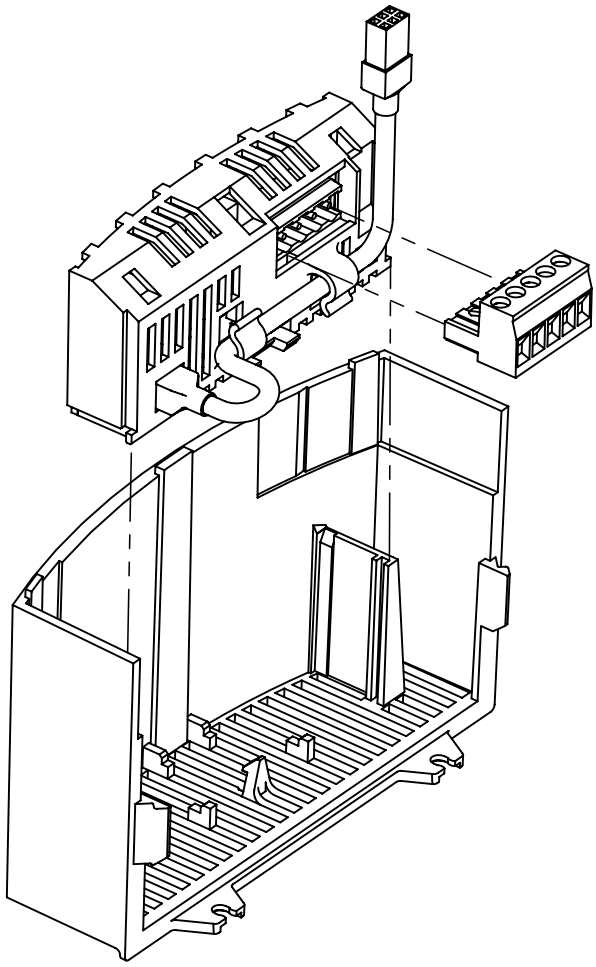
Lenze
AC Tech



SMV DeviceNet™ Communications Module

Communications Interface Reference Guide

About These Instructions

This documentation applies to the optional DeviceNet™ communications module for the SMVector inverter and should be used in conjunction with the SMVector Operating Instructions (Document SV01) that shipped with the drive. These documents should be read in their entirety as they contain important technical data and describe the installation and operation of the drive.

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1 Safety Information

1.1 Warnings, Cautions and Notes

1.1.1 General

Some parts of Lenze controllers (frequency inverters, servo inverters, DC controllers) can be live, moving and rotating. Some surfaces can be hot. Non-authorized removal of the required cover, inappropriate use, and incorrect installation or operation creates the risk of severe injury to personnel or damage to equipment.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information, qualified skilled personnel are persons who are familiar with the installation, assembly, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

1.1.2 Application

Drive controllers are components designed for installation in electrical systems or machinery. They are not to be used as appliances. They are intended exclusively for professional and commercial purposes according to EN 61000-3-2. The documentation includes information on compliance with the EN 61000-3-2.

When installing the drive controllers in machines, commissioning (i.e. the starting of operation as directed) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 2006/42/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting drive as directed) is only allowed when there is compliance to the EMC Directive (2004/108/EC). The drive controllers meet the requirements of the Low Voltage Directive 2006/95/EC. The harmonised standards of the series EN 50178/DIN VDE 0160 apply to the controllers.

The availability of controllers is restricted according to EN 61800-3. These products can cause radio interference in residential areas. In the case of radio interference, special measures may be necessary for drive controllers.

1.1.3 Installation

Ensure proper handling and avoid excessive mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electronic components and contacts.

Controllers contain electrostatically sensitive components, which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

1.1.4 Electrical Connection

When working on live drive controllers, applicable national regulations for the prevention of accidents (e.g. VBG 4) must be observed. The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the regulatory documentation.

The regulatory documentation contains information about installation in compliance with EMC (shielding, grounding, filters and cables). These notes must also be observed for CE-marked controllers.

The manufacturer of the system or machine is responsible for compliance with the required limit values demanded by EMC legislation.

1.1.5 Operation

Systems including controllers must be equipped with additional monitoring and protection devices according to the corresponding standards (e.g. technical equipment, regulations for prevention of accidents, etc.). The user is allowed to adapt the controller to his application as described in the regulatory documentation.

DANGER!
- After the controller has been disconnected from the supply voltage, do not touch the live components and power connection until the capacitors have discharged. Please observe the corresponding notes on the controller.
- Do not continuously cycle input power to the controller more than once every three minutes.
- Please close all protective covers and doors during operation.

WARNING!
Network control permits automatic starting and stopping of the inverter drive. The system design must incorporate adequate protection to prevent personnel from accessing moving equipment while power is applied to the drive system.

Table 1: Pictographs used in these instructions

Pictograph	Signal Word	Meaning	Consequences if ignored
	DANGER!	Warning of Hazardous Electrical Voltage.	Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
	WARNING!	Impending or possible danger for persons	Death or injury
STOP	**STOP!**	Possible damage to equipment	Damage to drive system or its surroundings
	NOTE	Useful tip: If observed, it will make using the drive easier	

1.2 Reference Documentation

- SV01, SMV Operating Instructions: Technical Library: http://www.lenzeamericas.com
- AN0023, Getting Started with DeviceNet (PS & SMV Drives): Technical Library: http://www.lenzeamericas.com
- DeviceNet™ Information, ODVA (Open DeviceNet Vendor's Association): http://www.odva.org

2 Introduction

The following information is provided to allow the SMV Series drive to operate on a DeviceNet network; it is not intended to explain how DeviceNet™ itself works. Therefore, a working knowledge of DeviceNet is assumed, as well as familiarity with the operation of the SMV Series drive.

2.1 Fieldbus Overview

The DeviceNet fieldbus is an internationally accepted communications protocol designed for commercial and industrial installations of factory automation and motion control applications. High data transfer rates combined with it's efficient data formatting, permit the coordination and control of multi-node applications.

2.2 Module Specification

- Group 2 Server Device
- Supported Baudrates: 125 kbps, 250 kbps, 500 kbps
- Supported input/output data words: Polled, Bit Strobe, Changed of state, Cyclic
- Explicit communication for parameter access

NOTE: The SMV does not support the Explicit Unconnected Message Manager!

To simplify setup and operation, implemented classes and behavior conform to the AC DRIVE profile as specified in the ODVA DeviceNet standard.

To assist in recovery from Communication Faulted condition, Offline Connection Set messages are supported. The SMV supports the following Group 4 message types:

Group 4 Message ID 2C - Communication Faulted Response Message

Group 4 Message ID 2D - Communication Faulted Request Message

Using these messages, the user will be able to identify a faulted drive and when possible, re-establish communication without disconnecting the network or resetting the drive. After receiving "Identify Request Message" while in Communication Faulted state, the value in parameter P419 will flash "1000/1777".

The SMV drive supports these object classes:

- Identity Object - Class 0x01
- Message Router Object - Class 0x02
- DeviceNet Object - Class 0x03
- Assembly Object - Class 0x04
- DeviceNet Connection Object - Class 0x05
- Parameter Object - Class 0x0F
- Parameter Group Object -Class 0x10
- Motor Data Object - Class 0x28
- Control Supervisor Object - Class 0x29
- AC/DC Drive Object - Class 0x2A
- Acknowledge Handler Object - Class 0x2B

2.3 Module Identification Label

Figure 1 illustrates the labels on the DeviceNet communications module. The SMV DeviceNet module is identifiable by:

- Two labels affixed to either side of the module.
- The color-coded identifier label in the center of the module

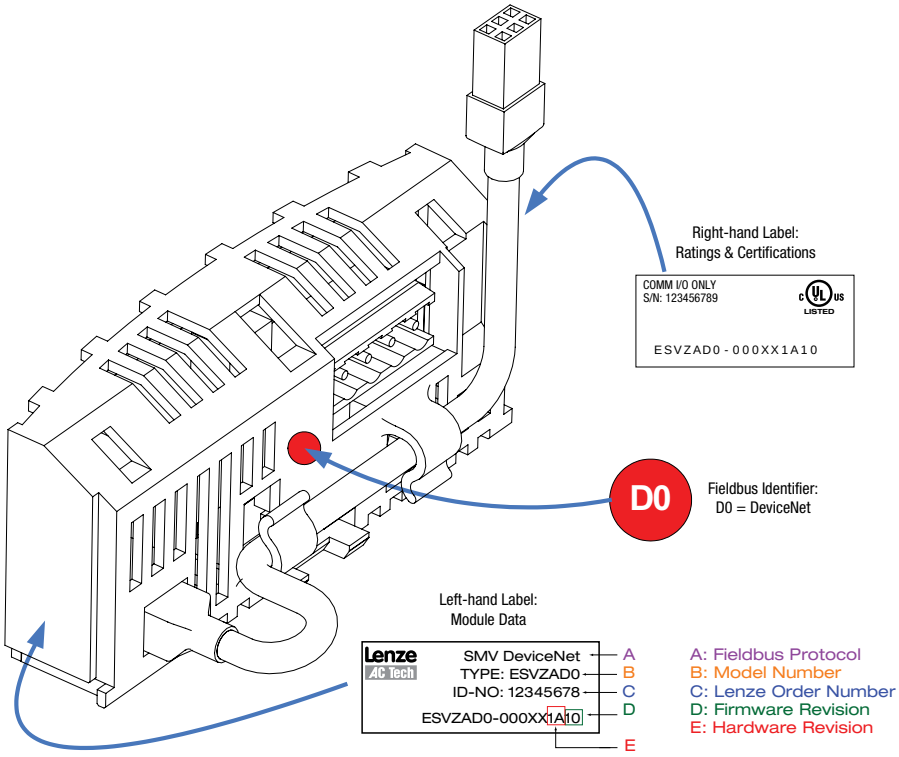
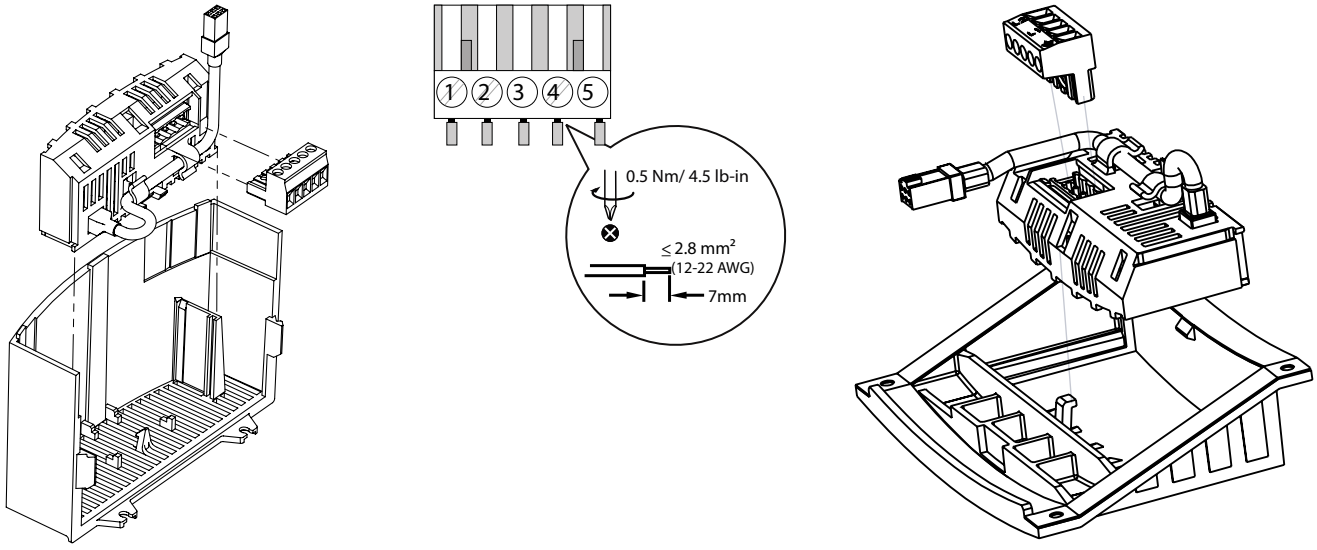


Figure 1: SMV DeviceNet Module Label

3 Installation

3.1 Mechanical Installation

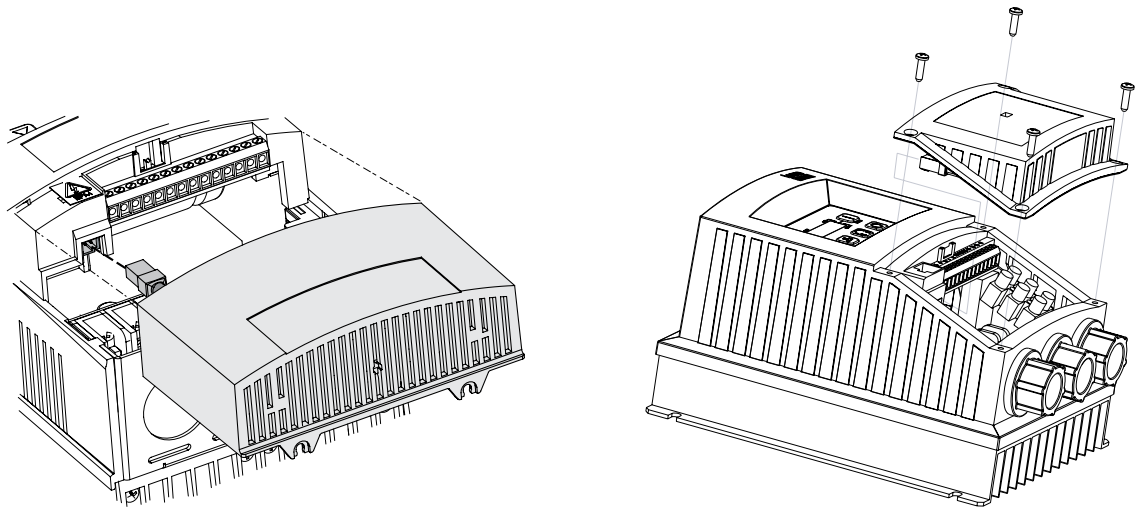
1. Ensure that for safety reasons, the AC supply has been disconnected before opening the terminal cover.
2. Insert the DeviceNet option module in the terminal cover and securely "click" into position as illustrated in Figure 2.
3. Wire the network cables as detailed in paragraph 3.3, Electrical Installation, to the connector provided and plug the connector into the option module.
4. Align terminal cover for refitting, connect the module umbilical cord to the drive then close the cover and secure as shown in Figure 3.



NEMA 1 (IP31) Models

NEMA 4X (IP65) Models

Figure 2: Installing the DeviceNet Communciations Module



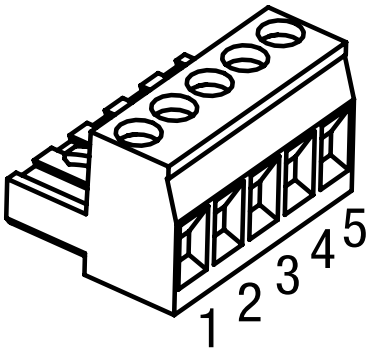
NEMA 1 (IP31) Models

NEMA 4X (IP65) Models

Figure 3: Re-Installing the SMV Terminal Cover

3.2 DeviceNet Terminal Block

Table 2: DeviceNet Pin Assignments

Terminal	Name	Wire Color	Description	Terminal Block
1	V-	Black	0V	
2	CAN_L	Blue	CAN Bus Low (negative data line)	
3	Shield	Bare		
4	CAN_H	White	CAN Bus High (positive data line)	
5	V+	Red	11 - 25 VDC power supply; current consumption (100mA @ 11VDC max)	

3.3 Electrical Installation

3.3.1 Cable Types

Due to the high data rates used on DeviceNet networks, it is paramount that correctly specified cable is used. The use of low quality cable will result in excess signal attenuation and data loss. Several types of cable are available for DeviceNet networks: 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 flexible, 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.

Cable specifications and approved manufacturers are available from the official DeviceNet website at: http://www.ovda.org.

3.3.2 Network Limitations

There are several factors that must be taken into consideration when designing a DeviceNet network. For full details refer to the official “DeviceNet™ Planning and Installation Manual” available on the http://www.ovda.org website. However, here is an abbreviated checklist:

- DeviceNet networks are limited to a maximum of 64 nodes. Devices default to node 63 so leave node 63 open to avoid duplicate node addresses when adding devices.
- Maximum total network length is governed by the data rate and cable type used. Refer to Table 3.

Table 3: 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

- Cumulative drop line does not exceed the network specified limit.
- Network drops/spurs must not exceed 6 meters (19’ 8.2”).

- Use fiber optic segments to:
  - Extend networks beyond normal cable limitations
  - Overcome different ground potential problems
  - Overcome very high electromagnetic interference
- Ground at only one location, preferably in the center of the network.

3.3.3 Connections and Shielding

- ODVA specifies to ground the DeviceNet network at one location only.
- The ground location should be done on the node that is closest to the physical center of the network to maximize the performance and minimize the effect of outside noise.
- The grounding connection method with regards to the network “V-” connections depends upon the cable type used (refer to cable data sheet or OVDA “DeviceNet™ Planning and Installation Manual” for further details.

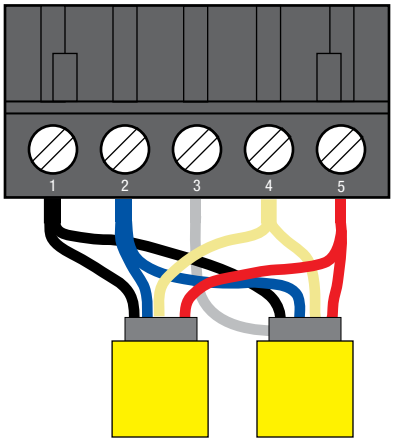


Figure 4: Network Daisy Chain Connection

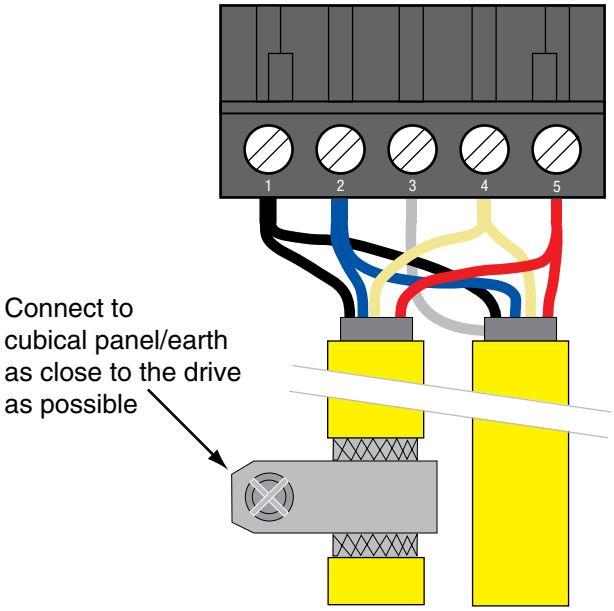


Figure 5: Ground Connection of Center Network Node

NOTE
If the bare screen is too long there is some risk that it may come into contact with the drive power terminals. Therefore it is strongly recommended that an insulating sleeve be fitted.

3.3.4 Network Termination

In high speed fieldbus networks such as DeviceNet, it is essential to install the specified termination resistors, i.e. one at both ends of a network segment. Failure to do so will result in signals being reflected back along the cable which will cause data corruption. The method of termination varies with the type of network cable available. If terminating using an open-style resistor on the drive connection, use a 121Ω 1/4W 1% resistor and fit as illustrated in Figure 6.

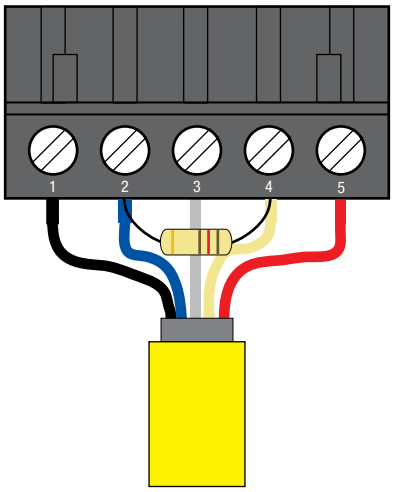


Figure 6: Network Termination on Drive Connector

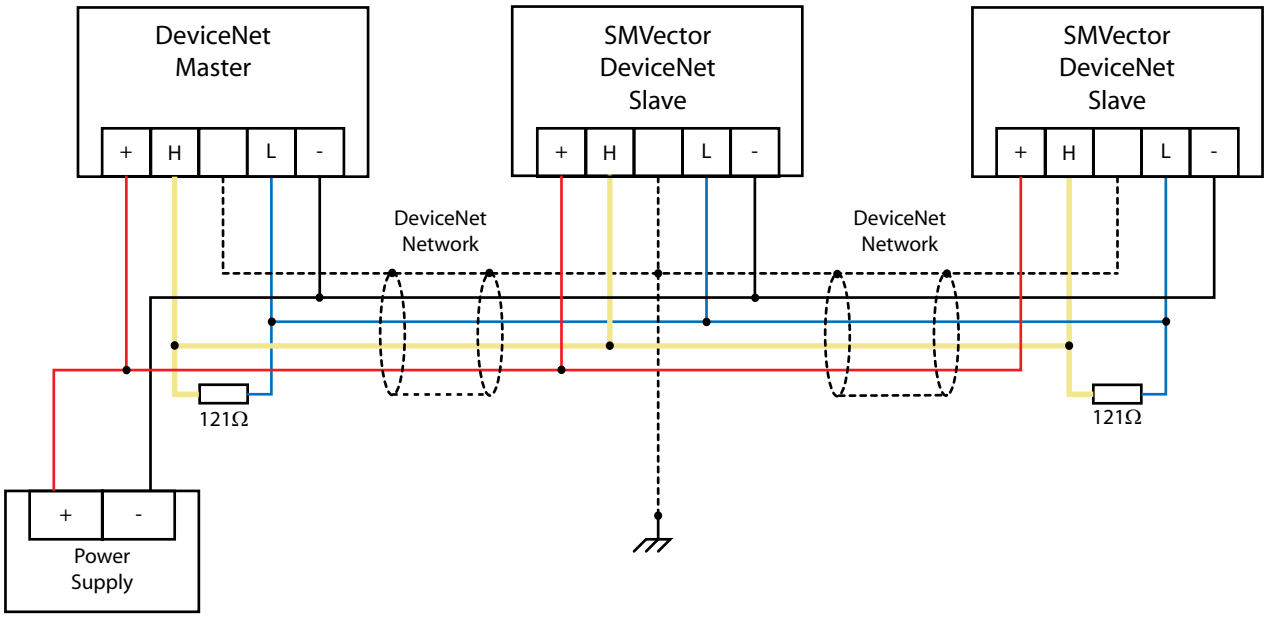


Figure 7: DeviceNet Network Wiring

4 Commissioning DeviceNet Communication

4.1 Overview

It is assumed that the user has familiarised themselves with how to navigate through the drive parameters using the keypad. Refer to the drive user manual for details.

The details that follow provide a step-by-step guide to quickly and easily set-up an SMV drive to communicate on a DeviceNet fieldbus network, in a basic format. There are many more features and settings available for the DeviceNet option module, for details on these refer to the fuller description in the sections that follow.

4.2 Configuring the Network Master

4.2.1 Master Support Files

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.

To simplify setup, the EDS file supporting the SMV Series drive is available from Lenze-AC Tech. To obtain a copy of the appropriate EDS file, please contact Lenze-AC Tech or visit www.lenzeamericas.com. The EDS file is also included on the CD that shipped with the drive.

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.

4.2.2 DeviceNet Master Setup Procedure

Details for configuring a specific network master are NOT provided herein. The method for configuring master devices differs greatly between manufacturers. Provided herein is a very basic, generic guide to setting up a network master.

1. Launch the Master configuration software.
2. Install/Import the required ESD support file(s) using the wizard tool if provided.
3. Setup master DeviceNet port with required cirteria such as node address and baudrate etc.
4. Add or “drag and drop” the required slave devices from the ESD library to the DeviceNet network which is typically depicted on screen.
5. Configure the slave node address, ensuring that each node has a unique and individual address.
6. Configure each slave's I/O data size. (This is typically done by dragging and dropping the required amount of modules from the ESD file library or picking the modules from a list).
7. Save the configuration and download to the Master.

4.3 Configuring the SMV DeviceNet Module

4.3.1 Connecting

With the drive power disconnected install the DeviceNet module and connect the network cable as instructed in the preceeding section 3.1. Ensure the drive Run/Enable terminal is disabled then apply the correct voltage to the drive (refer to the drive's user manual for voltage supply details).

4.3.2 Setting the Network Protocol

P400 - Network Protocol			
Default:	0	Range:	0 or 6
Access:	RW	Type:	Integer

Set P400 = 4 (DEVICENET)

Some SMV option modules are capable of supporting multiple protocols; therefore it is necessary to set the required protocol. The option module is only initialised after a protocol has been selected.

After the module is initialised with DeviceNet™ protocol it will enter Online Mode (P402 = 3).

4.3.3 Node Address (MAC-ID)

P410 - Node ID			
Default:	63	Range:	0 - 63
Access:	RW	Type:	Integer

Set P410 to the required value.

The default address is 63. The permissable address range is: 0 - 63

On a DeviceNet network, each node must be assigned a unique address (MAC-ID). Valid node addresses range from 0-63. In most cases, MAC-ID 0 is assigned to the DeviceNet master controller, to ensure that messages from the master controller have a higher priority on the CAN network. By default most DeviceNet devices will power up at address 63. It is important to leave address 63 available on the network so that the replacement of a node does not cause a conflict. If two or more nodes are assigned the same MAC-ID, the network will recognize only one node and permit that node to communicate with the master controller. All other nodes with the same MAC-ID will be left undiscovered by and invisible to the network.

If P410 (NODE ID) is changed, the drive must be reset by recycling power or by issuing a RESET command using Parameter P418 via the DeviceNet network before the new values take effect.

If an invalid node address is set, the SMV DeviceNet module will over-write the value in P410 to 63. When the SMV DeviceNet module is reset, this default value will be used as the DeviceNet node address.

4.3.4 Baud / Data Rate

P411 - Baud Rate			
Default:	0	Range:	0 - 2
Access:	RW	Type:	Integer

Set P411 to match the DeviceNet network baud rate.

Table 4: DeviceNet Baud Rates

P411 Value	Baud Rate
0	125 kbps
1	250 kbps
2	500 kbps

NOTE: If P411 (BAUD RATE) has been changed, the drive must be reset by recycling power or by issuing a RESET command using Parameter P418 via the DeviceNet network before the new value takes effect.

Once these parameters are set, cycle power to the drive. This will make the address and baud rate parameters take effect. During power-up (and resets), the SMV drive performs the following functions:

1. Power up initializations; sets all variables and states.
2. Sets the MAC address and baud rate base on values programmed in EPM (P410, P411).
3. Checks for duplicate node address to verify that its own address is unique on the network.

If the power-up or reset sequence fails, the SMV drive will enter DeviceNet failure mode. In this case, the drive will not be accessible to the network, but can still be operated in terminal mode. This failure state is indicated in parameter P419 (Dagnostic) by number “1093”.

4.3.5 Module Timeout Action

P404 - Module Timeout Action			
Default:	3	Range:	0 - 3
Access:	RW	Type:	Integer

Table 5: Module Timeout Action

P404 Setting	Action upon Timeout
0	Ignore
1	STOP (refer to P111)
2	Quick Stop
3	Fault (F_nEF)

To prevent runaway conditions, the default is set to 3, so that in the case of module timeout, the drive will display "F_nEF" (Module to drive communication fault).

4.3.6 Data Mapping

- The SMV DeviceNet module has support for 1 cyclic data channel in both directions.
- Cyclic data configuration is described in detail in section 5.
- The default mapping for SMV DeviceNet is 2 Data IN words and 2 Data OUT words, the configuration is shown in Table 6.

Table 6: Default Mapped Cyclic Data

Data OUT Channel	Mapped Function		Data IN Channel	Mapped Function
0	Drive Control Word		0	Drive Status Word
1	Frequency Setpoint		1	Actual Output Frequency

NOTE
The terms “OUT data” and “IN data” describe the direction of data transfer as seen by the DeviceNet network master controller.

4.3.7 Re-initialising

P418 - Re-initialise			
Default:	0	Range:	0 - 1
Access:	RW	Type:	Integer

Set P418 = 1 to activate any changes made to the module settings i.e. changing any parameters in the 400 range means the module has to be re-initialised. This can also be done by cycling power to the drive.

NOTE
The module is only re-initialised following a transition from 0 to 1 in P418

WARNING
DeviceNet re-initialisation may activate the new Dout configuration, which can result in changes to the present controller state, including starting.

4.3.8 Check Node Status

P419 - DeviceNet Status			
Default:	N/A	Range:	0 - 4
Access:	RO	Type:	Integer

P419 is a 4-digit integer. Digit 1 represents the Power Status, Digit 2 the Control Status, Digit 3 the Network Status and Digit 4 the I/O Status. Refer to Table 7 for the DeviceNet Status description.

Table 7: DeviceNet Module Status

P419 Digit	Digit Represnts	Selection
1	Power Status	1 = External power supply ON
2	Control Status	0 = Local Control and Reference 1 = Network Control, Local Reference 2 = Local Control, Network Reference 3 = Network Control, Network Reference
3	Network Status	0 = Network not connected 1 = Network not connected 2 = Network connection time out 3 = Communication faulted 5 = Network connected 8 = Duplicate MAC-ID failure 9 = Network critical link failure
4	I/O Status	0 = I/O connection off 1 = I/O connection idle state 3 = I/O faulted 5 = I/O active 9 = I/O critical error

4.3.9 Non-Module Parameter Settings

In addition to configuring the DeviceNet module there are several drive based parameters that may need to be set

- P100 - Start Control Source; network control is possible in any mode except mode 2 (“Remote Keypad Only”).
- P112 - Rotation; Used to enable either uni or bi direction rotation of the motor.
- P121, 122 or 123 = 9. One of the digital inputs must be assigned to mode 9 - “Network Control” and have the corresponding input closed to enable write access to the drive parameters.

4.3.10 Sample Setup and Wiring for DeviceNet Control

This example uses Explicit or I/O Polled messaging for Run Forward/Reverse and speed control. NOTE: If P100>0, then Terminal 1 must be closed to Terminal 4 in order to start the drive through the DeviceNet interface. Parameters can be setup using the drive keypad, EPM Programmer, or DeviceNet configuration tool (for example RSNetWorx™) that uses the EDS file provided by Lenze - AC Tech.

As a minimum, the following parameters should be set:

P121, P122, P123 - One of these parameters must be set to 09 (Network Enable)

P112 ROTATION DIRECTION - Set this parameter to FORWARD & REVERSE (01) if operation in both directions is required.

P305 MOTOR NOMINAL SPEED AT RATED FREQUENCY (RPM)

P304 MOTOR RATED FREQUENCY (Hz)

P400 DEVICENET NODE ADDRESS (0 - 63)

P401 DEVICENET BAUD RATE (125, 250, 500 kbps)

P430 DEVICENET OUTPUT ASSEMBLY SELECTION - Set this parameter to select output assembly for Polled connection. The following selections are available:

0 = 20 Basic Speed Control
1 = 21 Extended Speed Control RPM
2 = 100 Extended Speed Control Hz + Digital and Analog Output 1
3 = 102 PID Setpoint + Digital + Analog Output 1
4 = 104 Torque Setpoint + Digital + Analog Output 1

The most versatile assemblies are #21 (selection 1) and #100 (selection 2). They allow RUN FORWARD and RUN REVERSE control as well as speed control. Refer to Section 5.2 for more assembly details.

P440 DEVICENET INPUT ASSEMBLY SELECTION - Set this parameter for Polled, COS or Cyclic I/O connection. Refer to Section 5.2 for more assembly details.

NOTE: If Parameter P400 (NETWORK ADDRESS) or P401 (BAUD RATE) have been changed, the drive must be reset by recycling power or by issuing a RESET command using Parameter P418 via the DeviceNet network before the new values take effect.

4.3.11 Sample of Setup and Test Runs using Rsnetworx for DeviceNet

1. Make all necessary DeviceNet network connections.
2. Using "EDS Hardware Installation Tool" register the EDS file for SMV family of drives.
3. Switch mode to ONLINE. After browsing through all available addresses on the network, "AC Tech SMV Drive" should appear at the programmed address.
4. To access the drive parameters double click on the drive icon.
5. After uploading parameters from the SMV drive, they can be edited and downloaded back to the drive. SMV drive parameters accessed through the drive keypad correspond to the same Network ID, to simplify programming they have a drive parameter number in front of their name.

For example:

Parameter ID P160 corresponds to drive parameter "P160 Carrier Select"

Parameter ID P110 corresponds to drive parameter "P110 Start Method"

DeviceNet parameter IDs #1 to #99 are only accessible through the network connection. Refer to the Parameter Class section for parameter descriptions.

To assist in Network Controlled test runs, the EDS file consists of parameters that permit triggering RUN commands by changing the bits setable in ID#65 (Network Control Word).

NOTE: RUN and STOP commands must be triggered according to the table in Section 5.3.6

ID#61 - Network Reference Frequency: Controls the drive speed reference parameter if bit 6 (Network Reference) is set to Network Control.

WARNING!
Make sure it is safe to operate the driven equipment prior to starting the SMV Series drive from the network. Damage to equipment and/or injury to personnel can result!

5 Cyclic Data Access

5.1 What is Cyclic Data?

- Cyclic/Process/Polled data is the name given to the method used to transfer routine process data between the network master and slave nodes.
- Cyclic data transfer must be configured during network setup.
- The terms “OUT data” and “IN data” describe the direction of data transfer as seen by the DeviceNet network master controller.
- Cyclic data source & destination is configured & controlled by the SMV DeviceNet module's mapping capabilities.

5.2 Mapping Cyclic Data

5.2.1 Data OUT

P430 - Dout Assembly Selections			
Default:	1	Range:	0 - 4
Access:	RW	Type:	Integer

- The SMV DeviceNet module has 1 cyclic OUT channel which utilises up to 8 bytes of data.
- Table 8 lists the assembly selections for OUT going data being sent from the network master.

Table 8 – Data OUT

Parameter	Function	Default	Selection	Output Assembly	Length
P430	Dout Channel 1 mapping	1	0 – Basic Speed Control	20	4 bytes
			1 – Extended Speed Control	21	4 bytes
			2 – Extended Speed Hz + Digital & Analog Output 1	100	8 bytes
			3 – PID Setpoint + Digital & Analog Output 1	102	8 bytes
			4 – Torque Setpoint + Digital & Analog Output 1	104	8 bytes

WARNING
Modification to the Dout configuration may result in changes to present controller state, including starting.

5.2.2 Data IN

P440 - Din Assembly Selections			
Default:	1	Range:	0 - 5
Access:	RW	Type:	Integer

- The SMV DeviceNet module has 1 cyclic IN channel which utilises up to 8 bytes of data.
- Table 9 lists the assembly selections for IN coming data being sent to the network master.

Table 9 – Data IN

Parameter	Function	Default	Selection	Input Assembly	Length
P440	Din Channel 1 mapping	1	0 – Basic Speed Control	70	4 bytes
			1 – Extended Speed Control	71	4 bytes
			2 – Extended Speed Hz + Digital & Analog Input 1	101	8 bytes
			3 – PID Setpoint , Feedback	103	8 bytes
			4 – Speed, Actual Torque, Analog input	105	8 bytes
			5 - Data Words selectable with P441 - P444	106	Custom*

* Custom length selectable via P441 - P444 (0, 2, 4, 6 or 8 bytes)

5.3 Input/Output Assembly Configuration Mappings

5.3.1 Output Assembly Details

P430 = 0: Output Assembly 20 Basic Speed Control

P430 = 1: Output Assembly 21 Extended Speed Control

	Bit	P430 = 0
WORD0	0	0 = NOT Run Forward 1 = Run Forward
	1	Reserved
	2	Fault reset on transition from 0 to 1
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved
	8	Reserved
	9	Reserved
	10	Reserved
	11	Reserved
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
WORD1	Speed in RPMs (max 32767) • RPM calculation based on P304 and P305 • Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 25.0 HZ = 25.0 x 1750/60 = 729 = 0x02D9	

	Bit	P430 = 1
WORD0	0	0 = NOT Run Forward 1 = Run Forward
	1	0 = NOT Run Reverse 1 = Run Reverse
	2	Fault reset on transition from 0 to 1
	3	Reserved
	4	Reserved
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	Reserved
	8	Reserved
	9	Reserved
	10	Reserved
	11	Reserved
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
WORD1	Speed in RPMs (max 32767) • RPM calculation based on P304 and P305 • Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 25.0 HZ = 25.0 x 1750/60 = 729 = 0x02D9	

Attention: To use this Output Assembly 20, Network Control and Network Reference must be set using explicit communication by writing into the control word at NetID65. The bit configuration of this word matches the WORD0 of Output Assembly 100.

P430 = 2: Output Assembly 100 Speed in Hz + Digital and Analog Output

P430 = 3: Output Assembly 102 PID Setpoint + Digital and Analog Output

	Bit	P430 = 2
WORD0	0	0 = NOT Run Forward 1 = Run Forward
	1	0 = NOT Run Reverse 1 = Run Reverse
	2	Fault reset on transition from 0 to 1
	3	Reserved
	4	Reserved
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	Reserved
	8 9 10 11	Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 1 = Keypad 7 = Preset #4 (1) 2 = 0 - 10VDC 8 = Preset #5 (1) 3 = 4 - 20 mA 9 = Preset #6 (1) 4 = Preset #1 10 = Preset #7 (1) 5 = Preset #2 11 = MOP
	12	0 = No Action 1 = Inhibit (Coast to Stop)
	13	0 = No Action 1 = Activate (Quick Stop)
	14	0 = No Action 1 = Force Manual Mode (active only in Network Control, PID mode will force open loop)
	15	0 = DC brake active 1 = DC brake not active
WORD1		Unsigned speed 0.1 Hz resolution Received value = 0x01F0 = 49.6Hz
WORD2		Digital Output + Relay - Active when parameter P140, P142 = 25 Network Control Bit 9 - Open Collector Bit 10 - Relay Others - Reserved for future use
WORD3		Analog Output [0.1 VDC] - Active when parameter P150 = 9 Network Control Received value = 0x024B = 5.87 [VDC]

	Bit	P430 = 3
WORD0	0	0 = NOT Run Forward 1 = Run Forward
	1	0 = NOT Run Reverse 1 = Run Reverse
	2	Fault reset on transition from 0 to 1
	3	Reserved
	4	Reserved
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	Reserved
	8 9 10 11	Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 1 = Keypad 7 = Preset #4 (1) 2 = 0 - 10VDC 8 = Preset #5 (1) 3 = 4 - 20 mA 9 = Preset #6 (1) 4 = Preset #1 10 = Preset #7 (1) 5 = Preset #2 11 = MOP
	12	0 = No Action 1 = Inhibit (Coast to Stop)
	13	0 = No Action 1 = Activate (Quick Stop)
	14	0 = No Action 1 = Force Manual Mode (active only in Network Control, PID mode will force open loop)
	15	0 = DC brake active 1 = DC brake not active
WORD1		Network PID setpoint Signed value -999 to 31000
WORD2		Digital Output + Relay - Active when parameter P140, P142 = 25 Network Control Bit 9 - Open Collector Bit 10 - Relay Others - Reserved for future use
WORD3		Analog Output [0.1 VDC] - Active when parameter P150 = 9 Network Control Received value = 0x024B = 5.87 [VDC]

(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.

P430 = 4: Output Assembly 104 Torque Setpoint + Digital and Analog Output

	Bit	P430 = 4
WORD0	0	0 = NOT Run Forward 1 = Run Forward
	1	0 = NOT Run Reverse 1 = Run Reverse
	2	Fault reset on transition from 0 to 1
	3	Reserved
	4	Reserved
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	Reserved
	8 9 10 11	Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 1 = Keypad 7 = Preset #4 (1) 2 = 0 - 10VDC 8 = Preset #5 (1) 3 = 4 - 20 mA 9 = Preset #6 (1) 4 = Preset #1 10 = Preset #7 (1) 5 = Preset #2 11 = MOP
	12	0 = No Action 1 = Inhibit (Coast to Stop)
	13	0 = No Action 1 = Activate Quick Stop)
	14	0 = No Action 1 = Force Manual Mode (active only in Network Control, PID mode will force open loop
	15	0 = DC brake active 1 = DC brake not active
WORD1		Unsigned torque setpoint 0 - 400% limited by parameter P330 Torque Limit
WORD2		Digital Output + Relay - Active when parameter P140, P142 = 25 Network Control Bit 9 - Open Collector Bit 10 - Relay Others - Reserved for future use
WORD3		Analog Output [0.1 VDC] - Active when parameter P150 = 9 Network Control Received value = 0x024B = 5.87 [VDC]

(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.

5.3.2 Input Assembly Details

P440 = 0: Input Assembly 70 Basic Speed Control

P440 = 1: Input Assembly 71 Extended Speed Control

	Bit	P440 = 0
WORD0	0	1 = Faulted
	1	Reserved
	2	1 = Running Forward
	3	Reserved
	4	Reserved
	5	Reserved
	6	Reserved
	7	Reserved
	8	Reserved
	9	Reserved
	10	Reserved
	11	Reserved
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
WORD1	Speed in RPMs (max 32767) • RPM calculation based on P304 and P305 • Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 25.0 HZ = 25.0 x 1750/60 = 729 = 0x02D9	

	Bit	P440 = 1
WORD0	0	1 = Faulted
	1	Reserved
	2	1 = Running Forward
	3	1 = Running Reverse
	4	1 = Ready
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	1 = At Reference
	8	Reserved
	9	Reserved
	10	Reserved
	11	Reserved
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
WORD1	Speed in RPMs (max 32767) • RPM calculation based on P304 and P305 • Example 1: P304 = 60Hz; P305 = 1750 RPM request setpoint forward (CW) at 40.0 HZ = 40.0 x 1750/60 = 1166 = 0x048E	

P440 = 2: Input Assembly 101 Speed in Hz + Digital and Analog Input
P440 = 3: Input Assembly 103 Speed in Hz + Actual PID Setpoint and Feedback

	Bit	P440 = 2
WORD0	0	1 = Faulted
	1	Reserved
	2	1 = Running Forward
	3	1 = Running Reverse
	4	1 = Ready
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	1 = At Reference
	8 9 10 11	Actual Setpoint Source 0 = Keypad 6 = Preset #4 1 = 0 - 10VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP 5 = Preset #3 11 = Network
	12	1 = PID Active (closed loop)
	13	1 = Torque Mode Active
	14	1 = Current Limit
	15	1 = DC Braking
WORD1		Unsigned actual frequency 0.1 Hz resolution
WORD2		Digital Input/Output State (See Note 1 for details)
WORD3		Analog Input 0 - 10 V TB [0.1VDC] Received value = 0x3A = 5.8 [VDC]

	Bit	P440 = 3
WORD0	0	1 = Faulted
	1	Reserved
	2	1 = Running Forward
	3	1 = Running Reverse
	4	1 = Ready
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	1 = At Reference
	8 9 10 11	Actual Setpoint Source 0 = Keypad 6 = Preset #4 1 = 0 - 10VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP 5 = Preset #3 11 = Network
	12	1 = PID Active (closed loop)
	13	1 = Torque Mode Active
	14	1 = Current Limit
	15	1 = DC Braking
WORD1		Unsigned actual frequency 0.1 Hz resolution
WORD2		Actual PID Setpoint Signed value -999 to 31000
WORD3		Actual PID Feedback Signed value -999 to 31000

Note 1: Digital I/O State

WORD - Digital Input/Output State				
	Bit 0		Bit 8	TBC13C
	Bit 1		Bit 9	TB14 OutState
	Bit 2	Output Fault	Bit 10	Relay State
	Bit 3	Fast Current Limit State	Bit 11	Charge Relay
	Bit 4	TB1 ON	Bit 12	Assertion Level
	Bit 5		Bit 13	
	Bit 6	TB13A	Bit 14	
	Bit 7	TB13B	Bit 15	

P440 = 4: Input Assembly 105 Speed in Hz + Actual Torque and Analog Input
P440 = 5: Input Assembly 106 Custom Selectable

	Bit	P440 = 4
WORD0	0	1 = Faulted
	1	Reserved
	2	1 = Running Forward
	3	1 = Running Reverse
	4	1 = Ready
	5	0 = Local Control 1 = Network Control
	6	0 = Local Speed Ref 1 = Network Speed Ref
	7	1 = At Reference
	8 9 10 11	Actual Setpoint Source 0 = Keypad 6 = Preset #4 1 = 0 - 10VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP 5 = Preset #3 11 = Network
	12	1 = PID Active (closed loop)
	13	1 = Torque Mode Active
	14	1 = Current Limit
	15	1 = DC Braking
WORD1		Unsigned actual frequency 0.1 Hz resolution
WORD2		Actual Torque [%]
WORD3		Analog Input 0 - 10 V TB [0.1VDC] Received value = 0x3A = 5.8 [VDC]

	Bit	P440 = 5
WORD0		Data from Parameter/ID specified in Parameter P441 For Example: Setting P441 to 508 will place the value of parameter P508 Motor Current into the Word0 of Input Assembly 106
WORD1		Data from Parameter/ID specified in Parameter P442 For Example: Setting P442 to 527 will place the value of parameter P527 Actual Frequency into the Word1 of Input Assembly 106
WORD2		Data from Parameter/ID specified in Parameter P443 For Example: Setting P443 to 520 will place the value of parameter P527 0 - 10VDC Analog Input into the Word2 of Input Assembly 106
WORD3		Data from Parameter/ID specified in Parameter P444 For Example: Setting P444 to 506 will place the value of parameter P506 Motor Voltage into the Word3 of Input Assembly 106

Note: Value of Zero in Parameter P441 to P444 defines the end of Assembly 106.

6 Troubleshooting and Fault Elimination

6.1 Faults

Table 10 lists the faults common to the DeviceNet Communications Module.

Table 10: Faults

STATUS		POSSIBLE CAUSE	REMEDY
F_nEF	Module to Drive communication timeout	Connection between drive and module is not made.	Check cable and connection between module and drive.
F_nE 1	DeviceNet Lost	Established connection has timed out.	See parameters P415, P419, P430, P450 and P460, P470.
F_nE2	Message Monitoring timeout	Trigger via Supervisor Object 0x29 - 1-17 Force Fault Trip.	Check Master/Scanner Setup

6.2 Troubleshooting

Table 11 lists some common DeviceNet Communications problems and possible corrective action.

Table 11: Troubleshooting

NETWORK TROUBLESHOOTING		
SYMPTOM	POSSIBLE CAUSE	REMEDY
No communication from the drive.	Module is not initialized properly	- Verify the module connection - CheckP400 and P402
	Incorrect DeviceNet settings	- Use P403 to reset DeviceNet parameters - Verify P410 and P411
	Improper writing	- Check wiring between DeviceNet Network and Communications Module. - Ensure the terminal block is properly seated. - Check connection between module and drive.
DeviceNet write commands are ignored or return exceptions	Network enabled terminal is either open or not configured	Configure one of the input terminals (P121, P122 or P123) to "Network Enabled" function and close the corresponding contact.
SMV Drive cannot be accessed from network; P419 = "00"	Communication section is not receiving power	Check DeviceNet connections and power.
SMV Drive cannot be accessed from network; P419 code is “1093”.	Bus Failure	- Check DeviceNet connections and power. - Ensure SMV drive address is unique. - Check the baud rate. - Ensure bias resistors were placed correctly. - Reset SMV drive by cycling power. - Contact AC Tech Service Dept.
SMV drive cannot be accessed from network; P419 code is different than 1090 or “1093”.	- Communication section is not receiving power. - Connection problem; shorted signal wires for example. - Scanner device failure.	- Check DeviceNet connections and power. - Check the scanner device.
SMV drive cannot be accessed from the network; P419 Code is "083"	Duplicate DeviceNet address	- Ensure SMV drive address is unique. - Reset SMV drive by cycling power. - Use Faulted Node Recovery utility.
SMV drive stops and “F.nF1” fault is displayed; P419 code is “1x3x” or “1xx3” (x = any number except 9).	- SMV communication has been lost and the Watchdog Timer shut down the drive. - Communication was lost after the Master established communication. - Scanner device failure.	- Check the Master device. - Change expected packet rate if Master cannot handle the update rate. - Re-establish communication and clear the fault.
SMV drive stops without a fault; P419 code is “1111”.	Master device closed established connection when SMV drive was in Network Control Mode, and Parameter P419 DeviceNet Idle Mode is set to 0 (“Stop the Drive”).	- Switch Off Network Control before established connection is closed. - Set the DeviceNet Parameter P419 DeviceNet Idle Mode to 1 (“Hold Last State”). - Reestablish connection and restart the SMV drive.
SMV drive stops and “F.nF2” fault is displayed; P419 code is “1xxx” (x = any number).	Master device forced Network fault; Control Supervisor Object 0x29-1-17 “Force Fault Trip”.	Check Master device control logic.

7 Reference

Refer to the Installation and Operation manual (SV01) for drive-specific parameters. The 400 Series parameters exclusive to the DeviceNet™ communications module are accessible once the DeviceNet module is installed.

7.1 P400 Parameter Menu

Code		Possible Settings		IMPORTANT
No.	Name	Default	Selection	
CANopen Module Specific Parameters				
P400	Network Protocol		0 Not Active 4 DeviceNet	
P401	Module Revision		Display reads 04.x.x where: 04 = DeviceNet Module x.x = Module Revision	Read only
P402	Module Status	0	0 Not Initialized 1 Initialization: Module to EPM 2 Initialization: EPM to Module 3 Online 4 Failed Initialization Error 5 Time-out Error 6 Initialization Failed 7 Initialization Error	Read only Module type mismatch (P401) Protocol Selection mismatch (P400)
P403	Module Reset	0	0 No Action 1 Reset Module parameter values to default.	 Returns module parameters 401…499 to the default values shown in this manual.
P404	Module Time-out Action	3	0 Ignore 1 STOP (see P111) 2 Quick Stop 3 Fault (F_nEF)	• Action to be taken in the event of a Module/ Drive Time-out. • Time-out is fixed at 200ms. • Selection 1 (STOP) is by the method selected in P111.
P405	Network Fault	0	0 No Fault 1 F_nF1 - DeviceNet Lost 2 F_nF2 - Fault Triggered by DeviceNet	Read only
P406	Proprietary		Manufacturer specific	Read only
DeviceNet / Configuration Parameters				
P410(1)	DeviceNet address	63	0 ... 63	(Node ID)
P411(1)	DeviceNet baud rate	0	0 125 kbps (max distance = 500m) 1 250 kbps (max distance = 250m) 2 500 kbps (max distance = 100m)	
P414	DeviceNet Idle Mode	0	0 Stop the drive 1 Hold the last state	

Code		Possible Settings		IMPORTANT
No.	Name	Default	Selection	
P415	Action on Loss of DeviceNet	0	0 Trigger fault 'F_nt1' 1 Ignore 2 AC Tech specific - Switch off network controlled bits (STOP is not triggered)	Only active in Network Control (n.xxx)
P416	Bus Off	0	0 Hold in Error 1 Reset CAN	
P417	Bus Off Counter	0	Number of Bus Off Conditions 0.....255	Read-only Does not overflow
P418	Reset DeviceNet node	0	0 No action	On transition from 0 to 1, re-initializes DeviceNet controller and activates changes made to parameters marked with (1)
			1 Reset DeviceNet communication	
		⚠	**WARNING!** DeviceNet re-initialization may activate new assemblies configurations, which can result in changes to present controller state, including starting.	
P419	DeviceNet Status		4 Digit (See Below)	Read-only
	Digit 1 - Power Status		1 External power supply On	
	Digit 2 - Control Status		0 Local control and reference	
			1 Network control, local reference	
			2 Local control, network reference	
			3 Network control, network referencel	
	Digit 3 - Network Status		0 Network not connected	
			1 Network not connected	
			2 Network connection time out	
			3 Communication faulted	
			5 Network connected	
			8 Duplicate MAC ID failure	
			9 Network critical link failure	
	Digit 4 - I/O Status		0 I/O connection off	
			1 I/O connection idle state	
			3 I/O faulted	
			5 I/O active	
			9 I/O critical error	
P429	CAN Peripheral Status		Bits:	• Read-only • CAN warnings and errors
			0 Error passive mode	
			1 Bus off mode	
			2 CAN Enabled	
			3 Receiver busy	
			4 Transmitter busy	
			5 Transmit error count > 128	
			6 Overload frame	
			7 Receive error count > 128	

Code		Possible Settings		IMPORTANT
No.	Name	Default	Selection	
Assembly Configuration Parameters				
P430[1]	DeviceNet Output Assembly Selection (See Assembly Details)	1	0 Output assembly 20 - basic speed control	Length = 4 bytes
			1 Output assembly 21 - extended speed control	Length = 4 bytes
			2 Output assembly 100 - extended speed Hz + digital and analog output 1	Length = 8 bytes
			3 Output assembly 102 - PID setpoint + digital and analog output 1	Length = 8 bytes
			4 Output assembly 104 - torque setpoint + digital and analog output 1	Length = 8 bytes
		⚠	**WARNING!** DeviceNet re-initialization may activate new assemblies configurations, which can result in changes to present controller state, including starting..	
P439	Received Output Assembly Counter		Overflow above 255	Diagnostics-only
P440[1]	DeviceNet Input Assembly Selection (See Assembly Details)	1	0 Input assembly 70 - basic speed control	Length = 4 bytes
			1 Input assembly 71 - extended speed control	Length = 4 bytes
			2 Input assembly 101 - extended speed Hz + digital and analog input	Length = 8 bytes
			3 Input assembly 103 - PID setpoint, feedback	Length = 8 bytes
			4 Input assembly 105 - speed, actual torque, analog input	Length = 8 bytes
			5 Input assembly 106 - data words selectable with parameters P441 - P444	Custom: Length selectable via P441...P444 (0, 2, 4, 6 or 8 bytes)
[1]	These parameters take effect only after power up when P418 is reset or DeviceNet is reset.			
P441	Parameter ID of word 0	0	Value is placed in Word 0 of assembly 106	A value of 0 in Parameter P441 - P444 defines end of assembly 106
P442	Parameter ID of word 1	0	Value is placed in Word 1 of assembly 106	A value of 0 in Parameter P441 - P444 defines end of assembly 106
P443	Parameter ID of word 2	0	Value is placed in Word 2 of assembly 106	A value of 0 in Parameter P441 - P444 defines end of assembly 106
P444	Parameter ID of word 3	0	Value is placed in Word 3 of assembly 106	A value of 0 in Parameter P441 - P444 defines end of assembly 106
P449	Transmitted Assembly Counter	0	Overflow above 255	Diagnostic-only

Code		Possible Settings		IMPORTANT
No.	Name	Default	Selection	
DeviceNet Configuration Parameters				
P450	Explicit Message Instance State	0	0 Nonexistent	Read-only
			1 Configuring	
			2 Wait for connection ID	
			3 Established	
			4 Timed out	
			5 Deferred delete	
P452	Explicit Message Expected Packet Rate	0	0 ... 65535 {ms}	Read-only
P453	Explicit Message Status Bits Info Bit 0,1:		1 Auto delete - goes into non-existing state	Read-only
			3 Deferred delete	
	Explicit Message Timeout Info Bit 2:		1 Check timeout	
	Explicit Message Connection Info Bit 3:		1 Connection exists	
P460	Polled I/O Message Connection State	0	0 Nonexistent	Read-only
			1 Configuring	
			2 Wait for connection ID	
			3 Established	
			4 Timed Out	
P462	Polled I/O Expected Packet Rate	0	0 ... 65535 {ms}	Read-only
P463	Polled I/O Status Bits Bit 0,1:		0 Transition to timed out - stays in timeout	Read-only
			1 Auto delete - goes into nonexistent state	
			2 Auto reset - reset the connection timeout timer	
	Polled I/O Timeout Info Bit 2:		1 Check timeout	
	Polled I/O Connection Info Bit 3:		1 Connection exists	
P470	Bit Strobe Message Connection State	0	0 Nonexistent	Read-only
			1 Configuring	
			2 Wait for connection ID	
			3 Established	
			4 Timed Out	

Code		Possible Settings		IMPORTANT
No.	Name	Default	Selection	
P472	Bit Strobe Expected Packet Rate	0	0 ... 65535 {ms}	Read-only
P473	Bit Strobe Status Bit Info Bit 0,1:		0 Transition to timed out - stays in timeout	Read-only
			1 Auto delete - goes into nonexistent state	
			2 Auto reset - reset the connection timeout timer	
	Bit Strobe Timeout Info Bit 2:		1 Check timeout	
	Bit Strobe Connection Info Bit 3:		1 Connection exists	
P480	Change of State/ Cyclic Message Connection State	0	0 Nonexistent	Read-only
			1 Configuring	
			2 Wait for connection ID	
			3 Established	
			4 Timed Out	
P482	Change of State/ Cyclic Expected Packet Rate	0	0 ... 65535 {ms}	Read-only
P483	Change of State/ Cyclic Status Bits Bit 0,1:		0 Transition to timed out - stays in timeout	Read-only
			1 Auto delete - goes into nonexistent state	
			2 Auto reset - reset the connection timeout timer	
	Change of State/ Cyclic Timeout Action Bit 2:		1 Check timeout	
	Change of State/ Cyclic Connection Info Bit 3:		1 Connection exists	
P485	Change of State Trigger WORD selector	0	0 Word 0 of selected input assembly is used for COS trigger	Read/write
			1 Word 1 of selected input assembly is used for COS trigger	
			2 Word 2 of selected input assembly is used for COS trigger	
			3 Word 3 of selected input assembly is used for COS trigger	

Code		Possible Settings		IMPORTANT
No.	Name	Default	Selection	
P486	Change of State Status (16-bits)	0	0 ... 65535	Value from WORD selected in P485 Read-only
P487	Change of State Bit Mask (16-bits)	65535	0 ... 65535	Read/write Note: State change of bits in P486 masked with "1" in P487 trigger the COS I/O message if COS I/O connection is open
P490	Motor Type	7	0 Non-standard motor	
			1 PM DC motor	
			2 FC DC motor	
			3 PM synchronous motor	
			4 FC synchronous motor	
			5 Switched reluctance	
			6 Wound rotor induction	
			7 Squirrel cage induction	
CANopen Module Specific Parameters				
P494	Communication Module Software Version			• Read only • Format: x.yz
P495	Internal Code			• Read only • Alternating Display: xxx-; -yy
P498	Missed Messages Drive to Module			• Read only
P499	Missed Messages Module to Drive			• Read only

7.2 Class Implementation Details

7.2.1 Identity Object - Class 0x01

IDENTITY CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
INSTANCE 1				
1	GET	VENDOR ID	UINT	587
2	GET	DEVICE TYPE	UINT	2 (AC drive)
3	GET	PRODUCT CODE	UINT	2 (SMV DeviceNet Module)
4	GET	MAJOR REV. MINOR REV.	USINT USINT	1 1
5	GET	STATUS	USINT	4 = Configured 5 = Owned
6	GET	SERIAL NUMBER	UDINT	Unique 32-bit number
7	GET	PRODUCT NAME	ASCII String	“AC Tech SMV Communication Module Drive”

IDENTITY CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x05	NO	YES	RESET

7.2.2 Message Router Object - Class 0x02

MESSAGE ROUTER CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
INSTANCE 1				
1	GET	CLASS LIST	ARRAY	List of Implemented Classes
2	GET	MAXIMUM NUMBER OF CONNECTIONS	UINT	1
3	GET	CURRENTLY USED CONNECTIONS	UINT	1
4	GET	CURRENTLY USED ID’s	Array of UINT	List of Connection ID

MESSAGE ROUTER CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single

7.2.3 DeviceNet Object - Class 0x03

DEVICENET CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	2
INSTANCE 1				
1	GET/SET	NODE ADDRESS	USINT	0 to 63
2	GET/SET	DATA RATE	USINT	0 to 2
3	GET/SET	BOI	BOOL	0 = Hold in Error
				1 = Reset CAN
4	GET/SET	BUS-OFF COUNTER	USINT	0 to 255
5	GET	ALLOCATION INFO		
		ALLOC. CHOICE	BYTE	Allocation Byte
		MASTER ADDRESS	USINT	0 to 63 Address

DEVICENET CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single
0x4B	NO	YES	Allocate_Master/Slave_Connection_Set
0x4C	NO	YES	Release_Master/Slave_Connection_Set

7.2.4 Assembly Object - Class 0x04

ASSEMBLY CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	2
2	GET	MAXIMUM NUMBER OF INSTANCES	USINT	11
INSTANCES (See Below)				
1	GET	NUMBER OF MEMBER	USINT	1
3	GET/SET	DATA	INSTANCE	

INSTANCE NUMBER AND NAME	**ACCESS RULE FOR ATTRIBUTE #3 DATA**
INSTANCE 20 = BASIC SPEED CONTROL	GET / SET
INSTANCE 21 = EXTENDED SPEED CONTROL	GET / SET
INSTANCE 100 = EXTENDED SPEED HZ + DIGITAL AND ANALOG OUTPUT	GET / SET
INSTANCE 102 = PID SETPOINT + DIGITAL AND ANALOG OUTPUT	GET / SET
INSTANCE 104 = TORQUE SETPOINT + DIGITAL AND ANALOG OUTPUT	GET / SET
INSTANCE 70 = BASIC SPEED CONTROL	GET
INSTANCE 71 = EXTENDED SPEED CONTROL	GET
INSTANCE 101 = EXTENDED SPEED HZ + ANALOG AND DIGITAL I/O	GET
INSTANCE 103 = CUSTOM: SPEED, PID SETPOINT, FEEDBACK	GET
INSTANCE 105 = CUSTOM: SPEED, ACTUAL TORQUE, ANALOG INPUT	GET
INSTANCE 106 = CUSTOM: DATA WORDS SELECTABLE WITH PARAMETERS P441 - P444	GET

ASSEMBLY CLASS SERVICES			
SERVICE CODE	IMPLEMETED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x05	NO	YES	RESET

7.2.5 DeviceNet Connection Object - Class 0x05

DEVICENET CONNECTION CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
INSTANCE 1 - EXPLICIT MESSAGE INSTANCE				
1	GET	STATE	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out 5 = Deferred Delete
2	GET	INSTANCE TYPE	USINT	0 = Explicit
3	GET	TRANSPORT CLASS TRIGGER	USINT	0x83
4	GET	PRODUCED CONNECTION ID	UINT	
5	GET	CONSUMED CONNECTION ID	UINT	
6	GET	INITIAL COMM. CHARACTERISTICS	USINT	0x22
7	GET	PRODUCED CONNECTION SIZE	UINT	80 (max)
8	GET	CONSUMED CONNECTION SIZE	UINT	80 (max)
9	GET / SET	EXPECTED PACKET RATE	UINT	Timer Resolution of 2 ms
12	GET / SET	WATCHDOG ACTION	UINT	1 = Auto Delete 3 = Deferred Delete
13	GET	PRODUCED CONN. PATH LENGTH	UINT	0
14	GET	PRODUCED CONNECTION PATH		Null (No Data)
15	GET	CONSUMED CONN. PATH LENGTH	UINT	0
16	GET	CONSUMED CONNECTION PATH		Null (No Data)
17	GET	INHIBIT TIME	USINT	0

DEVICENET CONNECTION CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 2 - POLLED I/O MESSAGE CONNECTION				
1	GET	STATE	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out
2	GET	INSTANCE TYPE	USINT	1 = I/O Connection
3	GET	TRANSPORT CLASS TRIGGER	USINT	0x82
4	GET	PRODUCED CONNECTION ID	UINT	
5	GET	CONSUMED CONNECTION ID	UINT	
6	GET	INITIAL COMM. CHARACTERISTICS	USINT	0x01
7	GET	PRODUCED CONNECTION SIZE	UINT	0 to 8
8	GET	CONSUMED CONNECTION SIZE	UINT	0 to 4
9	GET / SET	EXPECTED PACKET RATE	UINT	Timer Resolution of 2 ms
12	GET / SET	WATCHDOG ACTION	UINT	0 = Time Out 1 = Auto Delete 2 = Auto Reset
13	GET	PRODUCED CONN. PATH LENGTH	UINT	3
14	GET	PRODUCED CONNECTION PATH		0x63 (Hex String) Hex String - Assembly #
15	GET	CONSUMED CONN. PATH LENGTH	UINT	3
16	GET	CONSUMED CONNECTION PATH		0x63 (Hex String) Hex String - Assembly #
17	GET	INHIBIT TIME	USINT	0

DEVICENET CONNECTION CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 3 - BIT STROBE				
1	GET	STATE	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out
2	GET	INSTANCE TYPE	USINT	1 = I/O Connection
3	GET	TRANSPORT CLASS TRIGGER	USINT	0x82
4	GET	PRODUCED CONNECTION ID	UINT	
5	GET	CONSUMED CONNECTION ID	UINT	
6	GET	INITIAL COMM. CHARACTERISTICS	USINT	0x02
7	GET	PRODUCED CONNECTION SIZE	UINT	0 to 8
8	GET	CONSUMED CONNECTION SIZE	UINT	8
9	GET / SET	EXPECTED PACKET RATE	UINT	Timer Resolution of 2 ms
12	GET / SET	WATCHDOG ACTION	UINT	0 = Time Out 1 = Auto Delete 2 = Auto Reset
13	GET	PRODUCED CONN. PATH LENGTH	UINT	3
14	GET	PRODUCED CONNECTION PATH		0x63 (Hex String) Hex String - Assembly #
15	GET	CONSUMED CONN. PATH LENGTH	UINT	3
16	GET	CONSUMED CONNECTION PATH		0x63 (Hex String) Hex String - Assembly #
17	GET	INHIBIT TIME	USINT	0

DEVICENET CONNECTION CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 4 - CHANGE OF STATE / CYCLIC INSTANCE				
1	GET	STATE	USINT	0 = Nonexistent 1 = Configuring 3 = Established 4 = Timed Out
2	GET	INSTANCE TYPE	USINT	1 = I/O Connection
3	GET	TRANSPORT CLASS TRIGGER	USINT	0x82
4	GET	PRODUCED CONNECTION ID	UINT	
5	GET	CONSUMED CONNECTION ID	UINT	
6	GET	INITIAL COMM. CHARACTERISTICS	USINT	0x01 or 0x0F
7	GET	PRODUCED CONNECTION SIZE	UINT	0 to 8
8	GET	CONSUMED CONNECTION SIZE	UINT	0
9	GET / SET	EXPECTED PACKET RATE	UINT	Timer Resolution of 2 ms
12	GET / SET	WATCHDOG ACTION	UINT	0 = Time Out 1 = Auto Delete 2 = Auto Reset
13	GET	PRODUCED CONN. PATH LENGTH	UINT	3
14	GET	PRODUCED CONNECTION PATH		0x63 (Hex String) Hex String - Assembly #
15	GET	CONSUMED CONN. PATH LENGTH	UINT	3
16	GET	CONSUMED CONNECTION PATH		0x63 (Hex String) Hex String - Assembly #
17	GET / SET	INHIBIT TIME	USINT	0

DEVICENET CONNECTION CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

7.2.6 Parameter Object - Class 0x0F

PARAMETER CLASS ATTRIBUTES NUMBER OF INSTANCES (PARAMETERS): 550				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	2
2	GET	NUMBER OF INSTANCES	UINT	150
8	GET	PARAMETER CLASS	WORD	0x03
		DESCRIPTOR		
9	GET	CONFIGURATION	UINT	0
		ASSEMBLY #		
10	GET	NATIVE LANGUAGE	UINT	0 = English
INSTANCE 1 - 550				
1	GET / SET	PARAMETER VALUE		
2	GET	LINK PATH SIZE	USINT	0 to 2
3	GET	LINK PATH	DNET PATH	
4	GET	DESCRIPTOR	WORD	
5	GET	DATA TYPE	USINT	
6	GET	DATA SIZE	USINT	

NOTE: Refer to Parameter List in the Parameter Object Instance table.

PARAMETER CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

Parameter Object Instance (Parameter List)
NOTE: These same parameters are present in the EDS File

ID NO	PARAMETER	OBJECT MAPPING
1-49	RESERVED	
50	DIGITAL OUTPUT BITS	0x0F-50-1
51-54	RESERVED	
55	TB30 ANALOG OUTPUT	0x0F-55-1
56-59	RESERVED	
60	KEYPAD COMMAND FREQUENCY	0x0F-60-1
61	NETWORK COMMAND FREQUENCY	0x0F-61-1
62	ACTUAL COMMAND FREQUENCY	0x0F-62-1
63	ACTUAL OUTPUT FREQUENCY	0x0F-63-1
64	RESERVED	
65	CONTROL WORD	0x0F-65-1
66	DEVICENET STATUS WORD	0x0F-66-1
67	DRIVE STATUS WORD	0x0F-67-1
68	DRIVE OPERATION STATE	0x0F-68-1
69	PRESENT FAULT	0x0F-69-1
70	KEYPAD PID SETPOINT COMMAND	0x0F-70-1
71	NETWORK PID SETPOINT COMMAND	0x0F-71-1
72	ACTUAL PID SETPOINT	0x0F-72-1
73	ACTUAL PID SETPOINT	0x0F-73-1
74	ACTUAL PID FEEDBACK	0x0F-74-1
75-79	RESERVED	
80	KEYPAD TORQUE SETPOINT (%)	0x0F-80-1
81	NETWORK TORQUE SETPOINT (%)	0x0F-81-1
82-90	RESERVED	
91	INTERNAL STATE FGD	0x0F-91-1
92	INTERNAL STATE PWM	0x0F-92-1
93-98	RESERVED	
99	DRIVE PARAMETER REVISION	0x0F-99-1
100-541	MATCH SMV PARAMETERS P100 TO P541	
542-550	RESERVED	

PARAMETER ATTRIBUTES			
ATTRIBUTE ID	**ACCESS RULE**	**BIT #**	**ATTRIBUTE**
50 Digital Output Bits	GET/SET	1	
		2	
		3	
		4	
		5	
		6	TB14 Out State (1 - ON; 0 - OFF)
		7	Relay State (1 - ON; 0 - OFF)
		8	
		9	
		10	
		11	
		12	
		13	
		14	
		15	
55 TB30 Analog Output	GET/SET		Min/Max (0/1000) corresponds to 0.00 to 10.00VDC
60 Keypad Command Frequency	GET/SET		Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point)
61 Network Command Frequency	GET/SET		Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point)
62 Actual Command Frequency	GET/SET		Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point)
63 Actual Output Frequency	GET/SET		Min/Max (0.0/500.0) Hz Default: 20 Hz Precision = 1 (1 place after decimal point)

PARAMETER ATTRIBUTES			
ATTRIBUTE ID	**ACCESS RULE**	**BIT #**	**ATTRIBUTE**
65 Control Word	GET/SET	0	0 = NOT Run Forward 1 = Run Forward
		1	0 = NOT Run Reverse 1 = Run Reverse
		2	Fault reset on transition from 0 to 1
		3	Reserved
		4	Reserved
		5	0 = Local Control 1 = Network Control
		6	0 = Local Speed Ref 1 = Network Speed Ref
		7	Reserved
		8	Network Speed Reference (valid if bit 6 is set) 0 = Network 6 = Preset #3 1 = Keypad 7 = Preset #4 (1) 2 = 0 - 10VDC 8 = Preset #5 (1) 3 = 4 - 20 mA 9 = Preset #6 (1) 4 = Preset #1 10 = Preset #7 (1) 5 = Preset #2 11 = MOP
		9	
		10	
		11	
		12	0 = No Action 1 = Inhibit (Coast to Stop)
		13	0 = No Action 1 = Activate Quick Stop
		14	0 = No Action 1 = Force Manual Stop
		15	0 = DC Brake Active 1 = DC Brake NOT Active
(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.			

PARAMETER ATTRIBUTES			
ATTRIBUTE ID	**ACCESS RULE**	**BIT #**	**ATTRIBUTE**
66 DeviceNet Status Word	Read Only	0	1 = Faulted
		1	Reserved
		2	1 = Running Forward
		3	1 = Running Reverse
		4	1 = Ready
		5	0 = Local Control 1 = Network Control
		6	0 = Local Speed Ref 1 = Network Speed Ref
		7	1 = At Reference
		8	Network Speed Reference (valid if bit 6 is set) 0 = Keypad 6 = Preset #4 (1) 1 = 0 - 10 VDC 7 = Preset #5 (1) 2 = 4 - 20 mA 8 = Preset #6 (1) 3 = Preset #1 9 = Preset #7 (1) 4 = Preset #2 10 = MOP 5 = Preset #3 11 = Network
		9	
		10	
		11	
		12	1 = PID Active (closed loop)
		13	1 = Torque Mode Active
		14	1 = Current Limit
		15	1 = DC Braking
(1) Presets #4, #5, #6 and #7 are ignored when the drive is operating in either PID mode or Torque mode.			

PARAMETER ATTRIBUTES			
ATTRIBUTE ID	**ACCESS RULE**	**BIT #**	**ATTRIBUTE**
67 Drive Status Word	Read Only	0	0 = Stop 1 = Run
		1	1 = Quick Stop (ramp to stop) Active
		2	0 = Direction Forward (commanded) 1 = Direction Reverse
		3	0 = Direction Forward (actual) 1 = Direction Reverse
		4	0 = NET REF not active 1 = NET REF sets the active source
		5	0 = Speed Mode 1 = Torque Mode
		6	0 = Open Loop (PID Off) 1 = Closed Loop (PID On)
		7	0 = Manual Mode; 1 = AUTO mode
		8	Actual Setpoint Source 0 = Keypad 6 = Preset #4 1 = 0 - 10 VDC 7 = Preset #5 2 = 4 - 20 mA 8 = Preset #6 3 = Preset #1 9 = Preset #7 4 = Preset #2 10 = MOP 5 = Preset #3 11 = Network
		9	
		10	
		11	
		12	
		13	Control 0 = Keypad 2 = Remote Keypad 1 = Terminal 3 = Network
		14	0 = Network Control Disabled 1 = Network Control Enabled
		15	1 = DC Braking
68 Drive Operation State	AC Tech Diagnostics Only		

PARAMETER ATTRIBUTES			
ATTRIBUTE ID	**ACCESS RULE**	**BIT #**	**ATTRIBUTE**
69 Present Fault	Read Only	1	Temperature Output Fault
		2	Overcurrent Fault
		3	Ground (Short to Earth) Fault
		4	Excessive Drive Temperature Fault
		5	Fly Start Fault
		6	High Bus Voltage (Over Voltage) Fault
		7	Low Bus Voltage Fault
		8	Motor Overload Fault
		9	OEM Defaults Corrupted
		10	Illegal Setup Fault
		11	Dynamic Brake Overheated Fault
		12	Single Phase, Voltage Ripple to High
		13	External Fault
		14	Control EEPROM fault
		15	Start Power Loss Fault
		16	Incompatibility Fault
		17	EEPROM Hardware Failure
		18	Internal Fault (Edge Over Run)
		19	Internal Fault (PWM Over Run)
		20	Stack Overflow Fault
		21	Stack Underflow Fault
		22	Internal Fault (BGD Missing)
		23	Watchdog Timeout Fault
		24	Illegal OPCO Fault
		25	Illegal Address Fault
		26	Drive Hardware Fault
		27	Internal Fault (AD Offset)
		28	Internal Fault (RKPD Lost)
		29	Assertion Level switched during operation Fault
		30	Internal Fault (FGD Missing)
		31	Internal Fault (PW Missing)
		32	Current Loop Fault
		33	Internal communication from JK1 Lost Fault

PARAMETER ATTRIBUTES			
ATTRIBUTE ID	**ACCESS RULE**	**BIT #**	**ATTRIBUTE**
69 Present Fault (continued)		34	Internal Fault (Module Communication (SPI) Timeout)
		35	Internal Fault (FNR: Invalid Message Received)
		36	Network Fault #1
		37	Network Fault #2
		38	Network Fault #3
		39	Network Fault #4
		40	Network Fault #5
		41	Network Fault #6
		42	Network Fault #7
		43	Network Fault #8
		44	Network Fault #9
70 Keypad PID Setpoint Command	GET/SET		Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point)
71 Network PID Setpoint Command	GET/SET		Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point)
72 Actual PID Setpoint	Read Only		Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point)
73 Actual PID Setpoint	Read Only		Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point)
74 Actual PID Feedback	Read Only		Min: -99.9 Max: 3100.0 Default = 0 Precision = 1 (1 place after decimal point)
80 Keypad Torque Setpoint (%)	GET/SET		Min: 0[%] Max: 400[%] Default = 0 Precision = 0
81 Network Torque Setpoint (%)	GET/SET		Min: 0[%] Max: 400[%] Default = 0 Precision = 0
91 Internal State FGD	AC Tech Diagnostics Only		
92 Internal State PWM	AC Tech Diagnostics Only		

7.2.7 Parameter Group Object - Class 0x10

PARAMETER GROUP CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	4
8	GET	NATIVE LANGUAGE	UINT	0 = English
INSTANCE 1 - 3				
1	GET	GROUP NAME	SHORT STRING	
2	GET	NUMBER OF MEMBERS IN THE GROUP	UINT	
3	GET	1st PARAMETER IN THE GROUP	UINT	
4	GET	2nd PARAMETER IN THE GROUP	UINT	
n	GET	(n-2) th PARAMETER IN THE GROUP	UINT	

7.2.8 Motor Data Object - Class 0x28

MOTOR GROUP CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET	NUMBER OF SUPPORTED ATTRIBUTES	USINT	7
2	GET	ATTRIBUTE LIST	ARRAY	
3	GET/SET	MOTOR TYPE	USINT	0 - 10
6	GET/SET	RATED CURRENT	UINT	RATED STATOR CURRENT (0.1A)
7	GET/SET	RATED VOLTAGE	UINT	RATED BASE VOLTAGE (V)
9	GET/SET	RATED FREQUENCY	UNIT	RATED FREQUENCY (Hz)
11	GET/SET	NOMINAL SPEED AT RATED FREQUENCY	UNIT	NOMINAL SPEED (RPM)

MOTOR DATA CLASS SERVICES			
SERVICE CODE	IMPLEMENTED FOR		SERVICE NAME
	CLASS	INSTANCE	
0x0E	YES	YES	GET_ATTRIBUTE_SINGLE
0x10	NO	YES	SET_ATTRIBUTE_SINGLE

7.2.9 Control Supervisor Object - Class 0x29

CONTROL CLASS ATTRIBUTES				
ATTRIBUTE ID	**ACCESS RULE**	**NAME**	**DATA TYPE**	**VALUE**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET	NUMBER OF SUPPORTED ATTRIBUTES	USINT	16
2	GET	ATTRIBUTE LIST	ARRAY	
3	GET/SET	RUNFWD	BOOL	0 to 1
4	GET/SET	RUNREV	BOOL	0 to 1
5	GET/SET	NETCTRL	BOOL	0 to 1
6	GET	STATE	UNIT	3 = READY 4 = ENABLED 5 = FAULTED
7	GET	RUNNINGFWD	BOOL	0 to 1
8	GET	RUNNINGREV	BOOL	0 to 1
9	GET	READY	BOOL	0 to 1
10	GET	FAULTED	BOOL	0 to 1
11	GET	WARNING	UNIT	0 (Not Supported)
12	GET/SET	FAULTRST	BOOL	0 to 1
13	GET	FAULT CODE	UNIT	0 to 65535
15	GET	CTRLFROMNET	US INT	0 to 1
16	GET/SET	ACTION ON LOSS OF DEVICE NET	US INT	0 = FAULT 1 = IGNORE COMM FAULT 2 = AC TECH SPECIFIC
17	GET/SET	FORCE TRIP	BOOL	0 to 1
The drive shows the "nF" fault on the LED display.				

If Attribute #5 NET CONTROL is set to 1, the RUN and STOP events are triggered according to the following event table:

ATTRIBUTE RUN FWD	ATTRIBUTE RUN REV	TRIGGER EVENT	RUN TYPE
0	0	STOP	N/A
0 -> 1	0	RUN	RUN FORWARD
0	0 -> 1	RUN	RUN REVERSE
0 -> 1	0 -> 1	NO ACTION	N/A
1	1	NO ACTION	N/A
1 -> 0	1	RUN	RUN REVERSE
1	1 -> 0	RUN	RUN FORWARD

NOTE: If ACT PARAMETER #17 DIRECTION is set to FORWARD ONLY, the drive will not be able to run in the reverse direction.

FAULT CODES		
Fault Code	**Fault Number**	**Fault Description**
0x0000	0	NO FAULT
0x2220	1	Temperature Output Fault
0x2220	2	Over Current Fault
0x2240	3	Ground (Short to Earth) Fault
0x4310	4	Excess Drive Temperature Fault
0x0000	5	Fly Start Fault
0x3210	6	High Bus Voltage (Over Voltage) Fault
0x3220	7	Low Bus Voltage (Under Voltage) Fault
0x7122	8	Motor Overload Fault
0x6320	9	OEM Defaults Corrupted Fault
0x6320	10	Illegal Setup Fault
0x7110	11	Dynamic Brake Overheated Fault
0x3130	12	Single Phase Voltage Ripple to High Fault
0x9000	13	External Fault
0x6310	14	Control EEPROM Fault
0x3120	15	Start Power Loss Fault
0x6320	16	Incompatibility Fault
0x6100	17	EEPROM Harfware Failure
0x6100	18	Internal Fault (Edge Over Run)
0x6100	19	Internal Fault (PWM Over Run)
0x6100	20	Stack Overflow Fault
0x6100	21	Stack Underflow Fault
0x6100	22	Internal Fault (BGD Missing)
0x6010	23	Watchdog Timed Out Fault
0x6100	24	Illegal OPCO Fault
0x6100	25	Illegal Address Fault
0x6100	26	Drive Hardware Fault
0x6100	27	Internal Fault (AD Offset)
0x7501	28	Internal Fault (RKPD Lost)
0x5200	29	Assertion Level switched during Operation Fault
0x6100	30	Internal Fault (FGD Missing)
0x6100	31	Internal Fault (PW Missing)
0x6100	32	Current Loop Fault

FAULT CODES		
Fault Code	**Fault Number**	**Fault Description**
0x7500	33	Internal Communication from JK1 Lost Fault
0x7501	34	Internal Fault (Module Communication (SPI) Timeout)
0x7502	35	Internal Fault (FNR: Invalid Message Received)
0x7511	36	Network Fault #1
0x7512	37	Network Fault #2
0x7513	38	Network Fault #3
0x7514	39	Network Fault #4
0x7515	40	Network Fault #5
0x7516	41	Network Fault #6
0x7517	42	Network Fault #7
0x7518	43	Network Fault #8
0x7519	44	Network Fault #9
0x1000	46 - 50	RESERVED

CONTROL SUPERVISOR CLASS SERVICES			
Service Code	Implemented For		Service Name
	Class	Instance	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

7.2.10 AC/DC Drive Object - Class 0x2A

AC/DC DRIVE CLASS ATTRIBUTES				
Attribute ID	**Access Rule**	**Name**	**Data Type**	**Value**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET	NO. OF SUPPORTED ATTRIBUTES	USINT	12
2	GET	ATRIBUTE LIST	ARRAY	
3	GET	AT REFERENCE	BOOL	Speed AtRef
4	GET/SET	NET REFERENCE	BOOL	0 = Local SpdRef 1 = Net SpdRef
6	GET	DRIVE MODE	USINT	1 = Open Loop Spd Control 2 = Vector Mode 3 = Torque Mode 4 = PID Mode
7	GET	ACTUAL SPEED	INT	Actual Speed (RPM)
8	GET/SET	SPEED REFERENCE	INT	Speed Reference (RPM)
9	GET	MOTOR PHASE CURRENT	INT	Actual Current (0.1A)
15	GET	MOTOR PHASE CURRENT	INT	Actual Power (W)
16	GET	INPUT VOLTAGE	INT	(V)
17	GET	OUTPUT VOLTAGE	IN	(V)
29	GET	STATUS OF SPEED REFERENCE	INT	0 = Local Spd Ref 1 = Net Spd Ref

AC DRIVE CLASS SERVICES			
Service Code	Implemented For		Service Name
	Class	Instance	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

7.2.11 Acknowledge Handler Object - Class 0x2B

ACKNOWLEDGE HANDLER CLASS ATTRIBUTES				
Attribute ID	**Access Rule**	**Name**	**Data Type**	**Value**
INSTANCE 0				
1	GET	REVISION	UINT	1
2	GET	NUMBER OF INSTANCES	UINT	1
INSTANCE 1				
1	GET/SET	ACKNOWLEDGE TIMER	UINT	1 to 65535 ms
2	GET/SET	RETRY LIMIT	USINT	0 to 255
3	GET	COS PRODUCING CONN INSTANCE	UINT	4

ACKNOWLEDGE HANDLER CLASS SERVICES			
Service Code	Implemented For		Service Name
	Class	Instance	
0x0E	YES	YES	Get_Attribute_Single
0x10	NO	YES	Set_Attribute_Single

Lenze AC Tech Corporation

630 Douglas Street • Uxbridge, MA • 01569 • USA
Sales: 800-217-9100 • Service: 508-278-9100
www.lenzeamericas.com

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