PROFIBUS and PROFINET
User Conference 2010

W1 - PROFIBUS Basics

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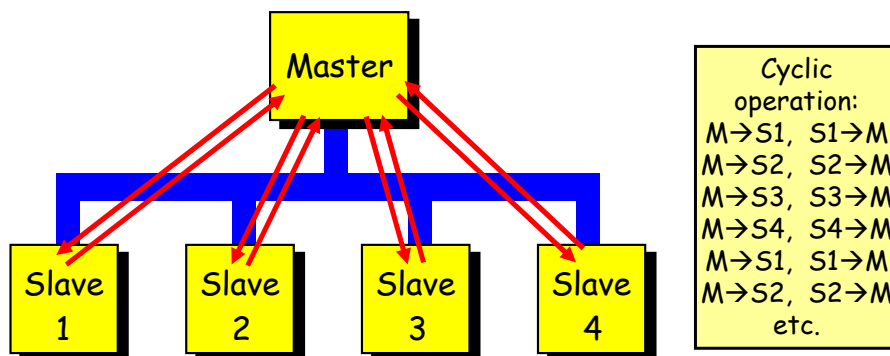

PROFIBUS Basics

- PROFIBUS is the worlds leading fieldbus.
  - Over 30 million devices installed
  - Mature and stable technology which has been in use of over 20 years.
  - Applicable to a wide range of industries and applications.
    - Manufacturing, drive control, process, materials and parts handling, trafic control, trains, boats, airports etc
- PROFIBUS provides communication for process data and parameters for over 3000 different devices from over 300 different manufacturers.
- PROFIBUS has a long future.

PROFIBUS Basics

- PROFIBUS comes in two main forms:
  - PROFIBUS DP **-** *Decentralised Periphery*
    - Low cost, simple, high speed field-level communications.
    - All modern PROFIBUS applications use DP.
  - *PROFIBUS PA - Process Automation*
    - Developed specifically for the process industry to replace 4-20mA transmission.
    - Two-wire connection carrying both power and data.
- DP is commonly used in manufacturing and general automation.
- PA is used for process type applications where speed is less important. However DP is always used as a backbone for PA systems.
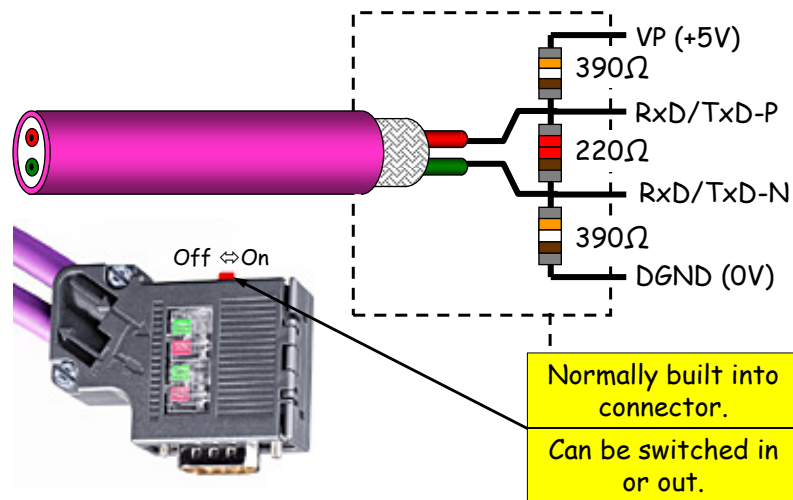

PROFIBUS Basics

- Data is exchanged in all PROFIBUS networks using *messages* or *telegrams* that pass between stations.

- *Master stations* control the network communications.

- *Slave stations* respond to telegrams from their controlling master.

  - A network can have one or more master stations.

  - Each master can control (communicate with) many slaves.

  - However each slave can only be controlled by one master. A slave is locked to a particular master.

Cyclic Data Transfer

VTC

Single master system

Master

Slave 1

Slave 2

Slave 3

Slave 4

Cyclic operation:
M→S1, S1→M
M→S2, S2→M
M→S3, S3→M
M→S4, S4→M
M→S1, S1→M
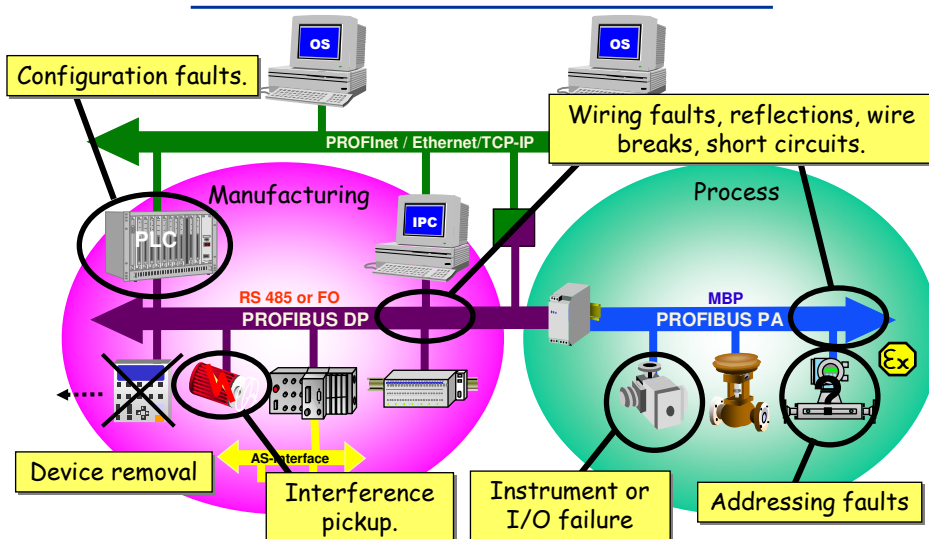M→S2, S2→M
etc.

Termination

VTC

- One of the bacic problems that can occur in PROFIBUS networks is "reflections".
- A reflection is where the signal echos backwards and forwards on the cable.
- Reflections are bad news since they can corrupt the telegrams that are passing between devices.
- To stop reflections we must terminate the ends or our PROFIBUS cable with a special termination network. The termination stops reflections from the ends of the network cable.
- PROFIBUS DP uses "active termination" at the two ends of each segment (isolated section of cable)
- The termination must be powered at all times.

Active Termination

VP (+5V)
390Ω
RxD/TxD-P
220Ω
RxD/TxD-N
390Ω
DGND (0V)

Off ⇔ On

Normally built into connector.

Can be switched in or out.

Most Common PROFIBUS Problems

OS   OS

Configuration faults.

Wiring faults, reflections, wire breaks, short circuits.

PROFINet / Ethernet/TCP-IP

Manufacturing   Process

IPC

PLC

RS 485 or FO
PROFIBUS DP

MBP
PROFIBUS PA

Ex

AS-Interface

Device removal

Interference pickup.

Instrument or I/O failure

Addressing faults

PROFIBUS Basics

- An analyser is an essential tool for fault finding, monitoring and health checking networks.

- It allows you to see the actual telegrams transmitted from device to device.

- Analysers for PROFIBUS are available from many manufacturers. However they vary enormously in capability, ease of use and price.

- We are going to demonstrate "ProfiTrace2", the latest development in a line of analysers from Procentec.

ProfiTrace2

- ProfiTrace2 is a modern high-speed, full-featured PROFIBUS Analyzer with the following features:
  - Full decoding of the telegrams;
  - Network statistics, for health checking;
  - Built-in triggered oscilloscope for waveform visualisation;
  - Bar graph, overview of device signal strength;
  - Direct connection to PROFIBUS DP or non-Ex PA segments;
  - Automated report generation for reference and documentation.
  - OPC server allows data to be easily displayed on SCADA or remote PC stations

ProfiTrace2

VTC

- ProfiTrace2 is available from:

    Hi-Port Telecom
    www.hiport.co.uk
    +44 (0)845 2902030

    or from:
    Verwer Training & Consultancy Ltd
    www.VerwerTraining.com
    +44 (0)1625 871199

PROFIBUS live demonstration