Series SD6 Limit with DeviceNet

DeviceNet Communications

This appendix describes the DeviceNet protocol as it is implemented in the Series SD6 controller. It primarily describes the objects and attributes accessible via the DeviceNet protocol. It may be necessary to refer to the DeviceNet specification as a compliment to the information found here.

DeviceNet Overview

The SD6 controller supports the object-based modeling used in the DeviceNet concepts. This product is configured as a Group 2 Only Slave device using the Predefined Master/Slave Connection Set.

There are two main categories of objects, DeviceNet Objects and Application Objects. DeviceNet objects handle what is necessary for networking and communications. Application Objects have access to the SD6 controller's parameters and data.

Addressing

All data is referenced based upon a four-part definition: Node (MAC ID) + Class + Instance + Attribute.

Table 1. Four Components to an Address, with Ranges

Node Address (MAC ID)	**[0 to 63]**
Class ID	[1 to 255]
Instance ID	[0 to 255]
Attribute ID	[1 to 255]

Data Types

The descriptions of attributes in the following sections include the data type for each. Table 5 lists and describes these data types.

Table 2. Descriptions of DeviceNet Elementary Data Types used by the Series SD

Data Type Name	Data Type Description
BOOLEAN	Logical Boolean with values TRUE and FALSE
BYTE	Bit string — 8 bits
EPATH	DeviceNet path segments
INT	Signed 16-bit integer value
SHORT_STRING	Character string (1 byte per character, 1 byte length indicator)
UDINT	Unsigned 32-bit integer value
UINT	Unsigned 16-bit integer value
USINT	Unsigned 8-bit integer value

Group 2 Only Server

A slave (server) device that is UCMM incapable and must use the Predefined Master/Slave Connection Set to establish communications (at a minimum, the Predefined Master/Slave Explicit Messaging Connection must be supported). A Group 2 Only device can transmit and receive only those identifiers defined by the *Predefined Master/Slave Connection Set*.

Master/Slave Connections

The SD6 supports the *Predefined Master/Slave Connection Set*. The general model calls for the utilization of an Explicit Messaging Connection to manually create and configure Connection Objects within each connection endpoint. This chapter uses the general model as a basis for the definition of a set of connections that facilitate communications typically seen in a master-slave relationship. These Connections are referred to collectively as the *Predefined Master/Slave Connection Set*.

The **master** is the device that gathers and distributes I/O data for the process controller. **Slaves** are the devices from which the master gathers I/O data and to which the master distributes I/O data. The master "owns" the slaves whose MAC IDs appear in its scan list. To determine with what slaves it will communicate, the master examines its scan list and sends commands accordingly. Except for the Duplicate MAC ID Check, a slave cannot initiate any communication before being told by the master to do so.

Electronic Data Sheet (EDS)

The EDS allows a configuration tool to automate the device configuration process. The EDS specification provides an open standard for device configuration and compatibility among all DeviceNet products. (Refer to the DeviceNet Specification). You can obtain a copy of the EDS at www.watlow.com and search on keywords *SD EDS,* request a copy by sending an e-mail to wintechsupport@watlow.com or by calling an Application Engineer at +1 (507) 494-5656 between 7 a.m. and 5 p.m. Central Standard Time (CST).

DeviceNet Objects

The following sections describe the standard DeviceNet objects and the SD6-specific application objects.

Identity Object

Class Code: 01hex

The Identity object provides identification information for the device. This includes the device manufacturer, product name, product type, serial number and DeviceNet Rev.

Table 3. Identity Object Revision History

Revision	Description
01	Initial Release

Table 5. Identity Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	Vendor ID	UNIT	Identification of each vendor by number. Watlow's Vendor ID 153	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2
2	Get	Product Type	UNIT	Identification of general type of product. This is Type 0 (Generic Device).	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2
3	Get	Product Code	UNIT	Watlow SD6L-XXXA-DNXX, CODE IS 103 WATLOW SD6L-XXXA-DSXX, CODE IS 102	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2
4	Get	Revision	STRUCT of:	Revision of the item the Identity Object represents	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2
5	Get	Status	WORD	Summary status of device	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2
6	Get	Serial Number	UDINT	Serial number of device Set in accordance with Watlow manufacturing guidelines.	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2
7	Get	Product Name	SHORT_STRING	Human readable ID: Watlow SD6L-DS Watlow SD6L-DN	See "Semantics" DeviceNet Spec, Vol. II, Sec. 6-2.2

Class Services: NONE

Instance Services:

- RESET (O,1)   GET ATTRIBUTE SINGLE

DeviceNet Object

Class Code: 03hex

The DeviceNet Object is used to provide the configuration and status of a physical attachment to DeviceNet.

The *MACID* attribute provides the network address for the device. If the rotary switches used to specify the device MACID are set to a valid MACID, i.e. a value from 0 to 63, the MACID attribute shall have Get Only access. If the rotary switches are set to the programmable mode, the MACID attribute shall have Get and Set access.

The *Baud Rate* attribute specifies the data rate for the device. If the rotary switch used to set the data rate specifies a valid data rate, i.e. 125, 250, or 500K Baud, the Baud

Rate attribute shall have Get Only access. If the rotary switches are set to the software programmable mode, the MACID shall have Get and Set access. The *Allocate Master/Slave Connection Set* service of the DeviceNet object shall be a required service for all devices. This implies a requirement that all devices are Group 2 devices on the DeviceNet network. Additionally, all devices shall support, as a minimum, the Explicit connection and the I/O Poll connection in the Master/Slave connection set.

The *Release Master/Slave Connection Set* service of the DeviceNet object shall be a required service.

Table 6. DeviceNet Object Revision History

Revision	Description
01	Initial Release
02	Modification of Baud Rate Attribute Behavior

Table 7. DeviceNet Object Class Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The revision level of this object. This is now at 2.

Table 8. DeviceNet Object Instance Attributes

0Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get/Set*	MACID	USINT	Node Address	Range 0 - 63
2	Get/Set*	Baud Rate	USINT	Baud Rate	(0) 500k Baud (default for DS) (1) 250k Baud (2) 125k Baud (default for DN)
3	Get	BSI	BOOLEAN	Bus off Interupt	Always zero
4	Get	Bus-Off Counter	USINT	Number of times CAN went tothe bus-off state	Range 0 - 255
5	Get	Allocation Information	STRUCT of:		
		Allocation Choice Byte	BYTE	See DeviceNet specification	
		Master's MAC ID	USINT	MAC ID of Master (from Allocate)	Range 0..63, 255 Modified via Allocate only
6 *	Get	MAC ID Switch Changed	BOOLEAN	The node address switches have changed since last power-up or reset.	(0) - No change (1) - Changed
7 *	Get	Baud Rate Switch Changed	BOOLEAN	The baud rate switches have changed since last power-up or reset.	(0) - No change (1) - Changed
8 *	Get	MAC ID Switch Value	USINT	Actual value of node address switch setting.	0 - 99
9 *	Get	Baud Rate Switch Value	USINT	Actual value of baud rate switch setting.	0 - 9

* NOTE: These parameters are only present on the SD6L-XXXA-DSXX.

Class Services: GET ATTRIBUTE SINGLE

Instance Services: *SET ATTRIBUTE SINGLE (when MACID or BAUD RATE in PRG MODE), GET ATTRIBUTE SINGLE, ALLOCATE M/S CONNECTION SET, RELEASE M/S CONNECTION SET.

Assembly Object – "Static"

Class Code: 04hex

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection. Assembly objects can be used to bind input data or output data. The terms "input" and "output" are defined from the network's point of view.

An input will produce data on the network and an output will consume data from the network.

The term "Static" implies: assemblies with member lists defined by the device profile or by the manufacturer of the product. The Instance number, number of Members, and member list are fixed.

Table 9. Assembly Object Revision History

Revision	Description
01	Initial Release
02	Class-specific Service Code 4B and 4C obsolete

Table 10. Assembly Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Instance	Semantics of Values
3	Get	Data	Array of BYTES	See description below	See description below

Instance #	Access Rule	Name	DeviceNet Data Type	Description of Instance	Semantics of Values
100	Set	Poll Output	DINT + DINT + USINT	Poll Output (PLC to Controller)	See Table 11.
101	Get	Poll Input	USINT + DINT + USINT	Poll Input (i.e. Controller to PLC)	See Table 12.

Poll Connection

The poll connection allows the master to write set point and process value in one connection. It also allows the reading of all process value, set point and alarm status.

Table 11. Static Input – Instance 101 in the Assembly Object (total of 6 bytes)

Byte	Parameter and Description	Size of Data	Range
0	Exception Status Byte Byte reserved for future use. (Required byte for Semiconductor-Sig)	USINT	Always returns a value of zero.
1-4	Process Value Actual value of process input	DINT	-1999.000 to 9999.000

5	Alarm Status
	    Indicates when alarm outputs are in alarm condition.
	
	    Breakdown of byte:
	        bit 0: limit low 1 status
	        bit 1: limit high 1 status
	        bit 2: limit or alarm low 2 status
	        bit 3: limit or alarm high 2 status
		USINT	For each bit:
			    (0) None
			    (1) Limit / Alarm

Table 12. Static Output – Instance 100 in the Assembly Object (total of 9 bytes)

Byte	Parameter and Description	Size of Data	Range
0-3	Limit 1 Low Low limit set point for output 1.	DINT	-1999.000 to 9999.000
4-7	Limit 2 High High limit set point for output 1.	DINT	-1999.000 to 9999.000
8	Set Point Control Breakdown of byte: Bit 0 : Selects whether setting output 1's set points is done via the SD front panel or through DeviceNet.	USINT	(0) DeviceNet (1) SD front panel

Class Services: NONE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE

Connection Object

Class Code: 05hex

The Connection Class allocates and manages the internal resources associated with both I/O and Explicit Messaging Connections. The specific instance generated by the Connection Class is referred to as a Connection Instance or a Connection Object.

A Connection Object within a particular module actually represents one of the end-points of a Connection. It is possible for one of the Connection end-points to be configured and "active" (e.g., transmitting) without the other end-point(s) being present. Connection Objects are used to model the communication specific characteristics of a particular application-to-application relationship.

A specific Connection Object Instance manages the communication-specific aspects related to an end-point.
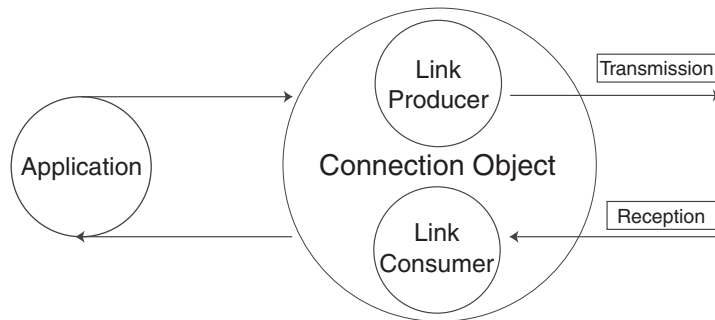
Explicit Connection

The Explicit Connection Object defines the configuration for the Explicit connection to the device. The Explicit Connection object is an instance of the Connection Object defined in the DeviceNet Specification.

I/O Connection

I/O Connection objects define the configuration for the I/O connections to the device. Each I/O Connection object is an instance of the Connection object defined in the *DeviceNet Specification*. All devices must be Group 2 devices and must support, as a minimum, the I/O Poll connection in the Master/Slave connection set.

Watchdog Timeout Action Attribute defines the action performed by the I/O Connection object in the event the Inactivity/watchdog Timer for the connection expires. For the I/O Connection object, Auto Reset shall be an invalid value for the Watchdog Timeout Action attribute.

Produced Connection Path Attribute defines the Application object class, instance, and attribute that produces data over the I/O connection. For all I/O connections, the Produced Connection Path shall be a Logical Segment, as defined in the DeviceNet Specification, and shall point to the Data Attribute of an Assembly object. The behavior of the device shall be such that, if the Produced Connection Path attribute is modified, the **Produced Connection**

Size Attribute shall be modified internally to accurately reflect the size of the assembly produce by the I/O connection. For all I/O connection objects in the Master/Slave Connection Set, if the Produced Connection Path attribute is modified, the new attribute value shall be saved in Non-Volatile (NV) memory and shall be the default value when the connection is allocated.

Produced Connection Size Attribute specifies the maximum number of data bytes produced over the I/O connection. The Produced Connection Size attribute shall have *Get Only* access for all I/O connection objects. The Produced Connection Size attribute shall accurately reflect the size of the assembly produced over the I/O connection.

Consumed Connection Path Attribute defines the Application object class, instance, and, optionally, attribute that consumes data received over the I/O connection. For all I/O connections over which the device is the Server (as specified by the Direction field of the Transport Class Trigger attribute), then special requirements as defined in the Semi SIG specification shall be followed.

Consumed Connection Size Attribute specifies the maximum number of data bytes consumed by the I/O connection objects. The Consumed Connection Size attribute shall accurately reflect the size of the assembly consumed by the I/O connection, as specified by the Consumed Connection Path attribute of the Data With ACK Path List attribute of the Acknowledge Handler object.

Table 13. Connection Object Revision History

Revision	Description
01	Initial Release

Table 14. Connection Object Class Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values

Table 15. Connection Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	State	USINT	State of the object	
2	Get	Instance Type	USINT	Indicates either I/O or Messaging	
3	Get	Transport Class Trigger	BYTE	Defines behaviour of the Connection	
4	Get	Produced Connection ID	UINT	Placed in CAN Identifier Field when the Connection transmits	
5	Get	Consumed Connection ID	UINT	CAN Identifier Field value that denotes message to be received	
6	Get	Initial Comm Characteristics	BYTE	Defines the Message Group(s) across which productions and consumption associated with this Connection when it occurs	
7	Get	Produced Connection Size	UNIT	Maximum number of bytes transmitted across this Connection	
8	Get	Consumed Connection Size	UNIT	Maximum number of bytes received across this Connection	
9	Get/Set	Expected Packet Rate	UNIT	Will round up to the next 100 mSec. Increment.	
12	Get/Set (set for explicit messaging only)	Watchdog Timeout Action	USINT	Defines how to handle Inactivity/Watchdog timeouts	For Explicit Connection only: 1 = Auto Delete 3 = Deferred Delete

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
13	Get	Produced Connection Path Length	UINT	Number of bytes in the Produced Connection Path Attribute	
14	Get	Produced Connection Path	EPATH	Specifies the Application Object(s) whose data is to be produced by this Connection Object.	
15	Get	Consumed Connection Path Length	UINT	Number of bytes in the Consumed Connection Path Length	
16	Get	Consumed Connection Path	EPATH	Specifies the Application Object(s) that are to receive data consumed by this Connection Object.	

Class Services: NONE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE
- 0x05   RESET SERVICE

S-Device Supervisor Object

(applies to SD6L-XXXA-DSXX only)

Class Code: 30hex

This object models the interface, functions, and behavior associated with the management of the device. The Semi SIG has many optional parameters for the supervisor object and we are only listing those parameters that we support.

Table 16. S-Device Supervisor Object Revision History

Revision	Description
01	Initial Release

Table 17. S-Device Supervisor Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
3	Get	Device Type	SHORT_ STRING	ASCII text describing the device	
4	Get	SEMI Standard Revision Level	SHORT_ STRING	Revision level of the SEMI S/A network standard to which the device complies	E54-0997
5	Get	Manufacturer's Name	SHORT_ STRING	ASCII text	Watlow
6	Get	Manufacturer's Model Number	SHORT_ STRING	Device model number	
7	Get	Software Revision Level	SHORT_ STRING	ASCII text of current software revision	See your specific SD
8	Get	Hardware Revision Level	SHORT_ STRING	ASCII text of current hardware revision	See your specific SD
9	Get	Manufacturer's Serial Number	SHORT_ STRING	ASCII text of serial number	See your specific SD
10	Get	Device Configuration	SHORT_ STRING	ASCII text of additional device	DeviceNet Limit
11	Get	Device Status	USINT	Current statua of the device	Always returns zero
12	Get	Exception Status	BYTE	Current statua of the device	Always returns zero
15	Get	Alarm Enable	BOOLEAN	Enables setting of exception bits for alarms	(0) - Disabled (1) - Enabled
16	Set	Warning Enable	BOOLEAN	Enables setting of exception bits for warnings	(0) - Disabled (1) - Enabled

Class Services: NONE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE
- 0x05   RESET SERVICE

Home Object

Class Code: 64hex

The Home Object provides access to parameters used for the default display of the Series SD6L Home Page.

Table 18. Home Object Revision History

Revision	Description
01	Initial Release

Table 19. Home Object Class Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The revision level of this object (currently 1)
2	Get	Max Instance	UINT	Max allowed Instances of this object	Always 1 for this Class

Table 20. Home Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
100	Get	Process Value	DINT	Current process value	-1999.999 to 9999.999
101	Get/Set	Limit 1 High Set Point	DINT	High Limit set point for Output 1	Range is from set point low limit to set point high limit Default 75 (*1000)
102	Get	Filtered Process Value	DINT	Filtered process value	-1999.999 to 9999.999 (* 1000), C or units
104	Get	Limit Low 1 Status	BOOLEAN	Low limit at output 1	(0) None (1) Limit
105	Get	Limit High 1 Status	BOOLEAN	High limit at output 1	(0) None (1) Limit
106	Get	Input Error	INT	There is an analog input error	(0) No error (10001) Sensor under range error (10002) Sensor over range error
107	Get	Limit / alarm Low 2 Status	BOOLEAN	Low limit at output 2	(0) None (1) Limit/alarm
108	Get	Limit / alarm High 2 Status	BOOLEAN	High limit at output 2	(0) None (1) Limit/alarm

Class Services:

- 0x0E   GET ATTRIBUTE SINGLE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE

Setup Object

Class Code: 65hex

The Setup Object provides access to parameters that define controller functions. These are the parameters found through the front panel on the Setup Page.

Table 21. Setup Object Revision History

Revision	Description
01	Initial Release

Table 22. Setup Object Class Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The revision level of this object (currently 1)
2	Get	Max Instance	UINT	Max allowed Instances of this object	1 for this Class

Table 23. Setup Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
100	Get/Set	Sensor Type	USINT	Analog input sensor type	(0) Thermocouple (default) (1) RTD (2) MA (3) VOLT (5) mV
101	Get/Set	Thermocouple Linearization	USINT	Thermocouple Type	(0) J (default for DN) (1) K (default for DS) (2) T (3) E (4) N (5) C (6) D (7) PTII (8) R (9) S (10) B
102	Get/Set	Temperature Units	BOOLEAN	Temperature Units	(0) °F (default for DN) (1) °C (default for DS)
103	Get/Set	Temperature Decimal Places	BOOLEAN	Thermocouple/RTD precision	(0) 0 (default) (1) 0.0
104	Get/Set	Process Decimal Places	USINT	Process precision	(0) 0 (default) (1) 0.0 (2) 0.00 (3) 0.000
105	Get/Set	InfoSense™	BOOLEAN	Enables the sensor feature, which synchronizes the controller with a Watlow sensor	(0) NO (default) (1) YES
106	Get/Set	InfoSense™ 1	INT	Set sensor point 1 code	0 to 999 (default is 500)
107	Get/Set	InfoSense™ 2	INT	Set sensor point 2 code	0 to 999 (default is 500)
108	Get/Set	InfoSense™ 3	INT	Set sensor point 3 code	0 to 999 (default is 500)

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
109	Get/Set	InfoSense™ 4	INT	Set sensor point 4 code	0 to 999 (default is 500)
110	Get/Set	Process Scale Low mA	DINT	Set the low scale for process input	1.00 to 20.00 mA (∗ 1000) (when Sensor Type set to mA, default = 4.00 mA)
111	Get/Set	Process Scale Low Volts	DINT	Set the low scale for process input	0.50 to 10.00 V (* 1000) (when Sensor Type set to Volt, default = 1.00 V)
112	Get/Set	Process Scale High mA	DINT	Set the high scale for process input	1.00 to 20.00 mA (* 1000) (when Sensor Type set to mA, default = 20.00 mA)
113	Get/Set	Process Scale High Volts	DINT	Set the high scale for process input	0.50 to 10.00 V (* 1000) (when Sensor Type set to Volt, default = 5.00 V)
114	Get/Set	Units Scale Low	DINT	Set the low range for process input units	-1999 to 9999 (* 1000) (default = -1999)
115	Get/Set	Units Scale High	DINT	Set the high range for process input units	-1999 to 9999 (* 1000) (default = 9999)
116	Get/Set	Set Point Low Limit Thermocouple	DINT	Set the low range for the set point	Minimum operating range (of sensor) to Set Point High Limit – 0.001 (if Sensor Type = Thermocouple, default = min. for default sensor (* 1000)
117	Get/Set	Set Point Low Limit RTD	DINT	Set the low range for the set point	-328 to Set Point High Limit – 0.001 (if Sensor Type = RTD, default = -328) (* 1000)
118	Get/Set	Set Point Low Limit mA and volts	DINT	Set the low range for the set point	-1999 to Set Point High Limit – 0.001 (if Sensor Type = V or mA, default = -1999) (* 1000)
119	Get/Set	Set Point High Limit Thermocouple	DINT	Set the high range for the set point	Set point low limit to max operating range of sensor, if Input Type = Thermocouple (default = max operating range for K-Thermocouple) (* 1000)
120	Get/Set	Set Point High Limit RTD	DINT	Set the high range for the set point	Set Point Low Limit + 0.001 to 1472, if Input Type = RTD (default = 1472) (* 1000)

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
121	Get/Set	Set Point High Limit mA and volts	DINT	Set the high range for the set point	Set Point Low Limit + 0.001 to 9999, if Input Type = mA or Volt (default = 999) (* 1000)
122	Get/Set	Input Filter	USINT	Select filtering action	(0) OFF (no filtering, default) (1) Filter display only (2) Filter control input only (3) Filter both
123	Get/Set	Filter Value	UDINT	Set the input filter value, units in seconds	0.0 to 60.0 (default = 0.0) seconds (* 1000)
124	Get/Set	Output 1 Function	USINT	Set the output 1 function	(0) OFF (2) Limit (default)
125	Get/Set	Output 1 Limit Sides	USINT	Selects output 1 limit active sides	(0) both (default) (1) high side (2) low side
126	Get/Set	Limit 1 hysteresis	DINT	Sets the hysteresis for the limit on output 1	0.0 to 999.0 (* 1000) 1.0 (default)
136	Get/Set	Output 2 Function	USINT	Set the output 2 function	(0) OFF (default) (1) Process Alarm (2) Limit
137	Get/Set	Output 2 Sides	USINT	Selects output 2 limit active sides	(0) both (default) (1) high side (2) low side
138	Get/Set	Output 2 hysteresis	DINT	Sets the hysteresis for the limit on output 2	0.0 to 999.0 (* 1000) 1.0 (default)
139	Get/Set	Output 2 Logic	BOOLEAN	Output condition in the alarm state	(0) closed (default) (1) open
150	Get/Set	Alarm 2 Latching	BOOLEAN	Turn alarm latching on or off.	(0) OFF (default) (1) ON
151	Get/Set	Alarm 2 Silencing	BOOLEAN	Turn alarm silencing on or off.	(0) No silencing (default) (1) Silencing

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
152	Get/Set	Alarm 2 Message	BOOLEAN	Display an alarm message when an alarm is active.	(0) OFF (no message) (1) ON (default)
153	Get/Set	Upper Display Look	USINT	Select what value appears in the upper display	(0) - None (1) - Process (2) - Limit 1 low (3) - Limit 1 high (default) (4) - Limit 2 low (5) - Limit 2 high (6) - Alarm 2 Low (7) - Alarm 2 High
154	Get/Set	Lower Display Look	USINT	Selects what value appears in the lower display	(0) - None (1) - Process (2) - Limit 1 low (3) - Limit 1 high (default) (4) - Limit 2 low (5) - Limit 2 high (6) - Alarm 2 low (7) - Alarm 2 high
155	Get	Analog Input Error Latching	BOOLEAN	Select whether input errors are latched.	(0) Non-latching (default) (1) Latching
161	Get/Set	Lockout	USINT	Set the security level for the user interface.	(0) No Lockout (default) (1) Programming and setup page locked (2) Programming and setup page locked. Only limit setpoints accessible (3) Full lockout
162	Set	Limit Acknowledge for output 1	BOOLEAN	Clears limit condition for output 1.	(0) No (1) Yes
163	Set	Limit or Alarm Acknowledge for output 2	BOOLEAN	Clears alarm or limit condition for output 2.	(0) No (1) Yes
165	Get/Set	Analog Input mV Scale Low	DINT	Sets low scale for millivolt inputs.	5.00 to 50.00 mV (default 5.00)
166	Get/Set	Analog Input mV Scale High	DINT	Sets high scale for millivolt inputs.	5.00 to 50.00 mV (default 50.00)
167	Get/Set	Process Milliamp Low Error	DINT	Sets the low threshold for input errors when using milliamp inputs	1.00 to 10.00 mA (default 1.00)
170	Get/Set	Process Milliamp High Error	DINT	Sets the high threshold for input errors when using milliamp inputs	10.00 to 20.00 mA (default 20.00)

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
168	Get/Set	Process Volts Low Error	DINT	Sets the low threshold for input errors when using voltage inputs	0.50 to 5.00 V (default 0.50)
171	Get/Set	Process Volts High Error	DINT	Sets the high threshold for input errors when using voltage inputs	5.00 to 10.00 V (default 10.00)
169	Get/Set	Process Millivolt Low Error	DINT	Sets the low threshold for input errors when using millivolt inputs	5.00 to 25.00 mV (default 5.00)
172	Get/Set	Process Millivolt High Error	DINT	Sets the high threshold for input errors when using millivolt inputs	25.00 to 50.00 mV (default 50.00)

Class Services:

- 0x0E   GET ATTRIBUTE SINGLE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE

Operational Object

Class Code: 66hex

Operational Object

The Operational Object access parameters used during normal day-to-day operation. These are parameters that normally appear as part of the Operations Page when using the controller's front panel.

Table 24. Revision History

Revision	Description
01	Initial Release

Table 25. Operational Object Class Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The revision level of this object (currently 1)
2	Get	Max Instance	UINT	Max allowed Instances	Always 1 for this Class

Table 26. Operational Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
100	Get/Set	Calibration Offset	DINT	Offset the input reading.	-999 to 999 (X 1000) (default = 0)
132	Get/Set	Limit 1 Low	DINT	Low limit / alarm set point for output 1	Range is from set point low limit to set point high limit Default 74 (*1000)
133	Get/Set	Limit 1 High	DINT	High limit / alarm set point for output 1	Range is from set point low limit to set point high limit Default 75 (*1000)
134	Get/Set	Limit / alarm 2 Low	DINT	Low limit / alarm set point for output 2	Limit: Range is from set point low limit to set point high limit Default 74 (*1000) Alarm: Range of sensor if Sensor Type is set to TC or RTD (default = 74.000) -1999 to 9999 (x1000) if Sensor Type is set to mA or Volt. (default = 74.000)
135	Get/Set	Limit / alarm 2 High	DINT	High limit / alarm set point for output 2	Limit: Range is from set point low limit to set point high limit Default 75.000 Alarm: Range of sensor if Sensor Type is set to mA or Volt. (default = 75.000)

Class Services:

- 0x0E   GET ATTRIBUTE SINGLE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE

Factory/Calibration Object

Class Code: 67hex

Factory/Calibration Object

The Factory/Calibration Object provides access to parameters that contain diagnostics information, calibration and restore-parameter functions.

Table 27. Factory/Calibration Revision History

Revision	Description
01	Initial Release

Table 28. Factory/Calibration Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
100	Get	Ambient Temperature	DINT	Displays the current calculated ambient temperature.	-50.0 to 300.0 F (*1000)
102	Get/Set	Restore Factory Calibration	BOOLEAN	Replaces the user calibration parameters with the factory calibration parameters.	(0) NO (default) (1) YES
103	Get/Set	Restore User Settings	USINT	Restores the customer-configured settings.	(0) NO (default) (1) User Set 1 (2) User Set 2
104	Get/Set	Save User Settings	USINT	Saves the current customer-configured settings.	(0) NO (default) (1) User Set 1 (2) User Set 2
105	Get/Set	Default Parameters	BOOLEAN	Reset all parameters to their default values.	(0) NO (default) (1) YES
106	Get	Output 1 Type	USINT	Displays the hardware type for Output 1.	(0) None (1) DC/Open Col. (2) Mech. Relay (3) S.S. Relay (4) Process
107	Get	Output 2 Type	USINT	Displays the hardware type for Output 2.	(0) None (1) DC/Open Col. (2) Mech. Relay (3) S.S. Relay (4) Process
108	Get	Software ID	INT	Software ID number	0 to 9999
109	Get	Software Build Number	INT	Software built number	0 to 9999 Build Number

Table 29. Factory/Calibration Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
110	Get	Serial Number	DINT	Serial number	0 to 99999999
111	Get	SW Release Version	INT	Release version	
112	Get	SW Prototype Version	INT	Prototype version	
113	Get	SW Branch Number	INT	Branch number	
114	Get	Upper ASCII Display	INT	Upper ASCII Display	
115	Get	Upper ASCII Display	INT	Upper ASCII Display	
116	Get	Upper ASCII Display	INT	Upper ASCII Display	
117	Get	Upper ASCII Display	INT	Upper ASCII Display	
118	Get	Upper ASCII Display	INT	Upper ASCII Display	
119	Get	Lower ASCII Display	INT	Lower ASCII Display	
120	Get	Lower ASCII Display	INT	Lower ASCII Display	
121	Get	Lower ASCII Display	INT	Lower ASCII Display	
122	Get	Lower ASCII Display	INT	Lower ASCII Display	
123	Get	Lower ASCII Display	INT	Lower ASCII Display	
124	Get	Discrete LEDs	INT	Discrete LEDs	
125	Get	Lower Display Flash	INT	Lower Display Flash	
126	Get	Part Name	INT	'SL'	
127	Get	Constant	INT	55	
128	Get	Constant	INT	AA	
129	Get	Constant	INT	'12'	
130	Get	Constant	INT	'34'	

Class Services:

- 0x0E   GET ATTRIBUTE SINGLE

Instance Services:

- 0x0E   GET ATTRIBUTE SINGLE
- 0x10   SET ATTRIBUTE SINGLE

Programmable Object

Class Code: 68hex

Programmable Object

The Programmable Object determines what parameters appear on the Operations Page.

Table 30. Programmable Object Revision History

Revision	Description
01	Initial Release

Table 31. Programmable Class Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
1	Get	Revision	UINT	Revision of this object	The revision level of this object (currently 1)
2	Get	Max Instance	UINT	Max allowed Instances of this object	Always 1 for this Class

Table 29. Programmable Object Instance Attributes

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
100	Get/set	P1	USINT	Programmable Parameter Location 1	L1.Lo
101	Get/set	P2	USINT	Programmable Parameter Location 2	L1.Hi
102	Get/Set	P3	USINT	Programmable Parameter Location 3	L2.Lo
103	Get/Set	P4	USINT	Programmable Parameter Location 4	L2.Hi
104	Get/Set	P5	USINT	Programmable Parameter Location 5	A2.Lo
105	Get/Set	P6	USINT	Programmable Parameter Location 6	A2.Hi
106	Get/set	P7	USINT	Programmable Parameter Location 7	Addr
107	Get/set	P8	USINT	Programmable Parameter Location 8	bAud

Attribute #	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of Values
108	Get/set	P9	USINT	Programmable Parameter Location 9	None
109	Get/set	P10	USINT	Programmable Parameter Location 10	None
110	Get/set	P11	USINT	Programmable Parameter Location 11	None
111	Get/set	P12	USINT	Programmable Parameter Location 12	None
112	Get/set	P13	USINT	Programmable Parameter Location 13	None
113	Get/set	P14	USINT	Programmable Parameter Location 14	None
114	Get/set	P15	USINT	Programmable Parameter Location 15	None
115	Get/set	P16	USINT	Programmable Parameter Location 16	None

Class Services:

• 0x0E   GET ATTRIBUTE SINGLE

Instance Services:

• 0x0E   GET ATTRIBUTE SINGLE
• 0x10   SET ATTRIBUTE SINGLE