Lenze AC Tech

Application Note

Getting Started with DeviceNet™ for AC Tech Drives

Contained herein is the basic information for setting up AC Tech SMV Inverter and PositionServo drives for DeviceNet communication. For detailed information on the DeviceNet option module, refer to the product's DeviceNet Communication Reference Guide (SMV: CMVDVN01, PositionServo: P94DVN01). Topics discussed in this application note include protocol, network power supplies, termination, cable length, wiring, node addressing, EDS files and drive configuration.

For Further Reference

Open DeviceNet Vendor Association:	http://www.odva.org
AC Tech Library:	http://www.actech.com

Common Terms

CAN	Controller Area Network
CIP™	Common Industrial Protocol
COS	Change of State. Device produces data whenever its state changes or at a base heartbeat rate.
Cyclic	Device will produce data at a defined interval.
EDS	Electronic Data Sheet
Explicit Message	Contains module vendor information; sent via a high CAN identifier (600-7BF Hex)
I/O Message	Contains real time I/O information of a module; sent via a low CAN identifier (000 - 3FF Hex)
PIT	Production Inhibit Time
Polled	Device receives data from Master in a sequential order according to the number of nodes.
PMSCS	Predefined Master/Slave Connection Set
UCMM	UnConnected Message Manager: Device can exchange data in peer-to-peer mode

Protocol: All AC Tech DeviceNet equipped drives have DeviceNet slave functionality only. AC Tech DeviceNet equipped drives do not support peer-to-peer mode. They support explicit messaging and the following I/O messages:

Polled:	The master will trigger reads and writes.
Bit Strobe:	Used for devices having little (1 bit) or no output data requirements. Also used for output data synchronization
Change of State (COS):	Messaging only occurs on a change of state of data. This is useful for increasing data throughput
Cyclic:	The slave will broadcast data unsolicited at a predefined time interval.

Information about DeviceNet protocol as well as complete network planning and installation guides can be found at www.odva.org.

Note:

Use polled mode connections as the default choice when configuring the DeviceNet master's I/O connection to the drive.

Recommended cable: Rockwell Automation (Allen Bradley) offers several choices in cables: flat cable, thicknet, mid cable and thinnet. Installation is typically done with thicknet for trunk cable and thinnet for drop cable. Thicknet has a 3" minimum bend radius. Thinnet is more flexable, with a 2" minimum bend radius, and as such is easier to install. Thinnet can be used for the entire installation. The type of cable used, the lengths of the overall network and the drop cables all affect the maximum baud rate.

Termination: DeviceNet networks are terminated at either end of the network with a 121 Ohm 1% ¼ Watt resistor. Refer to Figure 1. Some DeviceNet taps from Rockwell Automation include a termination resistor. Rockwell also offers caps that contain termination resistors for use with flat cable. Check your taps to see if an external resistor needs to be installed.

Network power supplies: All DeviceNet COMM adapters (not the devices themselves, just the COMM adapter portion) draw 24 VDC operational power directly from the DeviceNet network. DeviceNet power supplies are available from Rockwell Automation. You can use other power supplies conforming to Rockwell's specs. To view the specs refer to www.odva.org and download the DeviceNet Planning and Installation manual. To size the power supply you will need to sum up the consumption of all the DeviceNet nodes. Make sure to allow for expansion capability of the system.

Note:

Your installation also may need to use multiple network power supplies depending upon current usage, cable type, and network length. Refer to Chapter 4 of the DeviceNet Planning and Installation Manual on the www.odva.org website for detailed calculations and charts for NEC compliance. Also remember to break the V+ line between the two power supplies.

Note:

Power up the network power supplies prior to powering up AC Tech DeviceNet equipped drives. Failure to do so can cause the drive to enter a fault state.

Network topology: DeviceNet uses a linear line/drop topology. Rockwell Automation does offer several models of taps that provide various amounts of drop line connections. DeviceNet masters (scanners) do not need to be located at any particular point. They can be installed anywhere on the network.

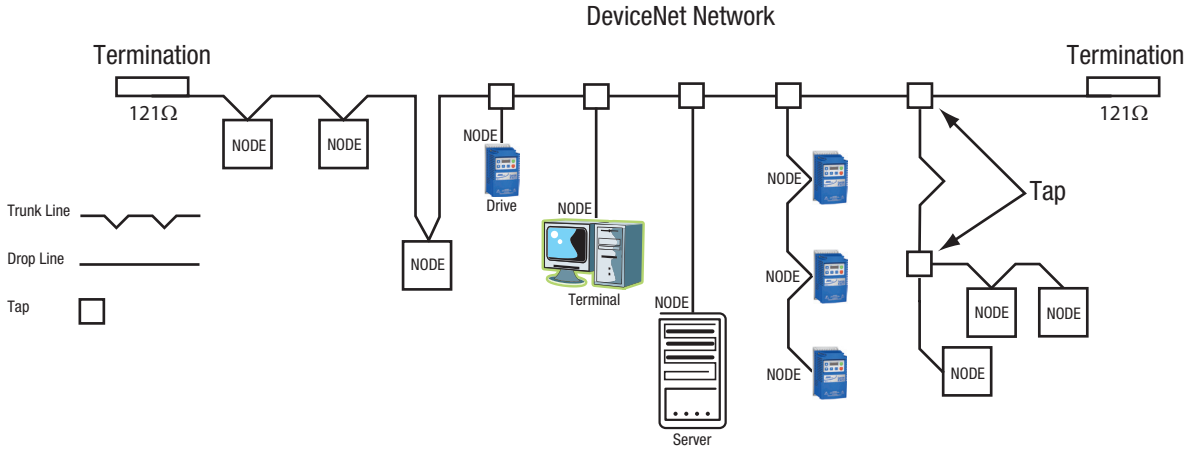

Figure 1: Network Cable and Termination

Maximum number of nodes: DeviceNet allows for up to 64 nodes to be connected to a single network. These can be a mix of slaves and masters (also referred to as scanners).

Maximum network and drop cable lengths and baud rate: DeviceNet drop cables are limited to 20' in length. Three factors influence the maximum baud rate: the total network length, the type of cable used and the sum of all drop cable lengths. Refer to Table 1.

Table 1: Network Length, Drop Cable Length and Baud Rate

Data Rate	MAXIMUM Network Length				Sum of all Drop Cable Lengths
	Flat Cable	Thicknet	Mid Cable	Thinnet	
125 kbps	420m	500m	300m	100m	156m
250 kbps	200m	250m	250m	100m	78m
500 kbps	75m	100m	100m	100m	39m

Basic wiring: Figure 2 illustrates the typical wiring with the correct color coding for the plug-in connector used on the AC Tech DeviceNet module.

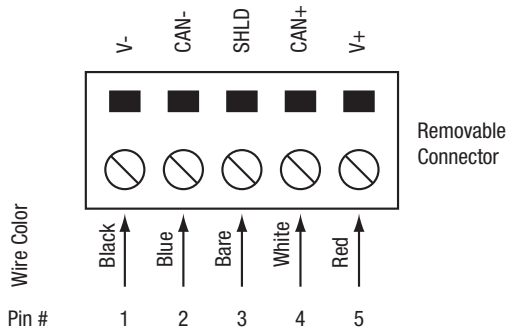

Figure 2: AC Tech DeviceNet Connector

Node addressing and drive configuration: Valid addresses range from 0-63. Each node must be addressed to a unique number. Set the node address and baud rate of the drive locally (via the keypad). By default most DeviceNet devices will power up at address 63. It is important to try to leave this address available on the network so that the replacement of a node does not cause a conflict.

EDS file: The EDS (Electronic Data Sheet) file is basically a lookup table. It tells the DeviceNet master (scanner) what the slave is and how its memory is mapped. The EDS file needs to be read into the DeviceNet master. The utility used for this purpose is RSNetworx for DeviceNet from Rockwell Automation.

Note:

The EDS file can be used by some PLC programming software for automatic tag generation.

RSNetworx: Use RSNetworx for DeviceNet to configure the data exchange between the AC Tech drive and the DeviceNet master. First use the “EDS Hardware Installation tool” to register the EDS file of the drive. Once the EDS file is registered, change to ONLINE mode and browse the network. Locate an icon for the AC Tech drive at its configured network address. Add the drive to the scan list for the DeviceNet master and define the I/O connection. By default, "Polled" is used for most applications. Double click on the icon for the drive to allow the drive parameters to be read and edited.

Note:

For the drive to take start/stop commands from the DeviceNet master, set the drive’s control source to NETWORK CONTROL. To allow the drive to take speed reference commands from the DeviceNet master, set the drive’s speed reference to NETWORK REFERENCE.

Drive configuration: Select the DeviceNet output assembly. Simply put, the drive can package varying configurations of data for the polled connection. Refer to the your product's user manual to select the assembly containing the data you need for your particular application. Set the corresponding value into the drive’s DeviceNet output assembly parameter.

WARNING!

Never reset a faulted drive locally! Always reset via the DeviceNet 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.