PROFIBUS

PROFIBUS is an open uniform digital communication system for a broad range of applications, especially within engineering and process automation. PROFIBUS is ideal for both fast time critical applications and for complex communication applications. PROFIBUS communication is rooted in the international standards IEC 61158 and IEC 61784 and with that satisfies the requirements of fieldbus users of being open and manufacturer independent. Communication between products from different manufacturers can take place without adaptation or specialised software.

History

The history of PROFIBUS goes back to 1987 when a European group consisting of companies and institutions established a strategy for a fieldbus. The group was made up of 21 members, companies, universities, other institutions and different authorities. The aim was to realise and receive general recognition for a serial fieldbus. An important intermediate target was to standardise an interface for the field devices. With the intention of reaching a wide standard, the concerned members of ZVEI (Central Association for the Electrical Industry) agreed to support a common technical concept for engineering and process automation. The first step was the specification of the complex communication protocol PROFIBUS FMS (**F**ieldbus **M**essage **S**pecification), which was drawn up to handle very demanding communication applications. An additional step was taken in 1993 when the first specification was completed for the simpler and with that significantly faster Profibus DP protocol, DP stands for **D**ecentralized **P**eripherals. This protocol has under gone continuous development and is now available in three versions offering different degrees of functionality: DP-V0, DP-V1 and DP-V2. Over and above DP there is also PROFIBUS PA (**P**rocess **A**utomation), which has been developed for the specific requirements of the process industry. Motion Control is a version for drive equipment and PROFIsafe is a version for safety applications. We will only describe DP related applications in the manual.

PROFIBUS communication

Profibus is based on RS-485 probably the most common industrial transmission technique. It uses a screened, twisted pair cable and can support transmission rates of up to 12 Mbit/s. The version RS-485-IS has now recently been specified as a 4-wire transmission media for protection class E for use in explosive environments.

The transmission technique MBP (**M**anchester coded, **B**us **P**owered) is used for applications in process automation that require a power supply across the bus to units in intrinsic safety areas. Transfer of PROFIBUS data over fibre optic cable is recommend-

Data rate (kbit/s)	Max segment lenght (m)
9.6	1200 (0.75 mi)
19.2	1200 (0.75 mi)
45.45	1200 (0.75 mi)
93.75	1200 (0.75 mi)
187.5	1000 (0.62 mi)
500	400 (1312 ft)
1500	200 (656 ft)
3000	100 (328 ft)
6000	100 (328 ft)
12000	100 (328 ft)

The values refer to **cable type A** with caracteristic as follow:

Surge Impedance	$135 - 165 \ \Omega$
Capacitance	<30 pf/m
Loop resistance	110 Ω/km
Core diameter	0.64 mm
Cable area	>0.34 mm^2

ed in applications exposed to electromagnetic interference, between installation sites with different ground potential and to bridge large distances.

Network topology PROFIBUS

As the basic interface is RS-485 devices should be connected in a bus structure. Up to 32 stations can be connected to a segment. Active bus termination is connected at the beginning and end of each segment as in the figure below. Both bus terminations must have a permanent voltage supply to give error free communication. Bus termination is usually integrated into the connectors and is activated with a switch. A repeater is used when more than 32 stations are to be connected to the same network, or when the network has longer transmission distances than those stated in the table on page 58. Remember that a repeater puts an electrical load on the network so you can only have 31 stations in a segment with a repeater. Up to 10 segments in a row can be interconnected when using regenerating repeaters.