



# PROFIBUS PA Fault-Finding and Maintenance Tools

Andy Verwer  
Automation Systems Centre  
Manchester Metropolitan University



## Presentation Outline



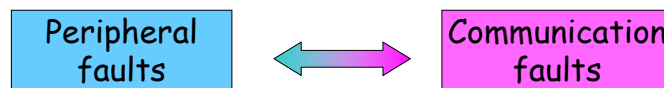
- Reliability and maintenance issues.
- Dealing with extensive systems.
- Fault categorisation.
- Strategies for fault-finding and maintenance.
- Tools for fault finding & maintenance
  - ProfiTrace 2 (Ultra)
  - Fieldcare (FDT)
  - Mobile Fieldbus Diagnostics Module (DTM)
- Practical demonstration

- PROFIBUS is a very cost effective and reliable technology.
- However, extensive installations can have thousands of PROFIBUS devices operating on many networks.
- The reliable operation of these networks is essential to maintaining plant productivity.
- Further, the rapid diagnosis of faults on networks, devices, actuators and sensors is critical for minimising plant downtime.

- To understand the problem, consider a modest installation with 1000 devices installed:
- Each device might exhibit a mean time to failure of 20 years.
- On average we would therefore expect a failure every 20/1000 years, which is approximately a failure every week!
- Without a well thought out maintenance strategy our plant will spend a lot of time out of service!

- The most common problems in any fieldbus or high-speed digital communications system are:
  1. Cabling and wiring faults:
    - Reflections, interference, cable routing and earthing faults etc.
  2. Poor design and installation:
    - Lack of awareness of avoidable issues at design stage, poor routing, layout, untrained installers, inaccurate or insufficient system documentation.
  3. Device and wiring failures:
    - Surprisingly rare but can lead to communications faults or peripheral faults.
- Quite often 1. and 2. exist from the start.

- Faults that occur during the operation of the plant can be broadly categorised as follows:



- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Concerned with the sensor or actuator.</li><li>• E.g. sensor wire break, loss of output power, sticking valve etc.</li><li>• The devices are still communicating.</li></ul> | <ul style="list-style-type: none"><li>• Prevent signals reaching their destination, e.g. network wiring errors, interference pickup, reflections etc.</li><li>• Communications are disrupted.</li></ul> |
|---|---|

- Because the communication remains operational, peripheral faults can often be located and diagnosed using the communications system itself.
- Tools and techniques that are useful for locating peripheral faults on PROFIBUS systems include:
  - Diagnostic reporting via engineering tools,
  - SCADA systems,
  - Protocol analysers etc.
- Most modern PA devices incorporate extensive self-diagnostic features that can help identify peripheral faults.

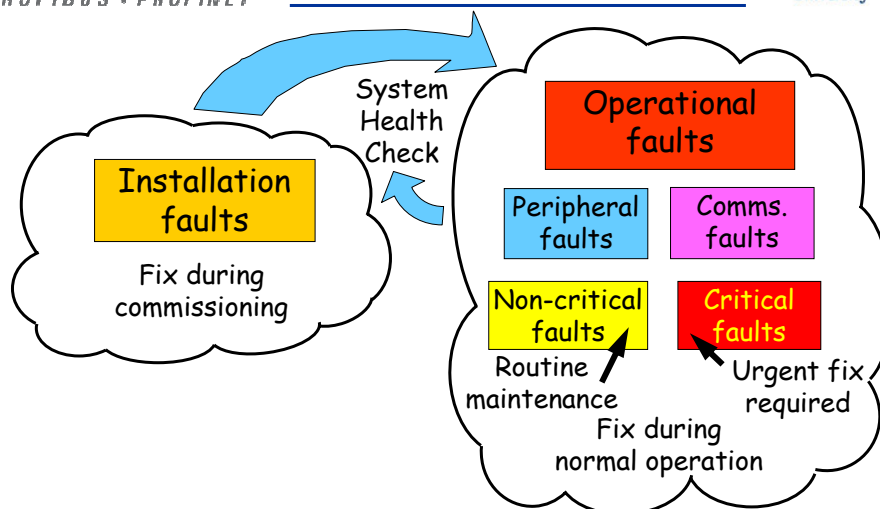
- Communication faults can be diagnosed using tools such as:
  - Protocol analysers and diagnostic tools.
  - Waveform visualisation tools such as oscilloscopes.
- Communication errors do not always produce loss of control. This is because modern fieldbus technologies are very robust to errors that can corrupt data.

- Quite often users are unaware that their system has communication errors because the robustness of PROFIBUS can hide these faults.



Green light  
- all must  
be ok!

- Only when the rate of data corruption reaches a critical threshold will the fault become visible.



- ProfiTrace2 is the latest in a range of fault finding and health checking tools from Procentec.
  - High-speed analyser for both DP and PA.
    - Extensive triggering and filtering capability.
    - PA probe available for PA segment connection.
  - Decoding of all telegrams (DPVO and DPV2).
  - Built-in high-speed oscilloscope.
    - DP scope shows RS485 waveform at bus interface.
    - PA probe Ultra allows MBP waveform to be measured.
  - Rapid overview of network health
    - live list and bar chart
    - Health-checking and performance statistics.
  - Report generation for documentation.

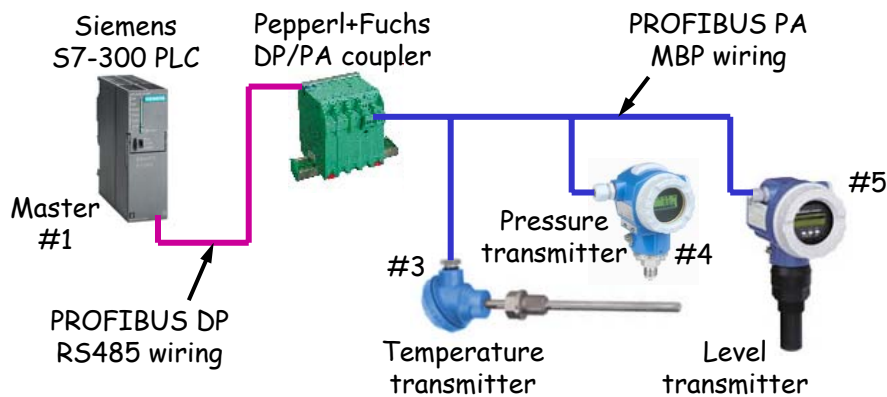
- In addition ProfiTrace2 can be used as a Class1 and Class2 master for setting up and testing of both DP & PA devices.
  - DP/PA Coupler required for PA devices (MBP segments)
  - Simple set up and commissioning of cyclic data exchange
  - Acyclic services for DVP1 DP devices and PA devices.

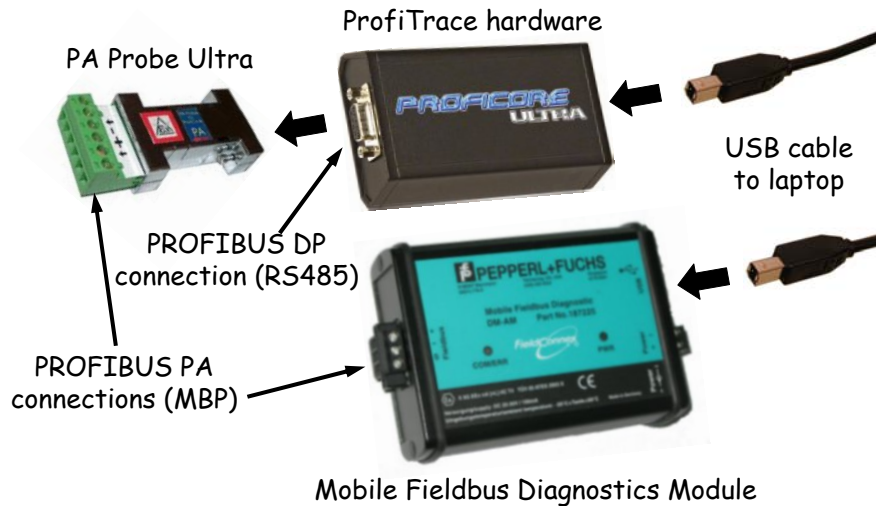


- The Fieldbus Diagnostic Module from Pepperl+Fuchs provides communications monitoring and diagnostics for PA segments.
  - The device is available as a permanent fixture that plugs into a coupler base,
  - or as a mobile unit that can be plugged into any PA segment.

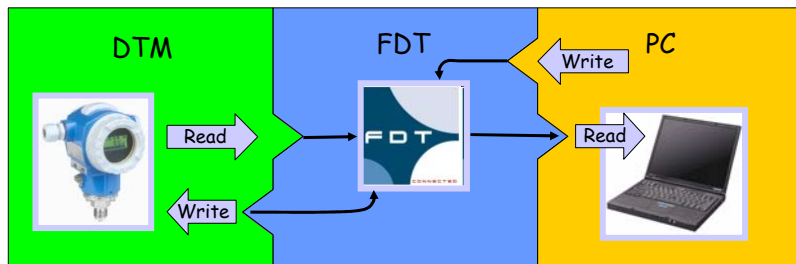


- We have a small system set up to demonstrate some of the engineering tools that are available:



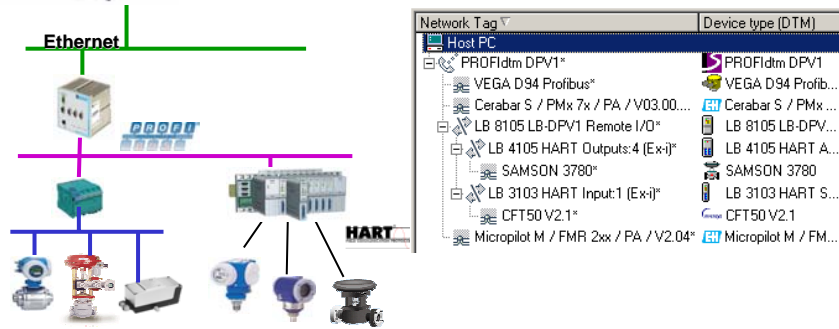


- The FDT (Field Device Tool) specification provides a standard interface between device specific Device Type Manager (DTM) software and the User.
- The DTM is a software component provided by the manufacturer of an intelligent device.
- The DTM provides all the functionality to configure, test and diagnose the device from a laptop or PC station.





- Each device in the communication link has a DTM which deals with all functions of that interface.
- Each field device has a DTM which deals with all functions of that device.



**Live  
Demonstration**

- A printable copy of this presentation can be downloaded from:

[www.VerwerTraining.com](http://www.VerwerTraining.com)

- Contact:

[Andy@VerwerTraining.com](mailto:Andy@VerwerTraining.com)

Questions?