Application Note

Getting Started with PROFIBUS for AC Tech Drives

Contained herein is the basic information for setting up AC Tech SMV Inverter and PositionServo drives for PROFIBUS communication. For detailed information on the PROFIBUS option module, refer to the product's PROFIBUS Communications Reference Guide (e.g. SMV: CMVPFB01; PositionServo: P94PFB01). Topics discussed in this application note include protocol, cabling, termination, number of nodes, network length and wiring, node addressing and data transfer.

For Further Reference

PROFIBUS:	http://www.profibus.com
AC Tech Library:	http://www.lenze-actech.com

Common Terms

CIP^{TM}	Common Industrial Protocol
IEC 61158	INTL Standard: Digital data communications for measurement and control - Fieldbus for use in industrial control systems
IEC 61784-1	INTL Standard: Digital data communications for measurement and control - Part 1: Profile sets for continuous and discrete manufacturing relative to fieldbus use in industrial control systems
PROFIBUS-DP	Decentralized Peripherals: Fast remote I/O to connect sensors and actuators to a controlling device
PROFIBUS-FMS	Fieldbus Message Specification: Client-Server communication between automation devices
PROFIBUS-PA	Process Automation: Connect field devices to process controller as in a SCADA network
Protocol	Set of rules about communication on a network. Rules on: syntax (data format); semantics (interpretation of data); timing (transmission agreement between sender and receiver)
SCADA	Supervisory Control And Data Acquisition. In North America, SCADA is a large-scale, distributed measurement and control system.

Protocol: All AC Tech Profibus compatible devices operate using PROFIBUS-DP only. PROFIBUS-PA and PROFIBUS-FMS are not supported.

Recommended cable: Belden has three recommendations: 3079A, 3079E and 183079A. The Belden 3079A cable is for standard installations. The Belden 3079E (a stranded cable) is for installations requiring more flexibility during installation and use. The Belden 183079A is used in harsh environments. This cable features corrugated aluminum armor. Siemens also offers several cable types for PROFIBUS networking.

Termination: PROFIBUS utilizes active termination installed at each end of a bus segment. Some devices have active termination built in and often require a dip switch setting to bring that into line. Others do not offer termination. Siemens offers several PROFIBUS termination products depending on installation requirements. For more information visit:

http://www.automation.siemens.com/simatic/dp/html_76/produkte/netzkomp.htm

The SMV PROFIBUS-DP module is equipped with integrated termination resistors, and can be switched into the network by setting SW1 to the ON position.
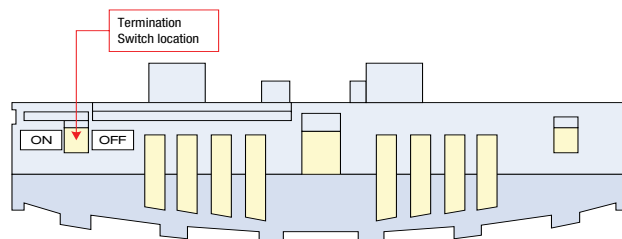

Figure 1: SMV PROFIBUS-DP Integrated Termination

NOTE:

It is strongly recommended that "standalone" active termination units are used to maintain the integrity of the network. If power is lost to a drive providing termination, active termination for the network is also lost.

Application Note

Network topology: The basic PROFIBUS-DP segment uses a linear drop topology. All nodes are daisy chained together within a segment. Repeaters can be used to create a tree structure.

Maximum number of nodes: All AC Tech products act as slaves on the PROFIBUS-DP network. A single master can poll the PROFIBUS-DP slaves. There can be a maximum of 31 nodes within a given network segment. Several network segments can be joined using repeaters to have a maximum of 127 nodes on the network. Repeaters are included in the node count.

Maximum network length: The maximum network length depends upon the baud rate used. All nodes must be set to the same baud rate. AC Tech and Lenze PROFIBUS equipped drives will auto detect the baud rate of the PROFIBUS master and do not need to be set.

Table 1: Data Rate & Maximum Network Length

Data Rate	Maximum Network Length
93.57 kbps	1200m
187 kbps	1000m
500 kbps	400m
1500 kbps	200m
3000 kbps	100m
6000 kbps	100m
12000 kbps	100m

Basic Wiring: On a network segment the cable is daisy chained from node to node as shown in Figure 2. Simply put, wire the B wire (+) to each B landing in series from one device to the next. Do the same for the A wire (-). Table 3 details the pinout connection of a 9-pole Sub-D socket. There must be a minimum of 1 meter of cable between adjacent nodes.
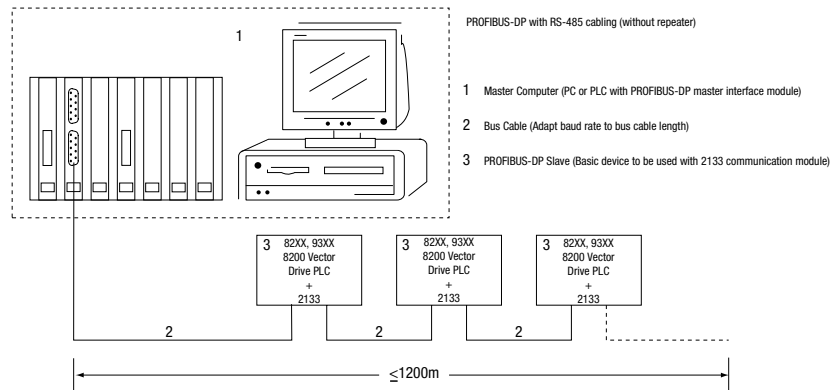

PROFIBUS-DP with RS-485 cabling (without repeater)

1   Master Computer (PC or PLC with PROFIBUS-DP master interface module)

2   Bus Cable (Adapt baud rate to bus cable length)

3   PROFIBUS-DP Slave (Basic device to be used with 2133 communication module)

Figure 2a: PROFIBUS Network

Table 4: PROFIBUS Connection to a 9-pole Sub-D Socket

Connector	Terminal	Name	Description
	1	free	--
	2	free	--
	3	RxD/TxD-P	Data cable B (receive/transmit data plus)
	4	RTS	Request to Send (receive/transmit data, no differential signal)
	5	M5V2	Data reference potential (ground to 5V)
	6	P5V2	5VDC / 30mA (bus termination)
	7	free	--
	8	RxD/TxD-N	Data cable A (receive/transmit data minus)
	9	free	--

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Figure 3 illustrates the PROFIBUS connector used on the AC Tech SMVector drive and Table 4 lists the function of each terminal.
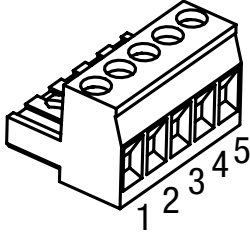

Figure 3: SMV PROFIBUS Connector

Table 4: SMV PROFIBUS Connector Pin Designation

Terminal	Function	Description
1	0V	Module Ground
2	RxD/TxD-N	Negative data line IN (A) Green
3	RxD/TxD-P	Positive data line IN (B) Red
4	RxD/TxD-N	Negative data line OUT (A) Green
5	RxD/TxD-P	Positive data line OUT (B) Red

Node addressing: Every slave node on the PROFIBUS-DP network needs to be set to a unique address. Valid slave addresses range from 3-126. Valid PROFIBUS master addresses are 1-2. Addresses can be set by several methods. Some units have dip switches, other require a PC or keyboard to interface locally to set the address, still other devices can have their address set by the PROFIBUS master (this requires a class 2 PROFIBUS master and only one device can be on the network at a time). Check the user manual for your specific device to see how address is set. If you have a choice, use the dip switches.

NOTE:

Address dip switches on some manufacturers' devices are only read at power up. As a rule it is best to set the address switch before powering up the unit.

GSD file: The GSD file is basically a lookup table. It tells the PROFIBUS DP master what the slave is and how its memory is mapped. Refer to the PROFIBUS DP master's user manual for instruction to read in the GSD file and how to program reads and writes. Refer to the slave's user manual for its parameter listings.

Communications status indication: Each PROFIBUS node should have communications status indicators. These can either be communications LEDs or functions accessible via the unit's display screen. Generally, the COMM LEDs will not illuminate until communications have been set up. If the LED is not flashing, then communications have most likely not yet been set up to the node or have been set up incorrectly. In the case of the AC Tech SMV drive, communications status can be determined by examining the drive's PROFIBUS parameters via the display. Please refer to the device's user manual for specific diagnostic information available.

Data transfer: PROFIBUS-DP transfers two types of Data, Process data and Parameter data. Each has its own data channel.

Process data: Use process data to control the drive. In the PLC, process data is mapped in the I/O area. This short amount of data is transferred to/from the slave cyclically in the shortest possible time.

Parameter data: This information is not time critical. In general this is used for operating parameters and diagnostic data. Note: Usage of parameter data will also add several words of process data (4 input and output words).

Slave setup: This will differ from model to model. As a general rule, drive parameters are used to set the mapping of drive parameters to the process data. Consult the product's user manual for configuration information.

WARNING!
Never reset a faulted drive locally! Always reset via the Modbus master. Failure to do so may result in unexpected operation.

WARNING!
Always send a low rotation speed command to a drive prior to changing direction. If both the direction and the speed setpoint are programmed to change at the same time, the drive may for a short time change direction and run at the wrong speed.