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5136-DNS-200X DeviceNet Slave Adapter

User's Guide

Version 1.04

Document # 715-0025





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This document applies to the 5136-DNS-200X DeviceNet Slave Adapter.

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1.00	22 Nov 2000	SST	Initial Release
1.01	6 Mar 2001	SST	IoStatusEnable feature is now enabled by default in firmware revision 1.016. Updated Adapter Object to reflect this change. Added CENELEC EN 50 044 Numbering Convention reference to the Mini Connector figures.
1.02	22 Oct 2001	SST	Byte access of adapter and slot object parameters for tools that do not support complex data types
1.03	30 May 2002	SST	Cosmetic changes
1.04	12 Jun 2002	G. Weir	Final changes in preparation for official release

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Contents

Introduction **1**
1.1 Purpose of this manual 1
1.2 Related Documentation 1
1.3 Conventions 2
1.3.1 Special Notation *2*
1.4 Warranty 3
1.4.1 Product Returns *3*
1.5 Technical Support 3
1.5.1 Support for Siemens ET200X Expansion Modules *3*
1.5.2 Before you call for help *3*
1.5.3 Getting help *4*
Technical Overview **5**
2.1 Overview 5
2.2 DeviceNet Features 5
2.3 I/O Features 6
Installation and Configuration **7**
3.1 Overview 7
3.2 Connecting to the Network 9
3.2.1 V+, V- *9*
3.2.2 CANH, CANL *9*
3.2.3 SHIELD *9*
3.2.4 Module Power *9*
3.2.5 Load Power *9*
3.2.6 Sealed Mini Connectors *10*
3.2.7 LED Indicators *10*
3.2.8 DC 24V Load *11*
3.3 Setting the Node Address and Data Rate 12
3.3.1 Node Address Configuration Options *12*
3.3.2 Data Rate Configuration Options *13*
Operation **14**
4.1 Overview 14
4.2 Operating Modes 14
4.2.1 Automatic Configuration Mode *14*
4.2.2 User Configured Mode *15*
4.3 I/O Status Byte 15
4.4 Strobe I/O Operation 16
4.5 Configuration 16
4.6 Configuration Consistency Value 16
4.7 Data Compression 16
4.8 Faults / Diagnostics 17

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4.8.1 Configuration Faults 17
4.8.2 Configuration Fault Recovery 17
4.8.3 Expansion Module Faults 17
4.9 Module Hot Swap 17
Troubleshooting 18
5.1 Overview 18
5.1.1 Unable to Communicate with the Device 18
5.1.2 All of the LEDs are Off 18
5.1.3 Module LED is Solid Red 18
5.1.4 Module LED is Flashing Green 19
5.1.5 Network Status LED is Solid Red 19
5.1.6 Network Status LED Flashing Red 19
5.1.7 I/O Status LED Flashing Red 19
Device Profile 20
6.1 Overview 20
6.2 DeviceNet Compliance 20
6.3 Required Objects 21
6.3.1 Identity Object 21
6.3.2 DeviceNet Object 22
6.3.3 Connection Object 23
6.3.4 Acknowledge Handler Object 29
6.4 Application Specific Objects 29
6.4.1 Assembly Object 29
6.4.2 200X Adapter Object 30
6.4.3 200X Slot Object 32
Technical Information 36
7.1 General Technical Information 36
7.1.1 200X-8DI Technical Data 38
7.1.2 200X-4DO Technical Data 39
General Technical Specifications 40
8.1 What Are General Technical Specifications? 40
8.1.1 Standards, Certificates, Approvals 40
8.1.2 Electromagnetic Compatibility and Shipping and Storage Conditions 42
8.1.3 Mechanical and Climatic Environmental Conditions 44
8.1.4 Information on Insulation Testing, Safety Class, Degree of Protection and Rated Voltage for 5136-DNS-200X 45

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1 Introduction

1.1 Purpose of this manual

This manual explains how to install and use the 5136-DNS-200X DeviceNet Slave Adapter for use with Siemens ET200X Expansion Modules.

1.2 Related Documentation

DeviceNet Specification

- Version 2.0 – 1998, ODVA

Siemens ET200X Distributed I/O Device Manual

- 6ES7 151-1AA00-8BA0

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1.3 Conventions

1.3.1 Special Notation

The following special notations are used throughout the manual:



WARNING

Warning messages alert the reader to situations where personal injury may result. Warnings are accompanied by the symbol shown, and precede the topic to which they refer.



CAUTION

Caution messages alert the reader to situations where equipment damage may result. Cautions are accompanied by the symbol shown, and precede the topic to which they refer.



NOTE

A note provides additional information, emphasizes a point, or gives a tip for easier operation. Notes are accompanied by the symbol shown, and follow the text to which they refer.

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1.4 Warranty

SST guarantees that all new products are free of defects in material and workmanship when applied in the manner for which they were intended and according to SST's published information on proper installation. The Warranty period for the 5136-DNS-200X DeviceNet Slave Adapter is one year from the date of shipment.

SST will repair or replace, at our option, all products returned freight prepaid, which prove upon examination to be within the Warranty definitions and time period.

The Warranty does not cover costs of installation, removal or damage to user property or any contingent expenses or consequential damages. Maximum liability of SST is the cost of the product(s).

1.4.1 Product Returns

If it should be necessary to return or exchange items, please contact SST for a Returned Merchandise Authorization (RMA) number.

SST
50 Northland Road
Waterloo, Ontario, N2V 1N3
Voice: (519) 725-5136
Fax: (519) 725-1515

1.5 Technical Support

1.5.1 Support for Siemens ET200X Expansion Modules

Support for Siemens ET200X Expansion modules should be directed to the appropriate Siemens technical support facility in your area.

1.5.2 Before you call for help

Before calling for technical support, ensure that you have the following information readily available:

- Product name and serial number
- Product revision, firmware revision
- Operating system type and version
- Details of the problem - Target network configuration, circumstances that caused the problem

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1.5.3 Getting help

Technical support is available during regular business hours by telephone, fax or e-mail from any SST office, or from the company Web site at www.mySST.com.

Documentation and software updates are available on our Web site.

NORTH AMERICA

Phone: 519-725-5136

Fax: 519-725-1515

Email: techsupport@mySST.com

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Phone: 33 (0) 2 32 96 04 20

Fax: 33 (0) 2 32 96 04 21

Email: supportintl@applicom-int.com

EUROPE (GERMANY)

Phone: 49 (0) 711 782374-0

Fax: 49 (0) 711 782374-11

Email: supportde@applicom-int.com

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2

Technical Overview

2.1 Overview

The 5136-DNS-200X DeviceNet™ Slave Adapter is an IP67 compliant device providing connectivity between a DeviceNet™ network and Siemens ET200X Expansion Modules.

2.2 DeviceNet Features

- Complies with DeviceNet Specification Volume I, Release 2.0 & Volume II, Release 2.0
- Supports all standard DeviceNet data rates: 125, 250 and 500 Kbps
- Operates as a Group 2 Only Server (non UCMM-capable)
  - Supports Explicit messaging connection
  - Supports Poll, Strobe, Cyclic, and Change-of-State I/O connections
  - Supports Fragmented I/O (maximum 128 bytes input and 128 bytes output)
  - Supports Fragmented Explicit Messaging
- Supports Configuration Consistency Value (CCV)
- Data rate and Node Address (MAC ID) configured via DIP Switch
- Supports Device Heartbeat messages

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- Supports Device Shutdown messages

2.3 I/O Features

There are two versions of the 5136-DNS-200X Adapter that are differentiated by the built in I/O provided by Siemens. The 5136-DNS-200X-8DI provides 8 discrete 24V input ports on the adapter module and the 5136-DNS-200X-4DO provides four discrete 24V 2A output ports.

Both modules include:

- Support provided for all 200X expansion modules
- Up to 7 expansion modules per DeviceNet Head Module
- Supports expansion module parameterization
- Supports expansion module diagnostics

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3

Installation and Configuration

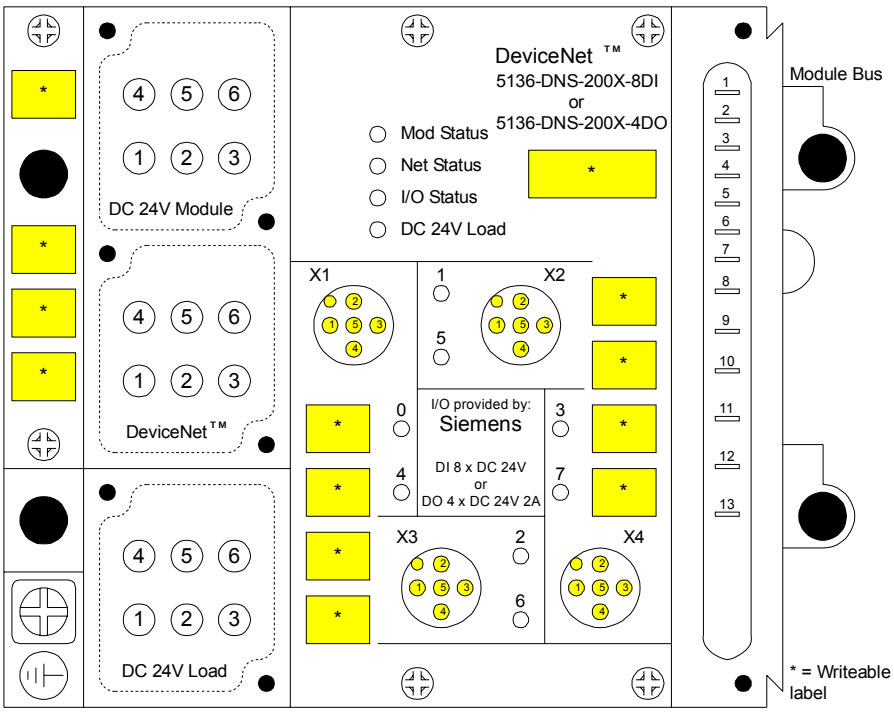
3.1 Overview

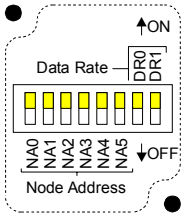
Some of the features of the 5136-DNS-200X are shown in the picture below.

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Hidden Switch Register label detail
(Under DeviceNet ™ Connector)

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3.2 Connecting to the Network

Connections are provided on the 200X via cable seal housing assemblies and they must be field wired according to the pin assignments in table 1.

Connection	Pin Numbers					
	1	2	3	4	5	6
DC 24V (Module)	NC	+24VDC (module)	Return (module)	NC	+24VDC (module)	Return (module)
DeviceNet™	CAN_H	SHIELD	SHIELD	CAN_L	V+	V-
DC 24V (Load)	NC	+24VDC (load)	Return (load)	NC	+24VDC (load)	Return (load)

NOTE

24 VDC power for module power, network interface power, input current and output load current must be provided by Class 2 power supplies.

3.2.1 V+, V-

These are the DeviceNet network power supply terminals that provide power for the Optically isolated network interface of the 5136-DNS-200X.

3.2.2 CANH, CANL

These are the CAN communication bus signals.

3.2.3 SHIELD

Connect the network cable shield to this terminal. This terminal is snubbed to the PC chassis ground. The shield should be connected directly to earth ground at only one point in the network.

3.2.4 Module Power

The 24V DC Module power terminal provides power to the logic portion of the 5136-DNS-200X module as well as the expansion modules

3.2.5 Load Power

The 24V DC Load power terminal provides output power for the 5136-DNS-200X expansion modules.

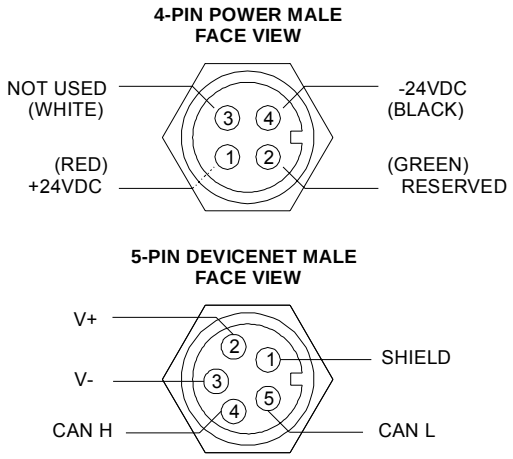
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3.2.6 Sealed Mini Connectors

The following diagram shows the pin-out used on the pre-wired sealed mini connectors available for the 5136-DNS-200X devices.



NOTE

Pin numbering shown for the 4-Pin Power receptacle is per the CENELEC EN 50 044 numbering convention.

3.2.7 LED Indicators

The 5136-DNS-200X has 4 LEDs that provide diagnostic information about the current state of the device and provide an indication of any faults. The Module Status, Network Status, and I/O Status LEDs conform to the behaviors defined in the DeviceNet Specification. The DC 24V Load led indicates the current state of load power.

Module Status LED

The Module Status LED indicates the current state of the device (5136-DNS-200X Adapter).

State	Description
Off	No power applied to device
Flashing Green	Device needs commissioning due to some configurationerror: • Invalid Parameter data • Invalid slot configuration data
Green	Device has initialized successfully and no errors were detected
Red	Unrecoverable Fault detected • Hardware Failure

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Network Status LED

The Network Status LED indicates the current state of the DeviceNet communications link.

State	Description
Off	Device is not online • DUP MAC ID test not yet complete • Device is not powered
Flashing Green	Device has completed, and passed, the Duplicate MAC ID test and is online No connections have been established with Master
Green	Device is online and allocated to a Master
Flashing Red	One or more connections are in the Timed-Out state
Red	Communications Failed • Excessive bus errors (Bus Off) • DUP MAC ID check failed

I/O Status LED

The I/O Status LED provides diagnostic information about the current state of the I/O under the control of the 5136-DNS-200X DeviceNet adapter module.

State	Description
Off	All outputs and inputs are inactive
Green	One or more outputs or inputs are active and under control(no faults present)
Flashing Green	One or more outputs or inputs are inactive (no faults present)
Flashing Red	One or more outputs or inputs are faulted

3.2.8 DC 24V Load

This LED provides diagnostic information about the current state of the load power.

State	Description
Off	Load power not present
Green	Load power present

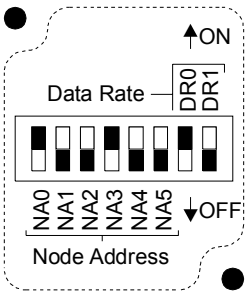
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3.3 Setting the Node Address and Data Rate

The node address (MAC ID) and data rate (baud rate) to be used by the device when communicating on the network are set via the 8 position DIP located underneath the DeviceNet connector assembly on the 5136-DNS-200X adapter module. Figure 1 below shows an example of a configuration with node address 9 and a data rate of 250K baud.



Hidden Switch Register label detail
(Under DeviceNet ™ Connector)

Figure 1

3.3.1 Node Address Configuration Options

Table 1 below shows the DIP switch positions for configuration of the node address.

DIP Switch Positions						MAC ID
NA5	NA4	NA3	NA2	NA1	NA0	(decimal)
OFF	OFF	OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
-	-	-	-	-	-	
OFF	OFF	ON	ON	ON	ON	15
OFF	ON	OFF	OFF	OFF	OFF	16
-	-	-	-	-	-	-
ON	ON	ON	ON	OFF	OFF	60
ON	ON	ON	ON	OFF	ON	61
ON	ON	ON	ON	ON	OFF	62
ON	ON	ON	ON	ON	ON	63

Table 1

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3.3.2 Data Rate Configuration Options

Table 2 below shows the DIP switch positions for configuration of the data rate.

DIP Switch Positions		data rate
DR1	DR0	
OFF	OFF	125K Baud
OFF	ON	250K Baud
ON	OFF	500K Baud
ON	ON	Invalid

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4

Operation

4.1 Overview

The 5136-DNS-200X DeviceNet Adapter is an IP67 compliant communications adapter for interfacing to Siemens ET200X Expansion Modules. It is a module device capable of operating out of the box without any special configuration software, but to take full advantage of advanced diagnostics and features, a configuration tool is required.

4.2 Operating Modes

The 5136-DNS-200X DeviceNet Slave Adapter operates in one of two modes: Automatic Configuration and User Configured.

4.2.1 Automatic Configuration Mode

When operating in Automatic Configuration mode, the 5136-DNS-200X DeviceNet Adapter configures its I/O sizes, module parameterization data and configuration data according to the combination of ET200X expansion modules present at power-up or reset.

- Expansion module parameter data cannot be specified
- DeviceNet Configuration Consistency Value is based on the automatically generated I/O configuration bytes
- I/O configuration cannot be verified – DeviceNet master is responsible for verifying configuration by examining I/O sizes. The adapter module is unable to differentiate modules of similar configuration types (i.e. 2A Discrete Output vs. a 0.5A Discrete Output module).

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- Slot object instance attributes are not settable
- No external tool is required for configuration (tool is still required for access to diagnostic information)
- I/O data format defined by combination of modules installed

4.2.2 User Configured Mode

When operating in User Configured mode the 200X DeviceNet adapter's I/O sizes, I/O module parameterization and I/O configuration are stored in non-volatile memory and accessed via the Slot Object.

- Expansion module parameter data can be modified allowing access to more advanced configuration options and diagnostics
- DeviceNet Configuration Consistency Value is based on the entire stored non-volatile configuration data
- I/O configuration is verified – mismatching I/O configurations results in an error. The Adapter is unable to differentiate modules of similar configuration types (i.e. 2A Discrete Output vs. a 0.5A Discrete Output module).
- Slot object instance attributes are settablecan be set providing no I/O connections are open
- External tool is required
  - Configuration data may be uploaded/downloaded/edited by SST configuration tool
- I/O data format defined by user via combination of modules configured



NOTE

Automatic Configuration mode is the default mode as shipped from the factory.

4.3 I/O Status Byte

Attribute 9 of the Adapter object allows you to enable or disable the generation of an additional I/O Status byte for detection of faults in the 5136-DNS-200S Adapter. If the *IoStatusEnable* attribute is TRUE (1) an additional status byte will be placed at the beginning of the input data packet, prior to any expansion module data. In the event of a fault the appropriate bit will be set in the status byte and the contents of the remainder of the I/O packet should be ignored. If a fault bit is set in the status byte the output data received by the Adapter module, from the Master, will be ignored.

If the *IoStatusEnable* attribute is FALSE (0) the input data packet contains only expansion module data as configured. In the event of a fault the Adapter module will transmit zero length I/O messages (no data) and the output data received from the Master will be ignored.

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4.4 Strobe I/O Operation

The strobe I/O protocol is intended for simple input-only devices. The maximum produced size across a strobe I/O connection, as defined by the DeviceNet protocol, is 8 bytes. The strobe I/O protocol has only a single bit of output data per device. The 200X adapter does not make use of it's output bit and can return up to a maximum of 8 bytes of input data depending on the configuration present.

IMPORTANT: Any configurations in which output data is required or in which the input data size exceeds 8 bytes will result in the disabling of the strobe I/O connection.

4.5 Configuration

- User configuration data is only accessible when the AutoConfig attribute in the 200X adapter object is false (0).
- Changes to user configuration data do not take effect until the device is reset (RESET service with data value of zero (0) to the identity object or a power cycle) or an I/O module is hot-swapped
- Changes to user configuration data are stored in non-volatile memory immediately (before the explicit message response is sent)
- Changes to configuration data that have not taken effect yet are indicated by the ConfigChanged attribute in the 200X adapter object – the next device reset will apply the changes and clear ConfigChanged
- User Configuration Data is not erased when going from User to Automatic Configuration Mode.

4.6 Configuration Consistency Value

The Configuration Consistency Value (CCV) is an indication of the current configuration within the device. If any configuration information changes which affects the behavior of the device (i.e. expansion modules removed, parameter data modified etc..) the CCV is updated.



NOTE

Because of the modular nature of the device and the method used to calculate the CCV it is not possible to guarantee that there will never be a duplicate CCV for 2 different configurations.

4.7 Data Compression

The 5136-DNS-200X Adapters do not support expansion module data compression.

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4.8 Faults / Diagnostics

4.8.1 Configuration Faults

Faults in the Expansion Module configuration/parameterization data are handled slightly differently depending on when they are detected. In any case the following occurs:

- 200X Adapter Object AdapterStatus attribute indicates the appropriate code
- Identity Object status attribute indicates a minor recoverable fault

Fault detected at powerup or as a result of a hot-swap when no I/O connections are open

- Any attempt to allocate I/O connections will be rejected by the device

Fault detected as a result of a hot-swap when one or more I/O connections are open

- I/O connection(s) produce zero-length data or, if the *IoStatusEnable* attribute is TRUE a fault will be indicated in the I/O Status byte at the beginning of the input data packet.
- Output data from master is ignored
- Any attempt to allocate I/O connections will be rejected by the device

4.8.2 Configuration Fault Recovery

Recovery from configuration faults is achieved by:

- Installing/removing I/O module(s) to make the actual configuration match the user-defined configuration
- And/or changing the configuration data to match the actual configuration and either restarting/resetting the adapter

4.8.3 Expansion Module Faults

Faults in Expansion Modules are reported as follows:

- Serious faults (as determined by the Adapter) force the produced I/O data to zero-length or, if the IoStatusEnable attribute is TRUE a fault will be indicated in the I/O Status byte at the beginning of the input data packet.
- The appropriate Slot Object instance SlotStatus attribute and Channel<n>Status attribute(s) indicate the nature of the fault
- I/O Status LED state will be Flashing Red

4.9 Module Hot Swap

The 5136-DNS-200X does not support Expansion Module hot-swap.

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5
Troubleshooting

5.1 Overview

The following section describes some typical problems scenarios and how to diagnose the problem:

5.1.1 Unable to Communicate with the Device

If you are unable to communicate with the device, please ensure that you have specified an appropriate MAC ID via the DIP Switches which does not conflict with any other devices on the network and that the correct Baud Rate has been configured. See section 5.1.5 for more information on detecting MAC ID or Baud Rate problems.

5.1.2 All of the LEDs are Off

It is necessary to provide module power top power connector on the front of the 200X Adapter. The 200X Adapter will not attempt to initialize until module power has been applied.

5.1.3 Module LED is Solid Red

If a Major Unrecoverable fault occurs the device will cease all communication on the network and the Module Status LED will be solid red. This condition could occur due to an invalid Baud Rate setting (both DR0 and DR1 set ON) or due to a hardware failure that prevents proper operation of the device.

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5.1.4 Module LED is Flashing Green

If the Module LED is flashing green, this is most likely due to a configuration error. In User Config mode this may indicate that an invalid Adapter parameter combination has been specified or the configuration specified by the Adapter Module does not match the actual expansion module configuration currently connected to the 200X Adapter.

5.1.5 Network Status LED is Solid Red

There are 2 cases in which the Network Status LED would be solid red. The first would be if the device fails the Duplicate MAC ID check sequence during power-up due to a conflicting node ID. The second reason for this condition is a Bus Off condition caused by excessive errors on the bus. This may be caused by an attempt to go online at an incorrect Baud Rate or due to excessive noise on the DeviceNet bus.

To attempt to recover from either condition simply remove the DeviceNet connector from the device and re-insert it again. The 200S device will detect the loss and re-application of Network power and re-initialize the CAN Chip and execute the Duplicate MAC ID sequence again. To prevent continuous failure of the DUP MAC Check you must either change the MAC ID of the 200X device or identify and re-configure the conflicting device.

5.1.6 Network Status LED Flashing Red

If the Network Status LED is flashing red one or more I/O connections are in the timeout state. In most cases if the master has unexpectedly stopped communicating with the device the Master/Slave connection set will automatically release when all connections have entered the timeout state based on the EPRs configured with the device during connection establishment. If for some reason any EPR was set to zero (0), the master slave connection set will not release automatically. In this case it may be necessary to cycle power to remove this condition.

5.1.7 I/O Status LED Flashing Red

If the I/O Status LED is flashing red one or more of the inputs/outputs are faulted. This may be caused by a diagnostic alarm due to a short circuit on an output module or a missing module due to hot swapping.

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6

Device Profile

6.1 Overview

The 5136-DNS-200X Adapter acts as a Group 2 Only Server for use within the Master/Slave environment on a DeviceNet network.

6.2 DeviceNet Compliance

The device:

- Complies with the DeviceNet Specification Volume I, Release 2.0
- Complies with the DeviceNet Specification Volume II, Release 2.0
- Operates as a Group 2 Only Server (non UCMM-capable)
- Supports Poll, Strobe, Cyclic, and Change-of-State I/O connections
- Supports Device Heartbeat messages
- Supports Explicit Messaging connection
- Supports Configuration Consistency Value

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6.3 Required Objects

This section describes the implementation of the objects required by the DeviceNet specification. Application specific objects are defined in the next section.

6.3.1 Identity Object

Class code 0x01

Class Attributes

No attributes are supported for the identity object at the class level.

Number of instances: 1

Instance 1 Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	Vendor	UINT	0008h
2	Get	Device Type	UINT	000Ch
3	Get	Product Code	UINT	019Eh (200X-8DI) 01A8h (200X-4DO)
4	Get	Revision Major Revision Minor Revision	Structure of: USINT USINT	 ? ?
5	Get	Status	WORD	Device_Status*
6	Get	Serial Number	UDINT	Unique 32 bit number
7	Get	Product Name String Length ASCII String	Structure of: USINT STRING	 16 "200X-8DI Adapter" or "200X-4DO Adapter"
9	Get	Configuration Consistency Value	UINT	?
10	Get/Set	Device Heartbeat Interval	USINT	0

* See Device_Status word definition below

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Device_Status

Bit(s)	Called	Definition
0	Owned	0 = not owned 1 = Group 2 allocated to a master
1	Reserved	Always 0
2	Configured	0 = "out-of-box" configuration 1 = Configuration modified (not including comms)
3	Reserved	Always 0
4, 5, 6, 7	Vendor Specific	Always 0
8	Minor Recoverable Fault	Minor configuration fault
9	Minor Non-recoverable Fault	Minor device fault (non-recoverable)
10	Major Recoverable Fault	Major configuration fault
11	Major Non-recoverable Fault	Major device fault (non-recoverable)
12, 13	Reserved	Always 0
14, 15	Reserved	Always 0

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single
0x05	No	Yes	Reset

6.3.2 DeviceNet Object

Class code 0x03

Class Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	Revision	UINT	2

Number of instances: 1

Instance 1 Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	MAC ID	USINT	Defined by switches
2	Get	Baud Rate	USINT	Defined by switches
5	Get/Special	Allocation Information Allocation Choice Byte Master's Node Address	Structure of: BYTE USINT	Allocation_Byte** 0-63 = master MAC 255 = unallocated

** See Allocation_Byte definition below

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Allocation_Byte

Bit(s)	Called	Definition
0	Explicit Message	Supported, 1 to allocate
1	Poll	Supported, 1 to allocate
2	Strobe	Supported, 1 to allocate
3	Reserved	Always 0
4	Change-of-State	Supported, 1 to allocate
5	Cyclic	Supported, 1 to allocate
6	Acknowledge Suppress	Supported, 1 to allocate
7	Reserved	Always 0

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	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

6.3.3 Connection Object

Class code 0x05

Class Attributes

No attributes are supported for the connection object at the class level.

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

Number of instances: 4

Instance 1 Attributes (Explicit Message Connection)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 3 = established
2	Get	Instance Type	USINT	0 = explicit message
3	Get	Transport Class Trigger	USINT	0x83
4	Get	Produced Connection ID	UINT	10XXXXXX011b X = Slave Mac ID
5	Get	Consumed Connection ID	UINT	10XXXXXX100b X = Slave Mac ID
6	Get	Initial Comm Characteristics	USINT	0x21

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7	Get	Produced Connection Size	UINT	7 non-fragmented X – fragmented
8	Get	Consumed Connection Size	UINT	7 non-fragmented X – fragmented
9	Get/Set	Expected Packet Rate	UINT	*default = 2500*
12	Get/Set	Watchdog Timeout Action	USINT	Default 0 = transition to timeout
13	Get	Produced Connection Path Length	UINT	0
14	Get	Produced Connection Path	Structure of:	null (no data)
15	Get	Consumed Connection Path Length	UINT	0
16	Get	Consumed Connection Path	Structure of:	null (no data)
17	Get	Production Inhibit time	UINT	0

Instance 2 Attributes (Polled I/O Connection, Polled with COS/Cyclic I/O Connection)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O message
3	Get	Transport Class Trigger	USINT	0x83
4	Get	Produced Connection ID	UINT	01111XXXXXXb X = Slave Mac ID
5	Get	Consumed Connection ID	UINT	10XXXXXX101b X = Slave Mac ID
6	Get	Initial Comm Characteristics	USINT	0x01
7	Get	Produced Connection Size	UINT	*Configuration dependent*
8	Get	Consumed Connection Size	UINT	*Configuration dependent*
9	Get/Set	Expected Packet Rate	UINT	*Default = 0*
12	Get	Watchdog Timeout Action	USINT	0 = timeout 1 = Auto Delete 2 = Auto Reset *Default = 0*
13	Get	Produced Connection Path Length	UINT	6
14	Get	Produced Connection Path Logical Segment, Class Class Number Logical Segment, Instance Instance Number Logical Segment, Attribute Attribute Number	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x64 0x30 0x03
15	Get	Consumed Connection Path Length	UINT	6
16	Get	Consumed Connection Path	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x65 0x30 0x03
17	Get	Production Inhibit time	UINT	0

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Instance 2 Attributes (COS/Cyclic Consuming I/O Connection, Acknowledged)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O message
3	Get	Transport Class Trigger	USINT	0x83
4	Get	Produced Connection ID	UINT	01111XXXXXXb X = Slave Mac ID
5	Get	Consumed Connection ID	UINT	10XXXXXX101b X = Slave Mac ID
6	Get	Initial Comm Characteristics	USINT	0x01
7	Get	Produced Connection Size	UINT	0
8	Get	Consumed Connection Size	UINT	*Configuration dependent*
9	Get/Set	Expected Packet Rate	UINT	*Default = 0*
12	Get	Watchdog Timeout Action	USINT	0 = timeout 1 = Auto Delete 2 = Auto Reset *Default = 0*
13	Get	Produced Connection Path Length	UINT	0
14	Get	Produced Connection Path	Structure of:	Empty
15	Get	Consumed Connection Path Length	UINT	6
16	Get	Consumed Connection Path	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x65 0x30 0x03
17	Get	Production Inhibit time	UINT	0

Instance 2 Attributes (COS/Cyclic Consuming I/O Connection, Unacknowledged)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O message
3	Get	Transport Class Trigger	USINT	0x80
4	Get	Produced Connection ID	UINT	0xFFFF
5	Get	Consumed Connection ID	UINT	10XXXXXX101b X = Slave Mac ID
6	Get	Initial Comm Characteristics	USINT	0xF1 (slave does not produce)
7	Get	Produced Connection Size	UINT	0
8	Get	Consumed Connection Size	UINT	*Configuration dependent*
9	Get/Set	Expected Packet Rate	UINT	*Default = 0*

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12	Get	Watchdog Timeout Action	USINT	0 = timeout 1 = Auto Delete 2 = Auto Reset *Default = 0*
13	Get	Produced Connection Path Length	UINT	0
14	Get	Produced Connection Path	Structure of:	Empty
15	Get	Consumed Connection Path Length	UINT	6
16	Get	Consumed Connection Path	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x65 0x30 0x03
17	Get	Production Inhibit time	UINT	0

Instance 3 Attributes (Strobed I/O Connection)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O message
3	Get	Transport Class Trigger	USINT	0x83
4	Get	Produced Connection ID	UINT	01110XXXXXXb X = Slave Mac ID
5	Get	Consumed Connection ID	UINT	10XXXXXX000b X = Masters MAC ID
6	Get	Initial Comm Characteristics	USINT	0x02
7	Get	Produced Connection Size	UINT	*Configuration dependent*
8	Get	Consumed Connection Size	UINT	*8*
9	Get/Set	Expected Packet Rate	UINT	*Default = 0*
12	Get	Watchdog Timeout Action	USINT	0 = Timeout (default) 1 = Auto Delete 2 = Auto Reset
13	Get	Produced Connection Path Length	UINT	6
14	Get	Produced Connection Path** Logical Segment, Class Class Number Logical Segment, Instance Instance Number Logical Segment, Attribute Attribute Number	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x64 0x30 0x03
15	Get	Consumed Connection Path Length	UINT	0
16	Get	Consumed Connection Path	Structure of:	NULL(no data)
17	Get	Production Inhibit time	UINT	0

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Instance 4 Attributes (COS/Cyclic Producing I/O Connection, Acknowledged)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O message
3	Get	Transport Class Trigger	USINT	For a cyclic connection 02h or 03h. For a change of state connection 12h or 13h.
4	Get	Produced Connection ID	UINT	01101XXXXXXb X = Slave MAC
5	Get	Consumed Connection ID	UINT	10XXXXXX010b X = Slave MAC
6	Get	Initial Comm Characteristics	USINT	0x01
7	Get	Produced Connection Size	UINT	*Configuration dependent*
8	Get	Consumed Connection Size	UINT	0 (zero length acknowledge)
9	Get/Set	Expected Packet Rate	UINT	Default = 0
12	Get	Watchdog Timeout Action	USINT	0 = Timeout (default) 1 = Auto Delete 2 = Auto Reset
13	Get	Produced Connection Path Length	UINT	6
14	Get	Produced Connection Path Logical Segment, Class Class Number Logical Segment, Instance Instance Number Logical Segment, Attribute Attribute Number	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x64 0x30 0x03
15	Get	Consumed Connection Path Length	UINT	4
16	Get	Consumed Connection Path	Structure of: USINT USINT USINT USINT	 0x20 0x2B 0x24 0x01
17	Get/Set	Production Inhibit time	UINT	0

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Instance 4 Attributes (COS/Cyclic I/O Producing Connection, Unacknowledged)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	State	USINT	0 = nonexistent 1 = configuring 3 = established 4 = timed out
2	Get	Instance Type	USINT	1 = I/O message
3	Get	Transport Class Trigger	USINT	For a cyclic connection 02h or 03h. For a change of state connection 12h or 13h.
4	Get	Produced Connection ID	UINT	01101XXXXXXb X = Slave MAC
5	Get	Consumed Connection ID	UINT	0xffff
6	Get	Initial Comm Characteristics	USINT	0x0F (slave does not consume)
7	Get	Produced Connection Size	UINT	*Configuration dependent*
8	Get	Consumed Connection Size	UINT	0
9	Get/Set	Expected Packet Rate	UINT	Default = 0
12	Get	Watchdog Timeout Action	USINT	0 = timeout 1 = Auto Delete 2 = Auto Reset *Default = 0*
13	Get	Produced Connection Path Length	UINT	6
14	Get	Produced Connection Path Logical Segment, Class Class Number Logical Segment, Instance Instance Number Logical Segment, Attribute Attribute Number	Structure of: USINT USINT USINT USINT USINT USINT	 0x20 0x04 0x24 0x64 0x30 0x03
15	Get	Consumed Connection Path Length	UINT	0
16	Get	Consumed Connection Path	Structure of:	Empty
17	Get/Set	Production Inhibit time	UINT	0

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

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6.3.4 Acknowledge Handler Object

Class code 0x2B

Class Attributes

No attributes are supported by the acknowledge handler object at the class level.

Number of instances: 1

Instance 1 Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get/Set	Acknowledge Timer	UINT	Default = 16
2	Get	Retry Limit	USNT	1
3	Get	COS/CYC Producing Connection Instance ID	USINT	4

6.4 Application Specific Objects

6.4.1 Assembly Object

Class code 0x04

Class Attributes

No attributes are supported for the assembly object at the class level.

Number of instances: 2

Instance 100 (64h) Attributes (vendor-specific input assembly)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
3	Get	Data Value	Array of USINT	Size dependent on configuration

Instance 101 (65h) Attributes (vendor-specific output assembly)

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
3	Get	Data Value	Array of USINT	Size dependent on configuration

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single

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6.4.2 200X Adapter Object

Class code 0x64

The 200X Adapter Object provides the external configuration and monitoring interface to the 5136-DNS-200X adapter.

Class Attributes

No attributes are supported for the identity object at the class level.

Number of instances: 1

Instance 1 Attributes

Attribute ID	Access Rule	Name	DeviceNet Data Type	Data Value
1	Get	AdapterStatus	USINT	Adapter Status (see below)
2	Get	InputSize	USINT	Currently configured input assembly size
3	Get	OutputSize	USINT	Currently configured output assembly size
4	Get/Set	AutoConfig	BOOL	Automatic Configuration Mode 1 Automatic configuration, the rack self-configures based on the modules installed 0 Manual Configuration, the rack configuration is stored in non-volatile memory
5	Get	ConfigChanged	BOOL	True if manual configuration changes have been made but have not taken effect (changes will take effect at next reset)
6	Get	Diagnostic String	ARRAY of USINT [65]	An array of USINT containing slot diagnostics. The first byte of the array indicates the number of valid diagnostic bytes within the array (remaining bytes within the array can be ignored).
7	Get	ConfiguredSlots	USINT	Indicates the number of configured slot objects
8	Get/Set	HeadParameters	200X -Array of USINT[3]]	Configuration information for expansion modules and adapter module behavior.
9	Get/Set	IoStatusEnable	BOOL	See Semantics
10	Get/Set	HeadParamByte1	USINT	See Semantics
11	Get/Set	HeadParamByte2	USINT	
12	Get/Set	HeadParamByte3	USINT	
13	Get/Set	HeadParamByte4	USINT	
14	Get/Set	HeadParamByte5	USINT	
15	Get/Set	HeadParamByte6	USINT	
16	Get/Set	HeadParamByte7	USINT	
17	Get/Set	HeadParamByte8	USINT	
18	Get/Set	HeadParamByte9	USINT	
19	Get/Set	HeadParamByte10	USINT	
20	Get/Set	HeadParamByte11	USINT	
21	Get/Set	HeadParamByte12	USINT	

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22	Get/Set	HeadParamByte13	USINT	
23	Get/Set	HeadParamByte14	USINT	
24	Get/Set	HeadParamByte15	USINT	
25	Get/Set	HeadParamByte16	USINT	
26	Get/Set	HeadParamByte17	USINT	
27	Get/Set	HeadParamByte18	USINT	
28	Get/Set	HeadParamByte19	USINT	

Semantics

Attribute 1 [AdapterStatus] Details

The AdapterStatus attribute reports the status of the 200X Adapter and expansion modules.

Bit	Name	Description
0		Reserved
1	Parameters Rejected	One or more expansion modules rejected the parameters specified by its slot object
2	Config. Rejected	One or more expansion modules rejected the configuration byte specified by its slot object
3	Extended Module Diagnostics	One or more expansion modules is reporting an error
4-7		Reserved

Attribute 9 [IoStatusEnable] Details

The IoStatusEnable attribute enables/disables the generation of a single I/O status byte at the beginning of the input data I/O packet. This status byte indicates if any faults have occurred which would result in invalid data. The format of the I/O status byte is shown below:

I/O Status Byte Format

Bit							
7	6	5	4	3	2	1	0
Reserved							Fault

The default value for this attribute is enabled (1).

NOTE

The I/O Status byte feature is only available in firmware revision 1.012 or newer. For firmware revisions 1.016 and later this attribute is enabled (1) by default. For firmware revisions prior to 1.016, which supported the I/O Status byte the default value was 0.

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Attributes 10-28 [HeadParamByte(n)] Details

The HeadParamByte attributes provide single byte (USINT) access to the elements of the HeadParameters attribute (attribute 8) for access via tools not supporting complex data type representation. Modification of either the HeadParameters will affect all the corresponding HeadParamByte attributes and visa versa.

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

6.4.3 200X Slot Object

Class code 0x65

The 200X Slot Object provides the external configuration and monitoring interface to the I/O module in one 200X slot. One instance of this object exists for each available slot.

Class Attributes

No attributes are supported for the identity object at the class level.

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Number of instances: 11

Instance Attributes

Attribute ID	Need in Implementation	Access Rule	Name	DeviceNet Data Type	Data Value
1	Required	Get/Set[1,2]	ModuleReference	UINT	For configuration tool use.
2	Required	Get/Set[1,2]	ParameterSize	USINT	Number of parameter bytes required by this slot
3	Required	Get/Set[2]	Parameters	Array of USINT	Parameter bytes for this slot – array size is set by attribute 2
4	Required	Get/Set[2]	ConfigByte	USINT	Configuration byte for this slot
5	Required	Get	SlotStatus	USINT	Slot status code (see below)
6	Required	Get	Channel0Status	USINT	Channel status code (see below)
7	Required	Get	Channel1Status	USINT	
8	Required	Get	Channel2Status	USINT	
9	Required	Get	Channel3Status	USINT	
10	Required	Get	Channel4Status	USINT	
11	Required	Get	Channel5Status	USINT	
12	Required	Get	Channel6Status	USINT	
13	Required	Get	Channel7Status	USINT	
14	Required	Get	Channel0Type	USINT	Channel type code (see below) ***The Channel Type code is zero if the corresponding Channel Status code is zero***
15	Required	Get	Channel1Type	USINT	
16	Required	Get	Channel2Type	USINT	
17	Required	Get	Channel3Type	USINT	
18	Required	Get	Channel4Type	USINT	
19	Required	Get	Channel5Type	USINT	
20	Required	Get	Channel6Type	USINT	
21	Required	Get	Channel7Type	USINT	
22	Conditional	Get/Set	ParamByte1	USINT	See Semantics
23	Conditional	Get/Set	ParamByte2	USINT	
24	Conditional	Get/Set	ParamByte3	USINT	
25	Conditional	Get/Set	ParamByte4	USINT	
26	Conditional	Get/Set	ParamByte5	USINT	
27	Conditional	Get/Set	ParamByte6	USINT	
28	Conditional	Get/Set	ParamByte7	USINT	
29	Conditional	Get/Set	ParamByte8	USINT	
30	Conditional	Get/Set	ParamByte9	USINT	
31	Conditional	Get/Set	ParamByte10	USINT	
32	Conditional	Get/Set	ParamByte11	USINT	
33	Conditional	Get/Set	ParamByte12	USINT	
34	Conditional	Get/Set	ParamByte13	USINT	
35	Conditional	Get/Set	ParamByte14	USINT	
36	Conditional	Get/Set	ParamByte15	USINT	
37	Conditional	Get/Set	ParamByte16	USINT	
38	Conditional	Get/Set	ParamByte17	USINT	
39	Conditional	Get/Set	ParamByte18	USINT	
40	Conditional	Get/Set	ParamByte19	USINT	
41	Conditional	Get/Set	ParamByte20	USINT	
42	Conditional	Get/Set	ParamByte21	USINT	
43	Conditional	Get/Set	ParamByte22	USINT	
44	Conditional	Get/Set	ParamByte23	USINT	

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45	Conditional	Get/Set	ParamByte24	USINT	
46	Conditional	Get/Set	ParamByte25	USINT	
47	Conditional	Get/Set	ParamByte26	USINT	
48	Conditional	Get/Set	ParamByte27	USINT	
49	Conditional	Get/Set	ParamByte28	USINT	
50	Conditional	Get/Set	ParamByte29	USINT	
51	Conditional	Get/Set	ParamByte30	USINT	
52	Conditional	Get/Set	ParamByte31	USINT	
53	Conditional	Get/Set	ParamByte32	USINT	

1 ***When Adapter Object AutoConfig attribute is true****: These attributes reflect the non-volatile configuration parameters and are not used by the adapter, Setting this attribute returns OBJECT_STATE_CONFLICT*

2 ***When an I/O connection is open****: Setting this attribute returns OBJECT_STATE_CONFLICT*

Attribute 5 [SlotStatus] Details

The SlotStatus attribute reports the operating status of the module installed.

Status Code	Text	Description
0	OK	Module is operating normally
1	Module Error	
2	Wrong Module	
3	No Module	Slot is empty – no module installed
4-255		Reserved

Attribute 6-13 [Channel<n>Status] Details

The Channel<n>Status attributes report the operating status of each channel in the module.

Status Code	Text	Description
0	No Error	Channel is either not used or operating normally
1	Short	
2	Under Voltage	
3	Over Voltage	
4	Overload	
5	Excess Temperature	
6	Wire Break	
7	Upper Limit Exceeded	
8	Lower Limit Exceeded	
9	Error	
10-15		Reserved
16-31		Manufacturer specific error codes
32-255		Reserved

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Attribute 14-21 [Channel<n>Type] Details

The Channel<n>Type attributes provide additional detail when the corresponding Channel<n>Status is reporting an error.

Status Code	Text	Description
0	n/a	Reported when corresponding Channel<n>Status is reporting "No Error"
1	Bit	1 bit channel
2	2 Bit	2 bit channel
3	4 Bit	4 bit channel
4	Byte	8 bit channel
5	Word	16 bit channel
6	2 Word	32 bit channel
7-255		Reserved

Attributes 22-53 [ParamByte(n)] Details

The ParamByte attributes provide single byte (USINT) access to the first 32 elements of the *Parameters* attribute (attribute 3) for access via tools not supporting complex data type representation. Modification of the *Parameters* attribute will affect all the corresponding ParamByte attributes and visa versa. The DNS-200X limits the slot object's ParameterSize attribute to a maximum value of 32.



NOTE

Each of the ParamBytes attributes are conditional based on the size specified in attribute 2, *ParameterSize*. ParamByte attributes with and index larger than the *ParameterSize* are non-existent and will return an *Attribute Not Supported* error if accessed.

Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	No	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

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7

Technical Information

7.1 General Technical Information

Measurements and Weight	**200X**
Measurements W x H x D (mm)	134 x 110 x 55
Weight (grams)	522
Module-specific data	
Number of inputs, outputs	8DI or 4DO
Unshielded cable length	30 m max.
Voltages, Currents, and Potentials	
Input Voltage	
Module voltage (Class 2 power supply)	24 VDC
Load voltage (Class 2 power supply)	24 VDC
• Reverse polarity protection	Yes - module voltage No - load voltage
Current Consumption	
• From input voltage - total (adapter module + bus modules)	To 40 ºC, 1 A max. To 55 ºC, 0.8 A max.
• From input voltage - adapter module only	200 mA max.
• From the module bus (through adapter module)	To 40 ºC, 0.8A @ 24 VDC max To 55 ºC, 0.6A @ 24 VDC max.

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• From load voltage - total (ET200X + output modules on module bus)	To 40 ºC, 10 A max. To 55 ºC, 8 A max.
• From load voltage - ET200X-4O only	To 40 ºC, 6 A max. To 55 ºC, 4 A max.
Electrical Isolation	
Insulation test voltage	500 VDC
Between backplane bus and electronic components	No
Between channels and backplane bus	No – inputs Yes - outputs
Between channels and supply voltage for electronic components	No – inputs Yes - outputs
Between channels	No
Between load power supply and all other circuit components	NA - inputs Yes – outputs
Between DeviceNet™ and all other circuit components	Yes
Permissible Potential Difference	
Between different circuits	75 VDC, 60 VAC
Module power dissipation	4 W max.

NOTE

24 VDC power for module power, network interface power, input current and output load current is provided by user-supplied Class 2 power supplies. The 5136-DNS-200X routes 24 VDC from the adapter module and load power connections to modules on the module bus. Power for 24 VDC inputs may be drawn directly from the input connectors. Additional power modules may be added for more 24 VDC output load current if the adapter module load current limit is exceeded.

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7.1.1 200X-8DI Technical Data

200X Inputs	
Sensor Supply Output	
Number Outputs	4
Current	To 40 ºC, 0.8 A max. To 55 ºC, 0.6 A max.
Short circuit protection	Yes, electronic
Sensor Selection Data	
Number Inputs	8
Input Voltage	
Rated value	24 VDC
With signal "1"	13 to 30 V
With signal "0"	-3 to 5 V
Input Current	
With Signal "1"	7 mA typ.
Input Delay	
From "0" to "1"	1.2 to 4.8 ms
From "1" to "0"	1.2 to 4.8 ms
Input Characteristics	To IEC 1131, Type 2
Connection of 2-wire BEROs	Possible
Permissible closedcircuit current	1.5 mA max.

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7.1.2 200X-4DO Technical Data

ET200X Outputs	
Sensor Selection Data	
Number Outputs	4
Output Voltage	
With signal "1"	Load voltage -0.8 V min.
Output Current*	To 40 C max. 0.8A To 55 C max. 0.6A
With signal "1" rated value Permissible range	2 A 5 mA to 2.4 A
With signal "0" (residual current)	0.5 mA max.
Load Resistance Range	12 Ohms to 4k Ohms
Lamp Load	10 W max.
Parallel connection of 2 outputs	
For redundant control of load	Possible (outputs of same basic module only)
For performance improvement	Not possible
Driving a digital input	Possible
Switching Frequency	
Resistive load	100 Hz max.
Inductive load to IEC947-5-1, DC13	0.5 Hz max
Lamp load	1 Hz max.
Limitation (internal) of voltage induced on circuit interruption	Load voltage - 47 V typ.
Short-circuit protection for output	Yes, electronic
Response threshold	3 A typ.

* Please note total current per 200X Head Module

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8

General Technical Specifications

8.1 What Are General Technical Specifications?

The general technical specifications comprise the standards and test specifications that the 5136-DNS-200X distributed I/O device complies with and fulfills and the criteria on the basis of which the 5136-DNS-200X distributed I/O device was tested. This description covers models 5136-DNS-200X-4DO and 5136-DNS-200X-8DI.

8.1.1 Standards, Certificates, Approvals

Introduction

This chapter contains the following information about the components of the 5136-DNS-200X:

- The most important standards that the 5136-DNS-200X complies with
- The certificates and approvals of the 5136-DNS-200X

DeviceNet™ Standard

The 5136-DNS-200X distributed I/O device is based on DeviceNet™ Specifications Volume I, Release 2.0 and Volume II, Release 2.0.

IEC 1131

The 5136-DNS-200X distributed I/O device fulfills the requirements and criteria of IEC 1131, Part 2.

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CE Marking

The 5136-DNS-200X distributed I/O device meets the requirements and protection objectives of the following EC Directives and complies with the harmonized European Standards (EN) that have been published in the Official Gazettes of the European Community for programmable logic controllers:

- 89/336/EEC "Electromagnetic Compatibility" (EMC Directive)
- 73/23/EEC "Electrical Equipment for Use Within Fixed Voltage Ranges" (Low Voltage Directive)

The EC declarations of conformity are being kept available for cognizant authorities at:

Siemens AG

Automation & Drives AS E4

Postfach 1963

D-92209 Amberg, Germany

UL Listed

UL Listed Mark

Underwriters Laboratories (UL) based on:

- UL 508 standard, file no. E75310.

CSA Certification

CSA Certification Mark

Canadian Standard Association (CSA) based on:

- Standard C22.2 No. 142-M1987, file no. 1051830 (LR44226).

FM Approval

FM Approval Mark

Factory Mutual System (FM) based on:

- Approved Standard Class Number 3611, Class I, Division 2, Group A, B, C, D, file no. J.I. 3006711.

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WARNING

Explosion Hazard

Death, serious injury or property damage may be incurred in hazardous areas if you disconnect plug and socket connections while the 5136-DNS-200X distributed I/O device is operating.

Always deenergize the 5136-DNS-200X Adapter in hazardous areas before disconnecting plug and socket connections.

ODVA (DeviceNet™) Compliance

Compliant with ODVA Conformance Testing at an independent ODVA approved conformance test lab.

8.1.2 Electromagnetic Compatibility and Shipping and Storage Conditions

Definition

Electromagnetic compatibility is the capacity of an electrical device to function satisfactorily in its electromagnetic environment without interfering with this environment.

The 5136-DNS-200X distributed I/O device also meets the requirements of the European Union's EMC legislation, among others. A requirement for this is that the 5136-DNS-200X distributed I/O system meets the specifications and directives concerning electrical installation.

Pulse-Shaped Interference

The following table shows the electromagnetic compatibility of the 5136-DNS-200X distributed I/O device when confronted with pulse shaped interference:

Pulse-Shaped Interference	Tested With	Corresponds to Severity
Electrostatic discharge in accordance with IEC 801-2	8 kV 6 kV 4 kV	3 (air discharge) 3 (contact discharge) 2 (contact discharge)
Burst pulses (rapid, transient interference) in accordance with IEC801-4	2 kV (supply line) 2 kV (signal line)	3 3
Surge in accordance with IEC 801-5 with external lightning protection elements only (refer to External Lightning Protection following General Technical Specifications)		
Symmetrical interconnection	2 kV (supply line) 2 kV (signal line)	3 3
Asymmetrical interconnection	1 kV (supply line) 1 kV (signal line)	3 3

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Sine-Shaped Interference

The following table shows the electromagnetic compatibility of the 5136-DNS-200X distributed I/O device when confronted by sine-shaped interference.

RF Radiation to EN 61000-4-3 (corresponds to IEC 801-3) Electromagnetic RF Field	RF Coupling to EN 61000-4-6 (corresponds to IEC 801-6)
80 to 1000 MHz 1.4 to 2 GHz	0.15 to 80 MHz
10 V/M	10 V_{rms} unmodulated
80% AM (1 kHz)	80% AM (1 kHz)
	150 Ω source impedance

Emission of Radio Interference

Emitted interference of electromagnetic fields in accordance with EN 55011: Limit Value Class A, Group 1 (measured at a distance of 10 m).

Frequency	Emitted Interference
From 30 to 230 MHz	< 40 dB (mV/m)Q
From 230 to 1000 MHz	< 47 dB (mV/m)Q

Shipping and Storage Conditions

The 5136-DNS-200X distributed I/O device exceeds the requirements of IEC 1131, Part 2 as regards shipping and storage conditions. The following specifications apply to modules shipped or stored in their original packaging.

Type of Condition	Permissible Range
Free fall	≤ 1 m
Temperature	From -40 °C to +60 °C
Temperature Variation	20 °C/h
Relative humidity	From 5 to 95% without condensation

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8.1.3 Mechanical and Climatic Environmental Conditions

Climatic Environmental Conditions

The following climatic environmental conditions apply:

Environmental Conditions	Operating Ranges	Remarks
Temperature	From 0 to 55 °C	For horizontal installation
	From 0 to 40 °C	For all other installation positions
Temperature variation	10 °C/h	
Relative humidity	From 15 to max. 95%	

Testing Mechanical Environmental Conditions

The following table provides information on the type and extent of tests of mechanical environmental conditions.

Test	Test Standard	Details of Test
Oscillations (during operation)	Oscillation test to IEC 68 Part 2-6 (sine)	Oscillation type: frequency sweeps with a rate change of 1 octave per minute. 10 Hz < f < 58 Hz, constant amplitude of 0.075 mm. 58 Hz < f < 150 Hz, constant acceleration of 1 g. Oscillation time: 10 sweeps per axis on all 3 perpendicular axes.
Shock (during operation)	Shock test to IEC 68 Part 2-27	Type of shock: half sine. Force of shock: 15 g peak value, 11 ms duration Direction of shock: 5 shocks per +/- direction in 3 perpendicular axes
Oscillations (during transport)	Oscillation test to IEC 68 Part 2-6 (sine)	Oscillation type: frequency sweeps with a rate change of 1 octave per minute. 5 Hz < f < 9 Hz, constant amplitude of 3. 5 mm. 9 Hz < f < 500 Hz, constant acceleration of 1 g. Oscillation time: 10 sweeps per axis on all 3 perpendicular axes.
Shock (during transport)	Shock test to IEC 68 Part 2-29	Type of shock: half sine. Force of shock: 25.5 g peak value, 6 ms duration Direction of shock: 500 shocks per +/- direction in 3 perpendicular axes

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8.1.4 Information on Insulation Testing, Safety Class, Degree of Protection and Rated Voltage for 5136-DNS-200X

Test Voltage

Insulation strength is demonstrated in the routine test with the following test voltage in accordance with IEC 1131, Part 2:

Circuits with Rated Voltage U_e to Other Circuits and Ground	Test Voltage
0 V < U_e ≤ 50 V	500 V DC

Rated Voltage for Operation

The 5136-DNS-200X distributed I/O device works with the rated voltage and corresponding tolerances specified in the following table:

Rated Voltage	Tolerance Range
24 VDC	20.4 to 28.8 V DC

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