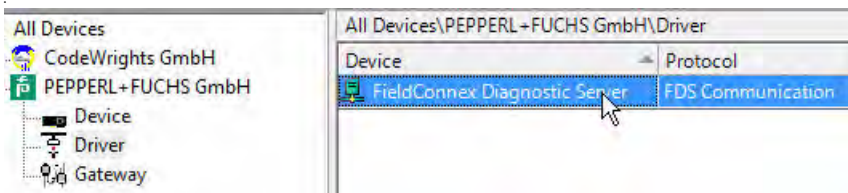


Figure 5.4: Device structure driver

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

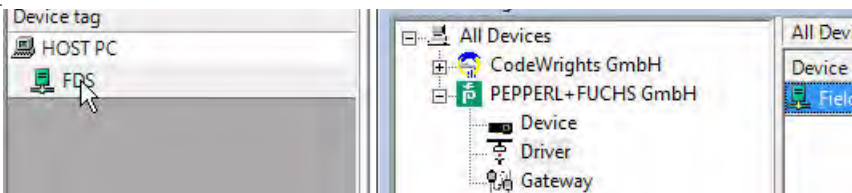


Figure 5.5: Drag&Drop the FDS

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

Now the project tree looks like this:

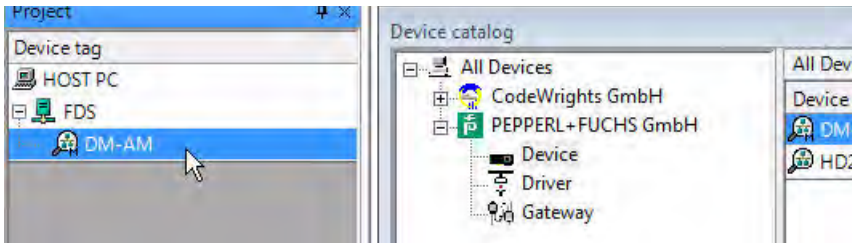


Figure 5.6: Project structure

5.2 DM-AM Parameter Window Overview

The parameter window is the main user interface of the Diagnostic Manager. It enables access to the most common functions and to the current segment data.

Detailed information is shown within each of the tabs on the DM-AM parameter window:

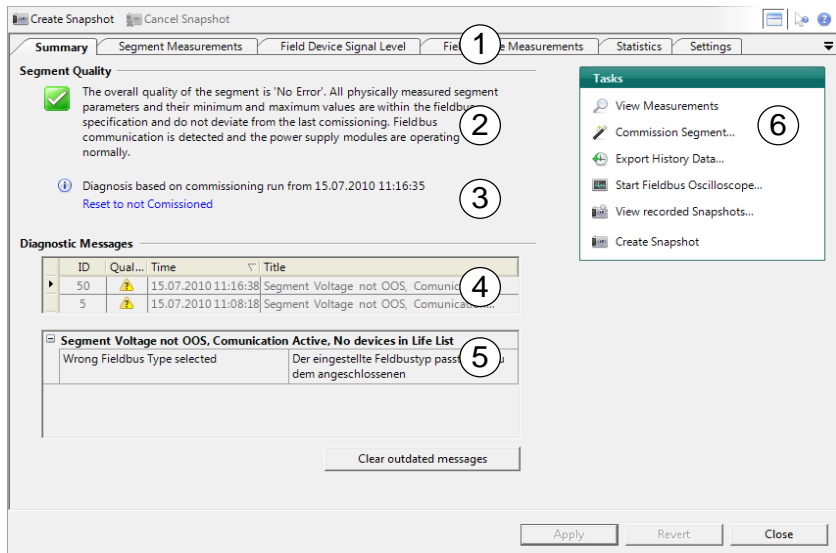


Figure 5.7: DM-AM parameter window

- 1 Function tabs
- 2 Rated Segment Quality
- 3 Commissioning Status information

Operation with the Diagnostic Manager

- 4 Diagnostic Messages
- 5 Detailed diagnostic information
- 6 Task quick start

The table Diagnostic Messages shows all failures or messages since start of the Diagnostic Manager or since the last reset. It contains all currently active messages and also all messages that are no longer active. By highlighting a diagnostic message you get detailed information about the cause of the problem and possible solutions in the table below. You also may delete inactive messages to focus on the active ones only.

Diagnostic Messages

ID	Quality	Time	Title
46		15.07.2010 11:45:15	1 or more nodes Signal level is higher than the...
45		15.07.2010 11:41:05	1 or more nodes Signal level is higher than the...
61		15.07.2010 11:40:32	Segment Voltage vorhanden >2V, No...
73		15.07.2010 11:40:32	Segment Voltage is OOS und >2 V (Host Only)
64		15.07.2010 11:40:16	Segment Voltage exceeds Baseline Range
51		15.07.2010 11:40:16	(Nur Host) Segment Voltage is out of Range for...
49		15.07.2010 11:40:16	Segment Voltage near Zero <= 2V (Host Only)

1 or more nodes Signal level is higher than the high MR required value from the baselin...	
Termination- too few	Nur ein oder kein Terminator am Bus

Clear outdated messages



Open DM-AM Parameter Window

Right mouse click on the DM-AM in your project tree and choose Parameter.

5.2.1 Summary Tab

This tab is the starting point of the Diagnostic Manager. It gives a brief overview about the segment health and enables you to perform a detailed analysis. You may also start additional functions right out of the task frame.

Summary Segment Measurements Field Device Signal Level Field Device Measurements

Segment Quality

The overall quality of the segment is 'No Error'. All physically measured segment parameters and their minimum and maximum values are within the fieldbus specification and do not deviate from the last commissioning. Fieldbus communication is detected and the power supply modules are operating normally.

Diagnosis based on commissioning run from 15.07.2010 11:16:35
[Reset to not Commissioned](#)

5.2.2 Segment Measurements Tab

Without prior configuration the Segment Measurements Tab gives a general idea of all relevant segment and field device data as well as the actual minimum and maximum values that have occurred and rating of the values according IEC 61158.

Segment Quality

The overall quality of the segment is 'No Error'. All physically measured segment parameters and their minimum and maximum values are within the fieldbus specification and do not deviate from the last commissioning. Fieldbus communication is detected and the power supply modules are operating normally.

System and Motherboard Measurement

Tag: DM-AM

Communication Act...

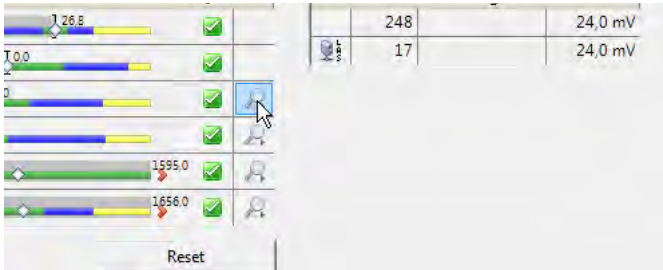
Segment Measurement

	Current V...	Value Range		
Voltage	26,8 V	0.0 26.8	<input checked="" type="checkbox"/>	
DC Unbalance	0,0 %	0.0 0.0	<input checked="" type="checkbox"/>	
Noise	29,0 mV	0.0 49.0	<input checked="" type="checkbox"/>	
Jitter	0,8 µs	0.0 1.5	<input checked="" type="checkbox"/>	
Signal Level Minimum	809,0 mV	0.0 1595.0	<input checked="" type="checkbox"/>	
Signal Level Maximum	839,0 mV	0.0 1656.0	<input checked="" type="checkbox"/>	

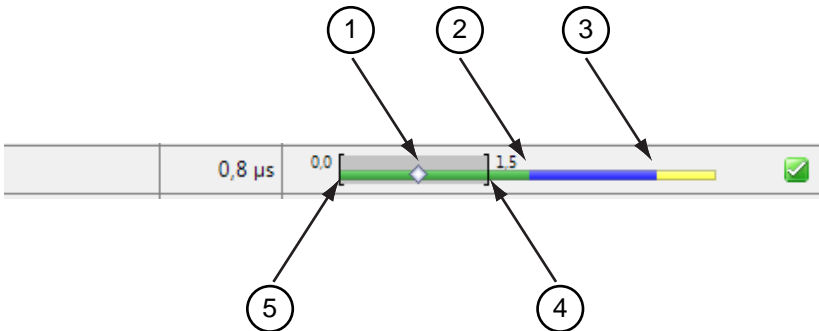
Reset

Operation with the Diagnostic Manager

Click on the magnifying glass to see current field device data.



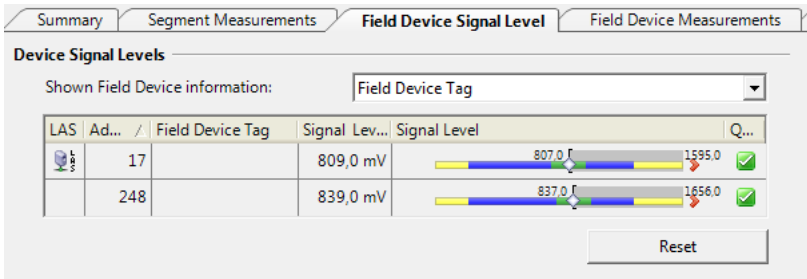
Within the segment measurement column there is a live view of the critical physical layer values. They are evaluated and compared to the IEC 61158-2 standard and graphically displayed to easily visualize the health of a segment.



1. Current value
2. Range for excellent value
3. Range for good value
4. Max. value occurred during operation
5. Min. value occurred during operation

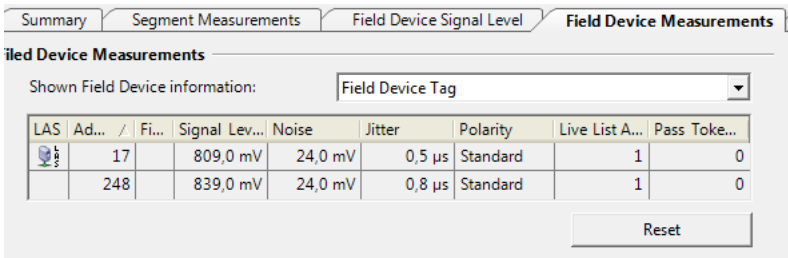
5.2.3 Field Device Signal Tab

Gives a graphical view on the devices' signal level.



5.2.4 Field Device Measurements

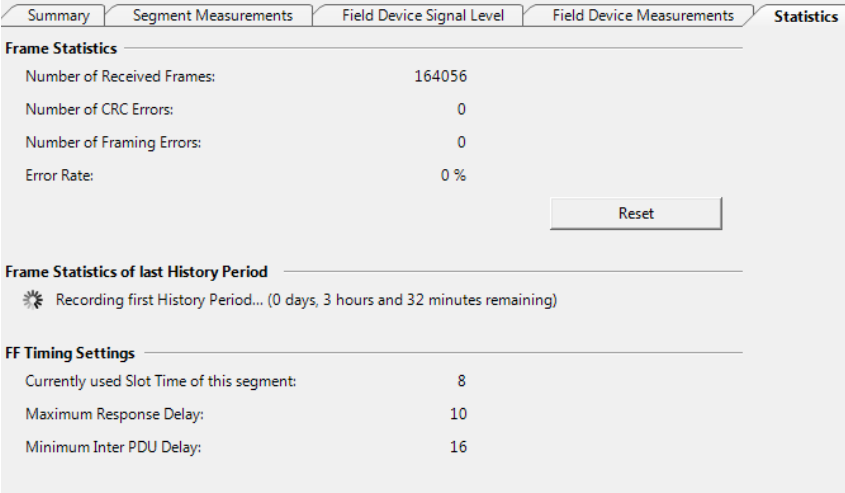
Within the field device measurement columns there is a live view of the critical physical layer values.



Operation with the Diagnostic Manager

5.2.5 Statistics Window

Here you can find general information about received communication frames, errors occurred, and other setting information.



Summary	Segment Measurements	Field Device Signal Level	Field Device Measurements	Statistics
Frame Statistics				
Number of Received Frames:		164056		
Number of CRC Errors:		0		
Number of Framing Errors:		0		
Error Rate:		0 %		
<input type="button" value="Reset"/>				
Frame Statistics of last History Period				
☼ Recording first History Period... (0 days, 3 hours and 32 minutes remaining)				
FF Timing Settings				
Currently used Slot Time of this segment:		8		
Maximum Response Delay:		10		
Minimum Inter PDU Delay:		16		

5.2.6 Settings Window

Here you can adjust segment settings such as the fieldbus type, tag of the diagnostic device and the recording intervals for long-term history storage. The long-term history function allows you to collect and store data for preset time intervals see chapter 5.8.

You will also find the serial number of the diagnostic device and the version number of firmware installed on the device.

Summary	Segment Measurements	Field Device Signal Level	Field Device Measurements	Statistics	Settings
ADM Settings					
Segment Tag:	DM-AM				
Fieldbus Type:	FOUNDATION Fieldbus				
Long-term History:	Recording interval: 4 hours; Recording length: 17 days				
Topology Settings					
<input type="radio"/> Ignore Topology settings for diagnostic calculation <input checked="" type="radio"/> Use following Segment Topology settings					
Measure Position:	Power Supply				
Power Supply:	HD2-FBPS-1.25.360				
Fieldbus Coupler Type:	Other				
Trunk Length:	10 m				
Trunk Cable:	Type A 0.8mm ² (AWG 18)				
<input type="button" value="Load Segment Checker file"/>					
Device Information					
Product:	DM-AM				
Serial Number:	01177156536031				
Software Revision:	1.3.0.0				
Static Revision:	8				
					<input type="button" value="Apply"/> <input type="button" value="Revert"/>

Operation with the Diagnostic Manager

5.3 Additional Functions

The Diagnostic Manager provides the following set of standard functions:

Commissioning Wizard (chapter 5.4)	User-friendly tool for fast and easy start-up with the Diagnostic Module. The wizard leads you step by step through a complete segment check-out with individual segment data calculation and value take over.
Snapshot Explorer (chapter 5.6)	Special dialog for administration and printing of created snapshots/reports.
History Export (chapter 5.8)	Allows you to collect and store data within pre-set time intervals and also export this data.
Fieldbus Oscilloscope (chapter 5.7)	Tool for in-depth analysis of the fieldbus signal.
Firmware Update (chapter 5.9)	Enables you to upload the latest firmware version of the Diagnostic Module

5.4 Commissioning Wizard

The Commissioning Wizard is a user-friendly tool for fast and easy start-up with the Diagnostic Module. By leading you step-by-step through a complete segment checkout, all necessary individual 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**



Perform Segment Commissioning

1. Open the Commissioning Wizard
2. Press the button **Next**
Connected field devices are shown
3. Enter device tags manually or press button read tags
4. Press the button **Next**
A general overview and the current segment and field device data is shown
5. Press the button **Next**
A snapshot of the physical layer measurement is taken.
6. If the Expert System detected any issues while the snapshot was recorded you have to ignore them to proceed. If they are not ignored the Commissioning Wizard will cancel the commissioning procedure and create a report about the failed commissioning. Before the report is shown you may also specify a comment to be included in the report and select an option to include characteristic Oscilloscope Recording fragments for each field device into the report. Press the button Next to proceed. A printable report is generated that is stored in the Snapshot Explorer
(see chapter 5.6)
7. Press the button **Next**
Warning and alarm limit values are now stored to the diagnostic device and it operates in commissioning mode

Operation with the Diagnostic Manager

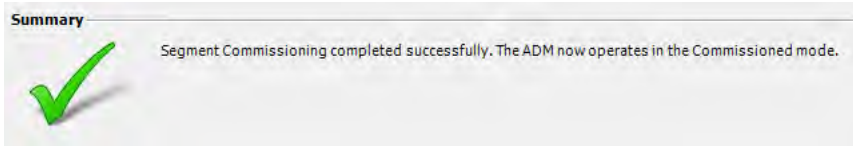


Figure 5.8: Segment commissioning successful

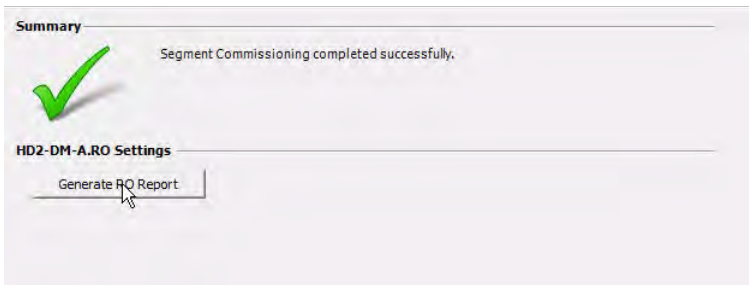
5.4.1 Generate Reports for HD2-DM-A.RO DIP-Switch Settings

The Commissioning Wizard includes a function to support proper DIP-Switch settings of the HD2-DM-A.RO module.



Generate RO Report

1. Run complete segment commissioning as described previously
2. Press Generate RO Report button within last window



The report is generated and can be printed or saved.

HD2-DM-A.RO Settings Report

Date: 3/19/2010 4:03:47 PM
Segment Tags: DM-AM

Measurement Equipment

Device Type: DM-AM
Serial Number: 01177156536031
Software Revision: 1.3.0.0PRE21
DTM Revision: 2.0.0.998

DIP Switches Setting:

Priority	1	1	2
On	On	On	Off
Off	Off	Off	On
Position	1	2	3

1 2 3 4 5 6 7 8

Please choose highest priority of each block when combining several reports

5.5 Snapshots

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 Parameter Window

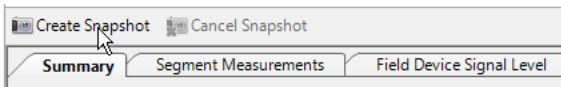
1. Right-click on the DM-AM in the project tree
2. Choose **Parameter**



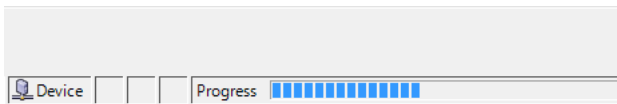
Make new Snapshot

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

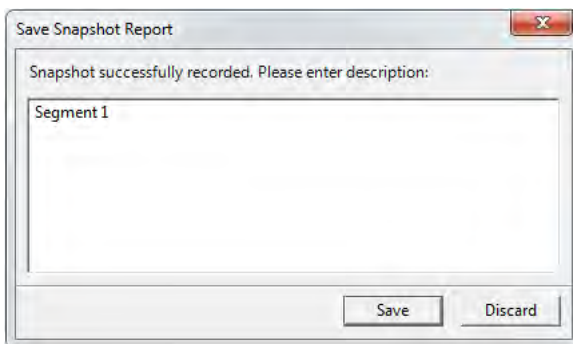
1. Press the button **Create Snapshot** or **Create Snapshot including Oscilloscope Recordings**.



Snapshot capturing in progress:



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



Operation with the Diagnostic Manager

- To save the current report, press button **Save**
The Snapshot Explorer appears (see chapter 5.6)

5.6 Snapshot Explorer

The Snapshot Explorer is the user interface for administration, printing and exchange of the snapshots. 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 can be selected: a clearly arranged default template and the compact template, which contains the same information within less space.

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.

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

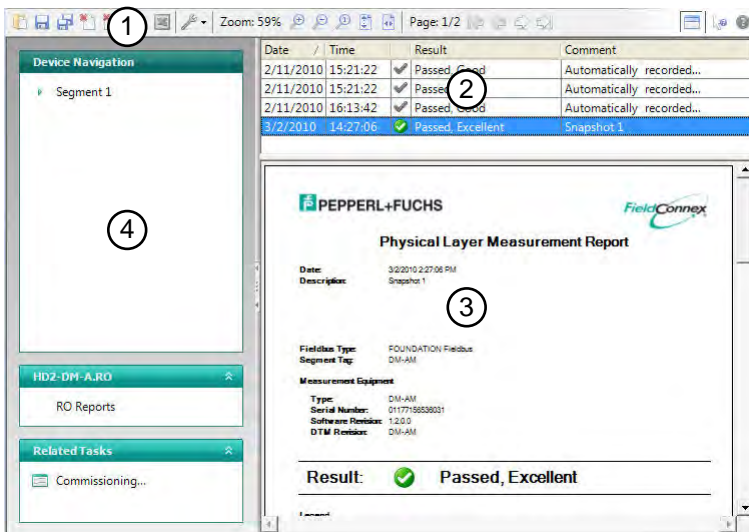


Figure 5.9: Snapshot screen overview

1 Toolbar

- 2 Snapshot collection
- 3 Report preview
- 4 Segment navigation panel



Open Snapshot Explorer

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



Export Snapshot 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 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 Snapshot 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**



View Snapshot with Microsoft[®] Excel

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



Operation with the Diagnostic Manager

5.7 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 analyzed and shown afterwards.



Open Fieldbus Oscilloscope

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

5.7.1 Oscilloscope Screen Overview














Figure 5.10: Oscilloscope screen overview

- 1 Overview screen
- 2 Information and user notes
- 3 Zoom in view

5.7.2 Oscilloscope Tools and Shortcuts

The toolbar for graph handling is found on the left edge of the window

-  Press and hold right mouse button to grab and move graph
-  Press right mouse button to set horizontal marker to measure clearance and time
-  Press right mouse button to set vertical marker to measure the voltage
-  Press and hold right mouse button to make a rectangular measurement
-  Click on graph to get voltage at this point
-  Zoom in
-  See 1:1 graph size
-  Zoom out
-  Set level and layer measurement

Mode	Action	Result
all tools	Double click on telegram in over-view screen area	Changes the view to completely show the clicked frame
all tools	CTRL + mouse wheel	Increases/decreases the zoom factor
	Drag while left mouse button is pressed	Move the waveform to the left/right
	Double click left/right mouse button	Increases/decreases the zoom factor
		After activation of vertical cursor mode, the cursors are automatically placed on the minimum and maximum value of the complete waveform

Operation with the Diagnostic Manager



Double click left mouse button

Sets the maximum cursor to the maximum value of the currently visible part of the waveform



Double click right mouse button

Sets the minimum cursor to the minimum value of the currently visible part of the waveform

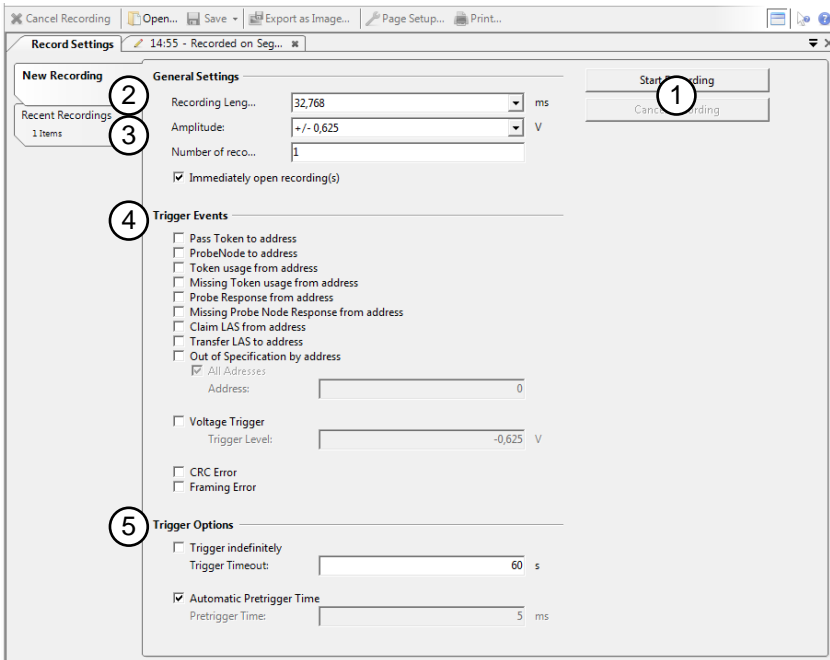


Figure 5.11: Control panel Overview

- 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
- 3 Sampled amplitude
- 4 Trigger Events
- 5 Trigger Options

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5.7.3 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	Trigger if the specified addresses sends frames after receiving a pass token
Probe node to address	Trigger if a Probe Node is sent to the specified Address but no Probe Node Response is detected as the next frame
Token usage from address	Trigger if the specified addresses sends frames after receiving a pass token
Missing Token usage (next valid bus address is triggered)	Trigger if a pass token is sent to the specified Address but is not used from this address afterwards.
Probe response from address	Trigger if a Probe Node frame to the specified address is detected
Missing probe response to address	Trigger if a Probe Node is sent to the specified Address but no Probe Node Response is detected as the next frame
Claim LAS from address	Trigger if a Claim LAS frame is detected from the specified address
Transfer LAS to address	Trigger if a Transfer LAS frame to a specified address is detected
Out of Specification by address (available since Diagnostic Manager version 1.3)	Triggers when one of the parameters Noise, Jitter or Signal Level gets into state Out of Specification. Please note: Amplitude, Recording Length and Pretrigger Time are set automatically independent from the settings here.

Operation with the Diagnostic Manager

Trigger events for PROFIBUS PA segments are:

Request from address	Trigger if any Request Frame is detected from the specified address
Response from address	Trigger if any Response Frame is detected from the specified address
Missing response from address (next valid bus address is triggered)	Trigger if the Slave at the specified address does not Response on a Request
Pass Token to address	Trigger if a Pass Token frame to the specified address is detected
Missing Pass Token response from address	Trigger if a Master at the specified address does not react on a Pass Token frame
Out of Specification by address (available since Diagnostic Manager version 1.3)	Triggers when one of the parameters Noise, Jitter or Signal Level gets into state Out of Specification. Please note: Amplitude, Recording Length and Pretrigger Time are set automatically independent from the settings here.

Other trigger events:

CRC error	Trigger if a fieldbus frame with a CRC error is detected
Framing error	Trigger if a Frame is invalid (e.g. SOF detected but EOF missing)
Signal level	Trigger if a voltage higher than the specified value is detected. Triggers for Signals, noise etc.

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



Start Fieldbus Oscilloscope

1. Right-click on the Diagnostic Module in the project tree
2. Choose **Additional functions/Fieldbus Oscilloscope**
3. Choose trigger events
4. Press **Start**



Save Oscilloscope Recordings as XML

The Diagnostic Manager saves the current Oscilloscope recordings in a XML-file. Save recordings to open them again and also if you want to do more detailed analysis outside of the Diagnostic Manager. Current recordings are stored only during the session, if you close the Oscilloscope Window unsaved recordings will be deleted.

1. Execute Fieldbus Oscilloscope measurement
2. Press Button Save (as)
3. Choose location and confirm



Open existing Oscilloscope Recordings

Within the oscilloscope dialog it is possible to open previously created oscilloscope recordings. All oscilloscope recordings taken during one session are shown in the recent recordings section, if you close the oscilloscope dialog all unsaved recordings are lost. Recordings created and saved in previous sessions can also be opened.

1. Press Open button within toolbar



2. Choose former created recordings and press open
New Oscilloscope tab opens



Save Oscilloscope Graph as Image

1. Execute Fieldbus Oscilloscope measurement
2. Press Export button as Image
3. Choose location and confirm

Operation with the Diagnostic Manager

5.8 Long-Term History

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

In this case the DM-AM can be used as a data logger independent of a PC, see chapter 5.8.2.

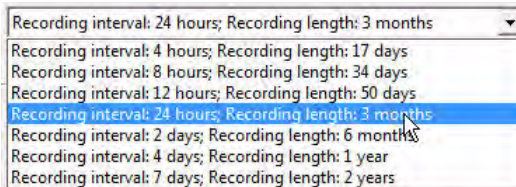
The period of data storage contains 100 data sets that are collected within a circular buffer: this means that the data set number 101 overwrites the data set number one. So the access is limited to the last 100 data sets recorded.

The interval range can be set between 4 hours and 7 days, thus the possible time range history data sets are stored for is between 17 days ($4h \cdot 100 = 400h = \text{ca. } 17 \text{ days}$) and approx. 2 years.



Set Long-Term History interval

1. Open Parameter window setting tab
2. Open DropDown menu Long-Term History
3. Choose time for your interval



4. Confirm with Enter

5.8.1 History Export

The History Export function lets you convert the collected and stored Long-Term History data to a commonly used document format, so that you can edit them or use them for your own calculations.

The data sets can be exported as an Exel-(see chapter 5.8.3), CSV- and his-file.



Export History

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

Only completed recording intervals are to be exported. The data of the uncompleted interval remains in the RAM of the DM-AM.

Operation with the Diagnostic Manager

5.8.2 Using DM-AM as Data Logger

In conjunction with the Long-Term History function the DM-AM can be used as a data logger, during this time the DM-AM works independent of a PC connection and of the Diagnostic Manager. At any time a PC can be connected to the DM-AM and the history data can be exported.

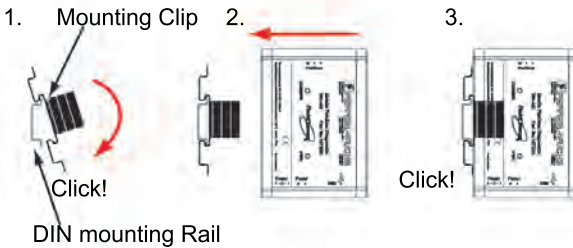
For this application the DM-AM must be powered with an external power supply, a Wall Power supply (DM-AM-WPS) is available as accessory. It comes with a mounting clip to secure the DM-AM to the DIN rail.



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 use.

Do not use the mounting clip where vibration is present.

5.8.3 Using the Excel export

For data exchange and to reformat or prepare your physical layer data, the Diagnostic Manager provides a convenient export to Microsoft Excel. The physical layer data is imported in a specially designed template. This template is optimized to provide an easy overview of all relevant parameters. You can also create diagrams with one click.

The screenshot shows the 'History Data' window in the Diagnostic Manager. It includes a sidebar with the FieldConnex logo and navigation options like 'Load TXT File', 'Merge TXT File', and 'Field Dev Diagram'. The main area features a bar chart comparing two data points, '11' and '248', with values around 800. Below the chart is a table with columns for 'Voltage V', 'Resistance R', 'Dissip. P', and 'Star Jan. Diagram', each with 'Maximum' and 'Minimum' sub-columns. A 'Status Flag' column is also present. The table contains several rows of data, including a summary row and a detailed data row with values like 22.30, 22.20, 1.00, 0.60, 362.00, 1.00, 0.75, 0.13, 14.00, 14.00, 1.15, 1.00, 402.00, 15.00, 0.50, 0.25, 29.60, 29.60, 2.00, 0.00, 713.00, 24.00, 1.00, 0.60, 0.00, 0.00, 0.00, 0.00, 0.00.

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Operation with the Diagnostic Manager

5.9 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. Press button Check Device
Current firmware revision is shown
4. Choose if you want to use firmware that comes with the Diagnostic Manager or from an other source

- Use firmware provided with this DTM
 Use firmware file from disk

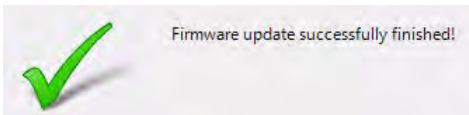


Attention

Connection Loss

In rare cases, there is a disconnection of the Diagnostic Module. Do not try to reconnect manually. The Diagnostic Module will reconnect automatically within a short time.

5. Press button **Next**



Firmware update successful

Field Device Handling for PROFIBUS

6 Field Device Handling for PROFIBUS

PROFIBUS devices can have two different states:

- in data exchange
- not in data exchange

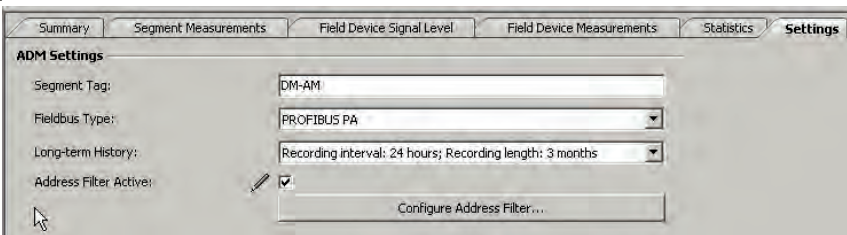
If at least one PROFIBUS device is in data exchange, the measurement takes place for PROFIBUS masters and devices which are in data exchange only. All other devices are disabled for the measurement.

To analyze PROFIBUS devices that are not in data exchange, you can use the Oscilloscope function. See chapter 5.7.

If multiple segments are linked together via a repeater, like in a PROFIBUS PA segment coupler SK2 application monitoring is done for all field devices connected to the same logical segment. To prevent the analysis of field devices not connected to the physical segment the DM-AM is connected to:

- "Set "Address Filter Active"
- "Specify a list of all devices connected to a physical segment by opening "Configure Address Filter".

If the Filter is activated only field devices in this list are monitored. All other field devices are ignored.



Measured Values / Parameters

7 Measured Values / Parameters

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 Communication

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

Segment/Field Device Noise

Monitors the current field device noise level.

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.

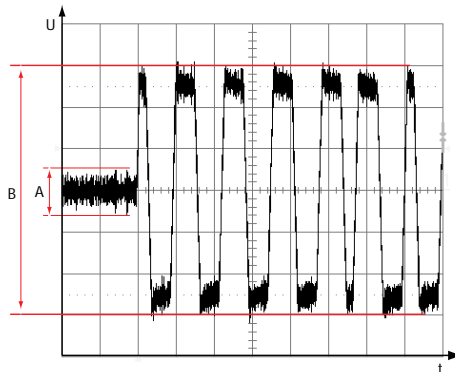


Figure 7.1: Communication noise

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 AC power supply injecting noise into the bus
- a regulated FOUNDATION Fieldbus supply injecting switching noise into the bus

Measured Values / Parameters

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 requirements. 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).

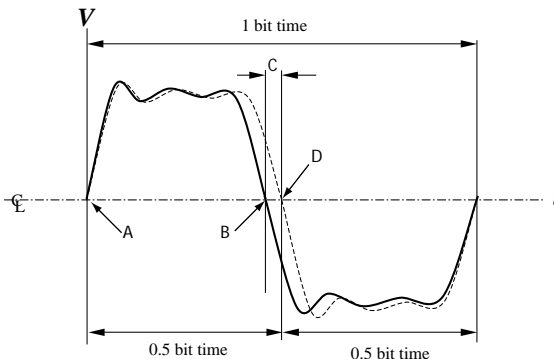


Figure 7.2: Bit cell jitter

- | | |
|---|--|
| 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 operational 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 μ s long. So the maximum bit cell jitter shall not exceed 3.2 μ s. Indeed, your system may be able to run with a higher jitter level but with a reduced level of immunity against EMC influences.

Active Field Devices

Provides a list of current active field devices, field device addresses and target configurations. In a FOUNDATION Fieldbus installation additionally the current active LAS is shown as well as the missing pass token.

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 7.3 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.

Measured Values / Parameters

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.

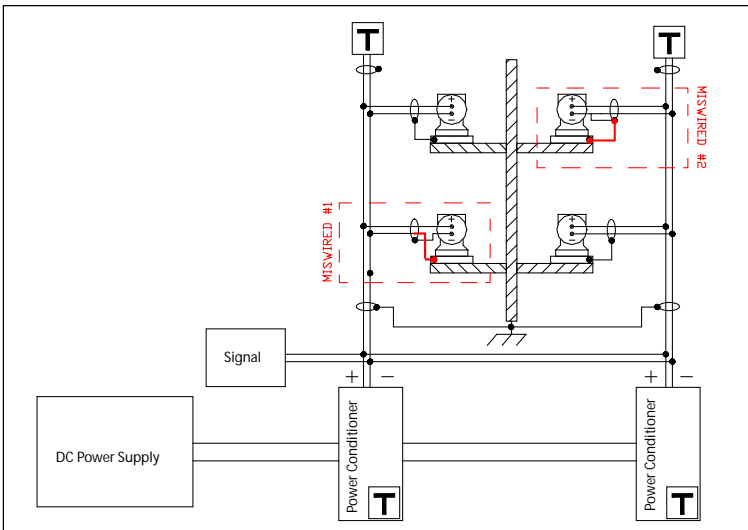


Figure 7.3: Fault wiring DC unbalance

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.

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:

- Percent of Framing Errors and CRC Errors frames in current history period
- Number of CRC Errors in last history period
- Percent of Framing Errors and CRC Errors frames in last history period
- Number of Framing Errors (e.g. SOF detected but EOF missing) in last history period

Field Device Polarity

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

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.

Fieldbus Coupler Alarms

Fieldbus Coupler Alarms Maintenance required and Out of Specification alarms from Pepperl+Fuchs Fieldbus Couplers with Diagnostics are detected and reported. This includes the diagnostics of the fieldbus coupler itself, as well as alarms from surge protectors and enclosure leakage sensors attached to the spurs and reported by the fieldbus coupler.

Installation in Hazardous Areas

8 Installation in Hazardous Areas

8.1 Safety Instructions

The Statement of Conformity and Certificate of Compliance 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.

8.2 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.



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.

Warning Do not use the delivered AC/DC adapter within hazardous areas.

List of Referenced Documents

9 List of Referenced Documents

9.1 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 installations 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

9.2 Guidelines

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

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

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Worldwide Headquarters

Pepperl+Fuchs GmbH
68307 Mannheim · Germany
Tel. +49 621 776-0
E-mail: info@de.pepperl-fuchs.com

For the Pepperl+Fuchs representative
closest to you check www.pepperl-fuchs.com/pfcontact

www.pepperl-fuchs.com

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