

PROFIBUS PA fault-Finding and Maintenance Tools

Andy Verwer
Verwer Training & Consultancy Ltd



PROFIBUS

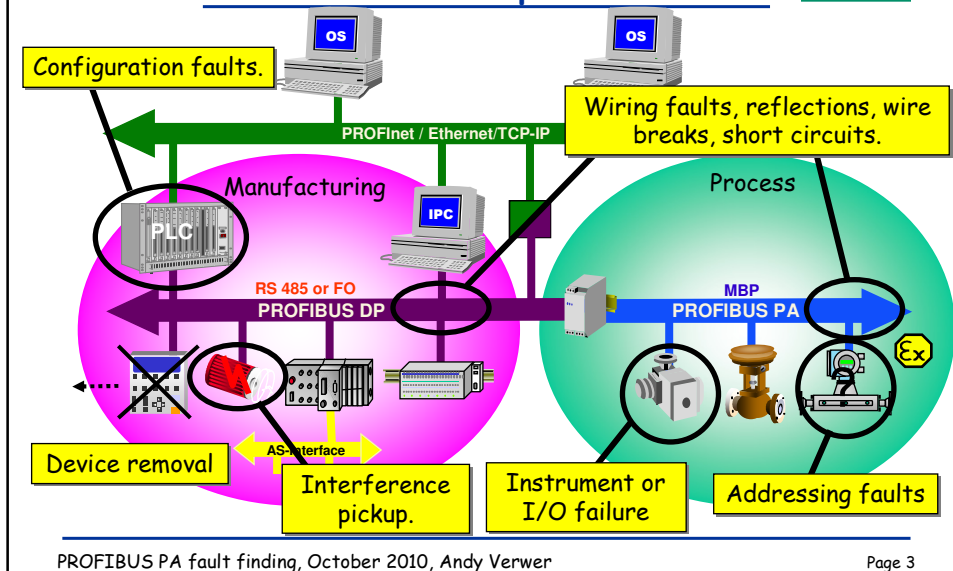


- PROFIBUS is a very reliable and cost effective technology.
- It is common to find extensive installations comprising thousands of PROFIBUS devices operating on complex networks which are connected together via industrial Ethernet.
- The reliable operation of these networks is essential to maintaining plant productivity.

- So, what can go wrong?



The most common PROFIBUS problems



The reliability problem



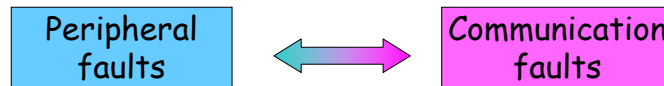
- To understand the problem that faces system engineers, consider a modest installation with 1000 devices installed:
 - Each device might exhibit a mean (average) time to failure of 20 years.
 - On average we would therefore expect a failure every 20/1000 years
- which is approximately a failure each week!**
- We must be able to locate and fix these failures quickly and efficiently.



Fault categorisation



- Operational faults can be categorised in several ways:



- Concerned with the sensor or actuator.
- E.g. sensor wire break, loss of output power, sticking valve etc.
- Devices are still communicating.
- Faults prevent signals reaching their destination.
- E.g. network wiring errors, interference pickup, reflections etc.
- Communication is disrupted.



Peripheral faults



- 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 using on-line system diagnostics.
 - Engineering tools, protocol analysers, etc.
- Modern intelligent devices incorporate self diagnostic features that can identify and highlight peripheral faults.
- However, tools are still required to access these extended diagnostics.



Communication faults



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



Communication faults



- 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.



Fault categorisation



- Operational faults can therefore be categorised as to their criticality:

Critical faults

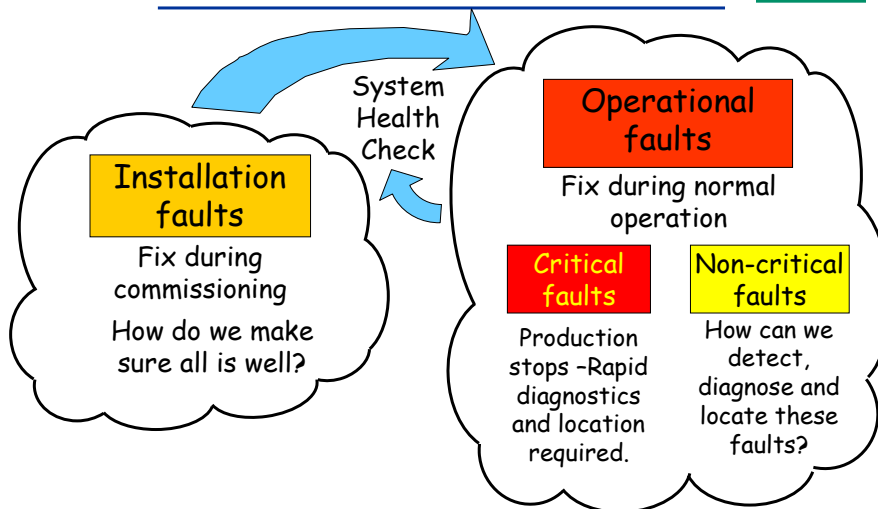


Non-critical faults

- Faults which prevent devices from functioning.
 - E.g. sensor wire break, loss of device power, stuck valve, cut network cable etc.
 - Can cause loss of production and/or unsafe situations and so must be immediately dealt with.
- Do not immediately prevent devices from working.
 - E.g. sensor drift, valve stiction, corrosion in connectors etc.
 - Can be tolerated for a short time because the device is still functioning, albeit with reduced accuracy or performance.



Fault categorisation





ProfiTrace2 (Procentec)



- 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 (DPV0 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.



ProfiTrace2



- 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.





Fieldbus Diagnostic Module (Pepperl+Fuchs)



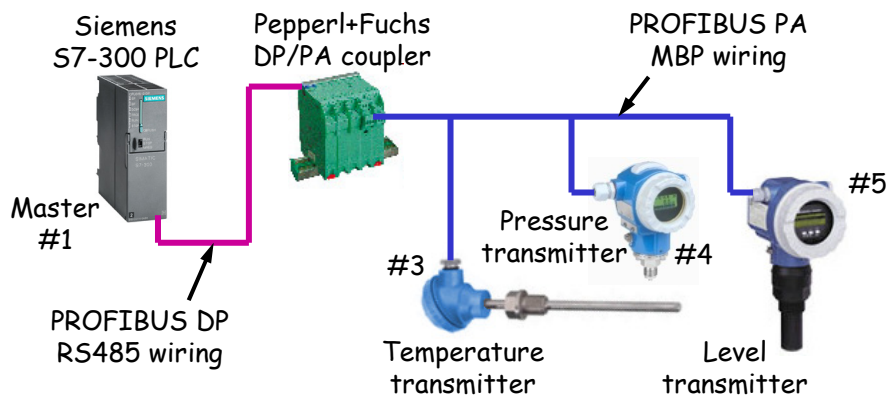
- The Fieldbus Diagnostic Module from Pepperl+Fuchs provides communications monitoring and diagnostics for PA segments.
 - The device is available as a permanent fixture that plugs into a coupler base,
 - or as a mobile unit that can be plugged into any PA segment.



Our Demo Setup

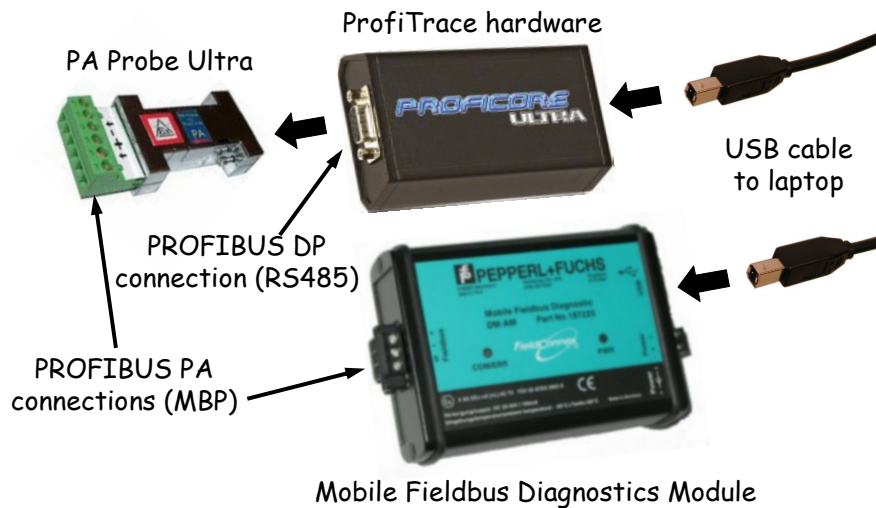


- We have a small system set up to demonstrate some of the engineering tools that are available:





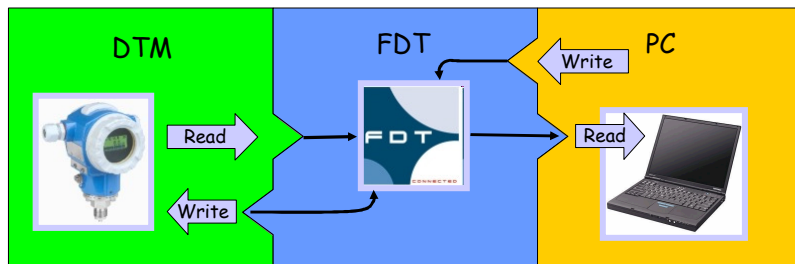
Our Demo Setup



FDT/DTM



- 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.



Live Demonstration