

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

CDN115
DEVICENET
SPECIFICATIONS

29011520 Revision 2.0 07/99

CDN115 DeviceNet Specifications

Table of Contents

Overview 1

Hardware 2
- Processor 2
- DeviceNet Interface 2
- Digital I/O 3
- Analog Inputs 3
- Analog Outputs 3
- Power Distribution 4
- Switches and Indicators 4
  - MacID/BaudRate Option 1 5
  - MacID/BaudRate Option 2 5
- Connectors 5
  - P2 I/O Header 5
  - DB-44 I/O Connector 6
  - Front Panel Interface Header 6
- DeviceNet Micro Connector 7

Specifications 8

Firmware 9
- DeviceNet Message Types 9
- DeviceNet Class Services 9
  - DeviceNet Object Classes 10

Identity Object Class Code: 01 (0x01) 11
- Identity Object Class Attributes 11
- Identity Object Instance Attributes 11
- Identity Common Services 11
- Identity Object Attributes 12
  - Product Code – Attribute 3 12
  - Revision Information – Attribute 4 12
  - Device Status – Attribute 5 12
  - Serial Number – Attribute 6 12
  - Device Name – Attribute 7 13

Device State – Attribute 8 13

Router Object Class Code: 02 (0x02) 14
Router Object Class Attributes 14
Router Object, Instance 1 Attributes 14
Router Common Services 14

DeviceNet Object Class Code: 03 (0x03) 15
DeviceNet Object Class Attributes 15
DeviceNet Object, Instance 1 Attributes 15
DeviceNet Object Common Services 15
DeviceNet Object Attributes 15
MacID – Attribute 1 15
Data Rate – Attribute 2 16
Bus Off Interrupt – Attribute 3 16
Bus Off Counter – Attribute 4 16
Allocation Byte – Attribute 5 16
Mac Switch Changed – Attribute 6 16
Baud Switch Changed – Attribute 7 17
Mac Switch Value – Attribute 8 17
Baud Switch Value – Attribute 9 17

Assembly Object Class Code: 04 (0x04) 18
Assembly Object Class Attributes 18
Assembly Object, Instance 100 Attributes 18
Assembly Object, Instance 101 Attributes 18
Assembly Object Common Services 18
Assembly Instance 100 19
Device Status 19
Digital Inputs 19
Pad Byte 19
Analog Inputs 19
Assembly Instance 101 19
Digital Outputs 19
Pad Byte 19
Analog Outputs 20

Connection Object Class Code: 05 (0x05) 21
Connection Object Class Attributes 21
Connection Object, Instance 1 Attributes (Explicit Message) 21

Connection Object, Instance 2 Attributes (POLL connection) 22
Connection Object Common Services 22

Discrete Input Point (DIP) Object Class Code: 08 (0x08) 24
DIP Object Class Attributes 24
DIP Object, Instance 1..16 Attributes 24
DIP Common Services 24
Input State – Attribute 3 24

Discrete Output Point (DOP) Object Class Code: 09 (0x09) 25
DOP Object Class Attributes 25
DOP Object, Instance 1..16 Attributes 25
DOP Common Services 25
Output State – Attribute 3 25
Fault State – Attribute 5 26
Fault Value – Attribute 6 26
Idle State – Attribute 7 26
Idle Value – Attribute 8 26

Analog Input Point (AIP) Object ..... Class Code: 1(
AIP Object Class Attributes 27
AIP Object, Instance 1..2 Attributes 27
AIP Common Services 27
AIP Object Attributes 27
Value - Attribute 3 27
Range – Attribute 7 27
Type – Attribute 8 27

Analog Output Point (AOP) Object Class Code: 11 (0x0B) 28
AOP Object Class Attributes 28
AOP Object, Instance 1..2 Attributes 28
AOP Common Services 28
AOP Object Attributes 28
Value – Attribute 3 28
Range – Attribute 7 29
Type – Attribute 8 29
Fault State – Attribute 9 29
Idle State – Attribute 10 29
Fault Value – Attribute 11 30
Idle Value – Attribute 12 30

CDN115 DeviceNet Specifications

Device Supervisor Object Class Code: 48 (0x30) 31
- Device Supervisor Object Class Attributes 31
- Configuration Object, Instance 1 Attributes 31
- Device Supervisor Object Common Services 31
- Device Supervisor Object Attributes 31
  - Manufacturer Model – Attribute 6 31
  - Software Revision – Attribute 7 32
  - Hardware Revision – Attribute 8 32
  - Device Status – Attribute 9 32
  - Exception Status – Attribute 12 32
  - Alarm Enable – Attribute 15 33
  - Warning Enable – Attribute 16 33

Configuration Object Class Code: 64 (0x40) 34
- Configuration Object Class Attributes 34
- Configuration Object, Instance 1 Attributes 34
- Configuration Object Common Services 34
- Configuration Reset Service 34
- Configuration Object Attributes 35
  - Mode Byte – Attribute 1 35
  - Num Digital Input – Attribute 2 36
  - Num Digital Output – Attribute 3 36
  - Num Analog Input – Attribute 4 36
  - Num Analog Output – Attribute 5 36
- Poll Packet Sizes 37

CDN115 DeviceNet Specifications

Revision History

Revision	Description	Date
1.0	First Release	11/97
2.0	Added Configuration Object Added Device Supervisor Object Upgraded to Version 2.0 of ODVA objects	07/99

CDN115 DeviceNet Specifications

Overview

The CDN115 (Multifunction I/O) device operates as a slave on the DeviceNet network. The unit supports Explicit Messages and Polled I/O Messages of the predefined master/slave connection set. It does not support the Explicit Unconnected Message Manager (UCMM).

The CDN115 includes a CCO Virtual Processor Object, 4 CCO Timers, 4 CCO Counters and 4 CCO Comparators. These objects allow self-contained combinatorial logic to be performed locally on the node without intervention from a remote MASTER device.

A Virtual Processor Object defines an environment in which a series of instructions are executed to perform simple control algorithms. A Virtual Processor Object includes the instruction storage, the control and status registers, the operating stack and storage registers used by the program.

The CCO Counter object provides a presetable down counter.

The CCO Timer object provides a presetable timer.

The CCO Comparator object provides a general purpose comparator.

Refer to the CDN115 CCO Specifications manual for further information.

CDN115 DeviceNet Specifications

Hardware

The CDN115 is available as both a board level controller as well as packaged in an extruded aluminum housing.

When used as a board level controller the DeviceNet interface, MacID/BaudRate switches, a user 'reset' signal and the DeviceNet status LED's are available on a Front Panel Interface Header compatible to the DIP298 and DIP398 Front panel assemblies, allowing these functions to be remotely mounted from the unit.

A third allows the CDN115 to be used as a 'daughter' board. In these applications the Front Panel Interface signals and the I/O signals are available on headers which my connect to a user supplied base module.

Processor

The CDN115 is implemented using a Motorola MC68HC705X32 processor which provides RAM (500 bytes), Flash (256 bytes) and E2PROM (32 Kbytes). The hardware platform supports downloadable application code through an asynchronous serial connection port. The processor power on reset/monitoring is implemented with an external DS1233 power monitor.

The processor section is powered from an isolated DC-DC power supply powered from the regulated +5 Vdc derived from the DeviceNet power. The Processor section is isolated from the Digital I/O and analog I/O subsystems.

DeviceNet Interface

The DeviceNet interface is connected through an 82C251 CAN transceiver. The Can transceiver is powered from a DC-DC converter driven by the DeviceNet power. The DeviceNet signals are routed a Front Panel Interface Header assembly for board level applications.

Rotary switches are provided to select the MacID and the Baud Rate. The MacID and Baud Rate signals are brought to the Front Panel Interface Header for board level applications.

Standard Red/Green DeviceNet Network and Module status LED's are mounted on the front of the board.

CDN115 DeviceNet Specifications

Digital I/O

The Digital I/O is optically coupled to the processor. The active low MIC59P60 output drivers are interfaced through a serial bit interface. The individual outputs will support up to 200 mA loads per channel. Based on package dissipation the maximum fully loaded output current is 100 mA (8 outputs) at 50 ^{o}C ambient. Each output is thermally protected for short circuit (500 mA typically) and includes under voltage protection. The output Fault State is accessible through software. External schottky diodes are provided for output transient protection and each I/O point is protected with a self-resetting poly fuse rated for 200 mA. Outputs default to the OFF condition during power up and processor reset conditions.

The digital output read back signals (inputs) are active low, with current limiting resistors setting the short circuit current to 6 mA at 24 Vdc. The inputs are designed to retain the OFF State with currents below 2 mA and to ensure an ON state with currents above 4 mA. Each input circuit includes an indicator LED in series with the detection opto coupler. Both the detection opto coupler and the indicator LED are protected with a shunt diode against reverse voltage breakdown.

The digital I/O circuitry is powered from an on board +24 Vdc power source. The control power for the output drivers is derived from a linear +12 Vdc regulator. The +24 Vdc power is protected with a self-resetting poly fuse rated at 2.5 Amps and a 36 transient suppressor.

The digital I/O signals and +24 Vdc power is connected directly to the I/O connector.

Analog Inputs

The Analog inputs are coupled directly to the processor and are implemented using a LTC1298 dual channel, 12 bit A/D. High impedance (1 Mohm) input buffering is provided including a low pass filter (16 hertz). The analog inputs are connected directly to the I/O Interface connector. The voltage reference for the output channel is supplied by an LT1121 precision reference.

The analog input circuitry is powered from an on board +/- 15 Vdc power source. The +15 and -15 Vdc power is protected with a self-resetting poly fuse rated at 100 mA.

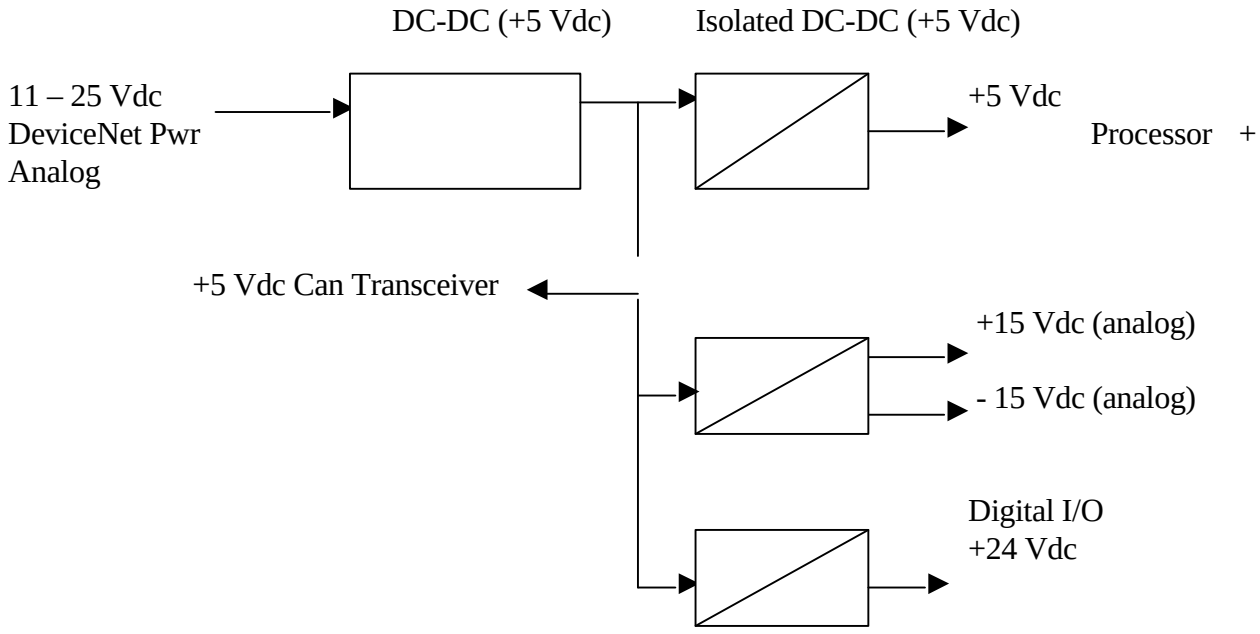
Analog Outputs

The analog outputs are implemented using two LTC1257 single channel 12 bit D/A's with a 0 to 10 Vdc output range. The output drivers are capable of driving 2 Kohm (5 mA) output loads. The analog output signals are connected directly to the I/O Interface connector. Analog outputs default to 0 volts during power up and processor reset conditions.

The analog output power is derived from the same +/- 15 Vdc power used for the analog inputs. The voltage reference for the output channel is supplied by an LT1021 precision reference.

Power Distribution

Power for the module is derived from the DeviceNet power (11 – 25 Vdc). Isolated DC-DC converters are used to derive secondary power requirements and to maintain isolation between the subsystems. The analog circuitry requires +/- 15 Vdc and is fully isolated from the processor. The Digital I/O circuitry is fully isolated from the Processor and Analog I/O and is powered by an onboard +24 Vdc source.



Switches and Indicators

The CDN115 includes 8 Green I/O status LED's which are wired directly to the I/O points. The LED is ON if the corresponding I/O point is ON.

CDN115 DeviceNet Specifications

Two DeviceNet indicators are provided, Network Status and Device Status per the ODVA DeviceNet specification.

MacID/BaudRate Option 1

Two BCD switches (S1 and S2) are installed on the board to allow setting the MacID. Values greater than 63 result in the switch being disabled and the last valid switch value will be used. The switches are read only during power up.

A BCD switch (S3) is installed on the board to allow setting the Data Rate. Setting the switch to a value greater than 2 result in the switch being disabled and the last valid baud rate value will be used. The switch setting is read only during power up.

MacID/BaudRate Option 2

The signals for the MacID and BaudRate switch are also available on the Front Panel Interface header which mates to the DIP298/398 front panel assemblies. When this option is to be used the onboard switches must be set in the '0' position. Refer to the DIP298/398 documentation for further information.

Connectors

The CDN115 has 3 connector sets: a DB-44 I/O interface connector, a 26 pin I/O interface header for daughter board applications and a 26 pin Front Panel Interface header for use in daughter board applications or with the DIP298/398 front panel assemblies.

P2 I/O Header

Pin	Description	Pin	Description
1	DGND	2	AGND
3	DIO0	4	AIN0
5	DIO1	6	AGND
7	DIO2	8	AIN1
9	DIO3	10	AGND
11	DIO4	12	AOUT0
13	DIO5	14	AGND
15	DIO6	16	AOUT1
17	DIO7	18	AGND
19	DGND	20	DGND
21	+24 Vdc	22	+24 Vdc
23	DGND	24	DGND
25	-15 Vdc	26	+15 Vdc

CDN115 DeviceNet Specifications

DB-44 I/O Connector

Pin	Description	Pin	Description	Pin	Description
1	DGND	16	DGND	31	AGND
2	DIO0	17	DIO4	32	AIN0
3	+24 Vdc	18	+24 Vdc	33	AGND
4	DGND	19	DGND	34	AIN1
5	DIO1	20	DIO5	35	AGND
6	+24 Vdc	21	+24 Vdc	36	AOUT0
7	DGND	22	DGND	37	AGND
8	DIO2	23	DIO6	38	AOUT1
9	+24 Vdc	24	+24 Vdc	39	AGND
10	DGND	25	DGND	40	+15 Vdc
11	DIO3	26	DIO7	41	- 15 Vdc
12	+24 Vdc	27	+24 Vdc	42	+24 Vdc
13	BUS +	28	BUS +	43	BUS +
14	BUS -	29	BUS -	44	BUS -
15	DGND	30	DGND		

Front Panel Interface Header

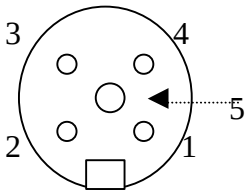
Pin	Description	Pin	Description
1	SGND	2	SGND
3	MACID0	4	MOD GREEN
5	MACID1	6	MOD RED
7	MACID2	8	NET GREEN
9	MACID3	10	NET RED
11	MACID4	12	RESET/
13	MACID5	14	CANH
15	MACID6	16	CANL
17	BRATE0	18	+5Vdc
19	BRATE1	20	CONFIG DET.
21	BUS -	22	BUS -
23	BUS +	24	BUS +
25	SGND	26	

CDN115 DeviceNet Specifications

DeviceNet Micro Connector

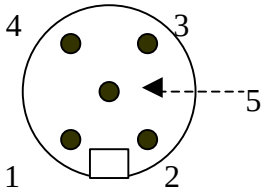
The DeviceNet connector uses the standard ODVA pinout for micro-DIN connectors.

1 - Drain (bare)
2 - V+ (red)
3 - V- (black)
4 - CAN_H (white)
5 - CAN_L (grey)



Mating Connector (Female)

CDN067-3 Connector (Male)



CDN115 DeviceNet Specifications

Specifications

Specification	Min	Typ.	Max	Description/notes
DeviceNet				ISO 11898 transceiver, optically coupled
MacID	0		63	Hardware settable (switch/backplane), Software settable
Data Rate	125		500	Kbit/second, hardware or software settable
Vpwr	11		25	Vdc
Ipwr		250	400	mA at 24 Vdc
Digital Inputs				8 Channels, linked to Digital Outputs
Ion	-4			mA
Ioff			-2	mA – Corresponding output must be in OFF state
Vin	-1		28	Vdc
Digital Outputs				8 Channels, linked to Digital Inputs
Ion		100	200	Individual channels will drive up to 200 mA. Dissipation should be limited to 800 mA for each group of 8 channels, averaging 100 mA / channel.
Ioff			.1 mA	Off leakage current for voltages less than V_{DIO}
V_{OL}		.9 1.1	1.1 1.2	@ 100 mA load @ 200 mA load
Digital Power				
V_{DIO}	18	24	28	Vdc.
I_{DIO}		40		mA + 6 mA / active I/O point
Analog Inputs				2 Channels
Resolution			12	Bits
Input Range				0-10 Vdc
Filtering				16 hertz, low pass
Impedance			1 M	Ohms input impedance
Analog Outputs				8 Channels
Resolution			12	Bits
Output Range				0 to +10 Vdc
Output Drive	2000			Ohms output load impedance

CDN115 DeviceNet Specifications

Firmware

The CDN115 supports DeviceNet using ODVA standard Digital Input Points (DIP's), Digital Output Points (DOP's), Analog Input Points (AIP's), and Analog Output Points (AOP's). The unit operates as a group II Slave. Additional objects include a User Defined configuration object and a set of Combinatorial Control Objects (CCO) that allow control programs to be executed directly on the module.

DeviceNet Message Types

The CDN115 supports the following Group 2 message types.

CAN IDENTIFIER	GROUP 2 Message Type
10xxxxxx111	Duplicate MACID Check Message
10xxxxxx110	Unconnected Explicit Request Message
10xxxxxx101	Master I/O Poll Command Message
10xxxxxx100	Master Explicit Request Message

xxxxxx = Node Address

The CDN115 supports the Group 4 Offline Connection set.

CAN IDENTIFIER	GROUP 2 Message Type
11111101100	Communication Faulted Response Message
11111101101	Communication Faulted Request Message
11111101110	Communication Ownership Response Message
11111101111	Communication Ownership Request Message

DeviceNet Class Services

The CDN115 supports the following class services and instance services.

SERVICE CODE	SERVICE NAME
05 (0x05)	Reset
14 (0x0E)	Get Attribute Single
16 (0x10)	Set Attribute Single
75 (0x4B)	Allocate Group 2 Identifier Set
76 (0x4C)	Release Group 2 Identifier Set

CDN115 DeviceNet Specifications

DeviceNet Object Classes

The CDN115 device supports the following DeviceNet object classes.

CLASS CODE	OBJECT TYPE
01 (0x01)	Identity
02 (0x02)	Router
03 (0x03)	DeviceNet
04 (0x04)	Assembly
05 (0x05)	Connection
08 (0x08)	Digital Input Point
09 (0x09)	Digital Output Point
10 (0x0a)	Analog Input Point
11 (0x0b)	Analog Output Point
50 (0x32)	Device Supervisor Object
64 (0x40)	Configuration Object
80 (0x50)	Virtual Processor Object *
81 (0x51)	Counter Object *
82 (0x52)	Timer Object *
83 (0x53)	Comparator Object *

Refer to the D.I.P. CCO Support documentation for further information on CCO control functions.

CDN115 DeviceNet Specifications

Identity Object Class Code: 01 (0x01)

The Identity Object is required on all devices and provides identification of and general information about the device.

Identity Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	1
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	7

Identity Object Instance Attributes

Attribute	Access	Name	Type	Value
1	Get	Vendor	UINT	59
2	Get	Product Type	UINT	7
3	Get	Product Code	UINT	1
4	Get	Revision	STRUCT OF	
		Major Revision	USINT	1
		Minor Revision	USINT	1
5	Get	Device Status	UINT	(1)
6	Get	Serial Number	UINT	(2)
7	Get	Product Name	STRUCT OF	
		Length	USINT	6
		Name	STRING [6]	CDN115

Identity Common Services

Service Code	Class	Instance	Service Name
05 (0x05)	No	Yes	Reset
14 (0x0E)	Yes	Yes	Get_Attribute_Single

CDN115 DeviceNet Specifications

Identity Object Attributes

Product Code – Attribute 3

The Product code is fixed at 7904 for the CDN494. The product code is used within the Electronic Data Sheet format to uniquely identify the product type.

Revision Information – Attribute 4

D.I.P. maintains strict version control. The major revision number will increment as functional enhancements are implemented. The minor firmware revision control number is incremented if minor changes are incorporated.

Device Status – Attribute 5

Bit Number	Name	Meaning
0	Owned	= 0, not owned = 1, allocated
1	Reserved	
2	Configured	= 0, not configured – this bit is not supported
3	Reserved	
4-7	User defined	
8	Minor Recoverable fault	= 0, no fault = 1, minor recoverable faults (DOP short circuit)
9	Minor Unrecoverable fault	= 0, no fault = 1, minor unrecoverable faults
8	Major Recoverable fault	= 0, no fault = 1, major recoverable faults (Loss of +24 Vdc)
9	Major Unrecoverable fault	= 0, no fault = 1, major unrecoverable faults (Checksum, A/D)
12-15	Reserved	

Serial Number – Attribute 6

The serial number is encoded in the product during the manufacturing cycle and is guaranteed to be unique across all product lines produced by D.I.P.

Device Name – Attribute 7

The DeviceName provides a character arry containing the short string CDN494 or CDN494-1.

Device State – Attribute 8

The Device State reflects whether any errors have occurred and the severity. The following states are supportted. The only exit from a Major Unrecoverable fault condition is power cycling the device.

State	Interpretation	Causes
0	Non-existent	
1	Self Test	
2	Standby	
3	Operating	Normal operating mode
4	Major Recoverable fault	Loss of +24 Vdc or +/-15 Vdc power
5	Major Unrecoverable fault	Memory Checksum failure

Router Object Class Code: 02 (0x02)

The Message Router Object provides a messaging connection point through which a Client may address a service to any object class or instance residing in the physical device.

Router Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	2

Router Object, Instance 1 Attributes

Attribute	Access	Name	Type	Value
2	Get	Number of Connections	UINT	2

Router Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single

CDN115 DeviceNet Specifications

DeviceNet Object Class Code: 03 (0x03)

The DeviceNet object provides general information on the specific node.

DeviceNet Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	2

DeviceNet Object, Instance 1 Attributes

Attribute	Access	Name	Type	Value
1	Get/Set	MACID	USINT	(1)
2	Get/Set	Baud Rate	USINT	(2)
3	Get/Set	Bus Off Interrupt	BOOL	(3)
4	Get/Set	Bus Off Counter	USINT	(4)
5	Get/Spc	Allocation Information	STRUCT of	(5)
		Choice Byte	BYTE	
		Master Node Addr.	USINT	

DeviceNet Object Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single
75 (0x4B)	No	Yes	Allocate Master/Slave
76 (0x4C)	No	Yes	Release Master/Slave

DeviceNet Object Attributes

MacID – Attribute 1

The MACID is set using two BCD rotary switches located on the module. Valid MACID addresses are 0 to 63 (0 to 3F Hex). Setting the switch address to a value greater than 63 will disable the switch and allow software setting of the MACID. The software setting defaults to the last hardware setting. The switch is only read during power up.

The MacID may also be set through connections on the Front Panel Interface header. These active low inputs form a BCD encoded value in the range 00 – 63. Connecting an input signal to the SGND signal turns the corresponding bit 'ON'.

Data Rate – Attribute 2

The Data Rate is set using a BCD switch. Valid Data Rates are 0 to 2. The software setting defaults to the last hardware setting. The switch is read during power up.

The Data Rate may also be set through connections on the Front Panel interface header. These active low inputs form a BCD encoded value in the range 0 – 2. Connecting an input signal to the SGND Common signal turns the corresponding bit 'ON'.

Bus Off Interrupt – Attribute 3

Bus Off Interrupt (BOI) determines the action if a Bus Off state is encountered.

BOI	Action
0	Hold chip in OFF state (default)
1	If possible reset CAN chip

Bus Off Counter – Attribute 4

Bus Off Counter will be forced to 0 whenever set regardless of the data value provided.

Allocation Byte – Attribute 5

Allocation_byte

bit 0	explicitset to 1 to allocate
bit 1	polled set to 1 to allocate
bit 2-7	reserved (always 0)

Mac Switch Changed – Attribute 6

The Mac Switch Changed flag will be set if the Mac Switch has changed since the last power up sequence. Note that if the Mac Switch is set in the 'disabled' or 'program' position it is considered to be removed from the circuit and reading this attribute will result in an 'Attribute Not Supported' error response.

Baud Switch Changed – Attribute 7

The Baud Switch Changed flag will be set if the Baud Switch has changed since the last power up sequence. Note that if the Baud Switch is set in the 'disabled' or 'program' position it is considered to be removed from the circuit and reading this attribute will result in an 'Attribute Not supported' error response.

Mac Switch Value – Attribute 8

The Mac Switch Value attribute returns the actual state of the Mac Switch. Note that if the Mac Switch is set in the 'disabled' or 'program' position it is considered to be removed from the circuit and reading this attribute will result in an 'Attribute Not Supported' error response.

Baud Switch Value – Attribute 9

The Baud Switch Value attribute returns the actual state of the Baud Switch. Note that if the Baud Switch is set in the 'disabled' or 'program' position it is considered to be removed from the circuit and reading this attribute will result in an 'Attribute Not Supported' error response.

Assembly Object Class Code: 04 (0x04)

The Assembly Objects bind attributes of multiple objects to allow data to or from each object to be sent or received over a single connection.

Assembly Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Class ID	UINT	101

Assembly Object, Instance 100 Attributes

Attribute	Access	Name	Type	Value
3	Get	Data	STRUCT of	(1)
		Supervisor Status	BYTE	See Configuration Class
		Digital Inputs	BYTE[]	See Configuration Class
		Pad Byte	BYTE	See Configuration Class
		Analog Inputs	UINT[]	See Configuration Class

Assembly Object, Instance 101 Attributes

Attribute	Access	Name	Type	Value
3	Get/Set	Data	STRUCT of	(3)
		Digital Outputs	BYTE	See Configuration Class
		Pad Byte	BYTE	See Configuration Class
		Analog outputs	UINT[8]	See Configuration Class

Assembly Object Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single

Assembly Instance 100

Assembly instance 100 is used to generate the POLL response packet and consists of a variable number of bytes as determined by the configuration object.

Device Status

The Device Status byte, if included, provides overall information on the device as defined in the Device Supervisor object.

Digital Inputs

The digital input byte(s) provide information on the digital input states. The number of bytes included is defined in the configuration object.

Pad Byte

The pad byte, if included, provides a single byte pad to ensure that the analog input values are positioned on an even byte boundary.

Analog Inputs

The number of analog inputs included is defined in the configuration object. The analog inputs are presented as low byte, followed by high byte.

Assembly Instance 101

Assembly instance 101 is used to consume the POLL request packet and consists of a variable number of digital output states, the desired analog input range selection, padding bytes and a variable number of analog output values as determined by the configuration object.

Digital Outputs

The digital output byte(s) set the state of the digital outputs. The number of bytes included is defined in the configuration object.

Pad Byte

The pad byte, if included, provides a single byte pad to ensure that the analog output values are positioned on an even byte boundary.

Analog Outputs

The number of analog inputs included is defined in the configuration object. The analog outputs are presented as low byte, followed by high byte.

CDN115 DeviceNet Specifications

Connection Object Class Code: 05 (0x05)

The Connection Objects manage the characteristics of each communication connection. As a Group II Only Slave device the unit supports one explicit message connection and a POLL message connection.

Connection Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1

Connection Object, Instance 1 Attributes (Explicit Message)

Attribute	Access	Name	Type	Value
1	Get	State	USINT	(1)
2	Get	Instance Type	USINT	0 = Explicit Message
3	Get	Transport Class Trigger	USINT	0x83
4	Get	Production Connection	UINT	(2)
5	Get	Consumed Connection	UINT	(2)
6	Get	Initial Comm. Char.	USINT	0x21
7	Get	Production Size	UINT	18
8	Get	Consumed Size	UINT	22
9	Get/Set	Expected Packet Rate	UINT	default 2500 msec
12	Get	Timeout Action	USINT	1 = AutoDelete
13	Get	Prod. Path Length	USINT	0
14	Get	Production Path		(null)
15	Get	Cons. Path Length	USINT	0
16	Get	Consumed Path		(null)
17	Get	Inhibit Timer	UINT	0

Connection Object, Instance 2 Attributes (POLL connection)

Attribute	Access	Name	Type	Value
1	Get	State	USINT	(1)
2	Get	Instance Type	USINT	1 = I/O Message
3	Get	Transport Class Trigger	USINT	0x82
4	Get	Production Connection	UINT	(2)
5	Get	Consumed Connection	UINT	(2)
6	Get	Initial Comm. Char.	USINT	0x1
7	Get	Production Size	UINT	See Configuration Obj
8	Get	Consumed Size	UINT	See Configuration Obj
9	Get/Set	Expected Packet Rate	UINT	default 2500 msec
12	Get/Set	Timeout Action	USINT	(3)
13	Get	Prod. Path Length	USINT	6
14	Get	Production Path	STRUCT of	
		Log. Seg., Class	USINT	0x20
		Class Number	USINT	0x04
		Log.Seg., Instance	USINT	0x24
		Instance Number	USINT	0x64
		Log.Seg., Attribute	USINT	0x30
		Attribute Number	USINT	0x03
15	Get	Cons. Path Length	USINT	6
16	Get	Production Path	STRUCT of	
		Log. Seg., Class	USINT	0x20
		Class Number	USINT	0x04
		Log.Seg., Instance	USINT	0x24
		Instance Number	USINT	0x65
		Log.Seg., Attribute	USINT	0x30
		Attribute Number	USINT	0x03
17	Get	Inhibit Timer	UINT	0

Connection Object Common Services

Service Code	Class	Instance	Service Name
05 (0x05)	Yes	Yes	Reset
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single

CDN115 DeviceNet Specifications

(1) Connection States:

0 = non-existent
1 = configuring
3 = established
4 = timed out

(2) Connection ID's:

Connection 1 Produced Connection ID: 10xxxxxx011
Connection 1 Consumed Connection ID: 10xxxxxx100

Connection 2 Produced Connection ID: 01111xxxxxx
Connection 2 Consumed Connection ID: 10xxxxxx101

xxxxxx = Node Address.

(3) Watch Dog Timeout Activity:

0 = Timeout (default)
1 = Auto Delete (Explicit Message, non modifiable)
2 = Auto Reset

Discrete Input Point (DIP) Object Class Code: 08 (0x08)

The Discrete Input Point (DIP) Object models discrete inputs in a product. There is a separate instance for each discrete input available on the device.

DIP Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	16
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	3

DIP Object, Instance 1..16 Attributes

Attribute	Access	Name	Type	Value
3	Get	Value	BOOL	(1)

DIP Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single

Input State – Attribute 3

Attribute 3 provides the state of the specific digital input. A value of 0 indicates an OFF state and a value of 1 indicates an ON state. The Digital inputs provide feedback of the digital output states. If the corresponding output state is set to 0 these points may be used as inputs.

Inputs 1..8 are mapped to the physical DIO input points. Inputs 9..16 are mapped to internal holding registers which may be used by CCO program or other system needs. All inputs are mapped to corresponding DOP outputs.

Discrete Output Point (DOP) Object Class Code: 09 (0x09)

The Discrete Output Point (DOP) Object models discrete outputs in a product. You can use this object in applications as simple as a actuator or as complex as a discrete I/O control module. There is a separate instance for each discrete output available on the device. To use a physical DIO point as an input the corresponding output must be off (0).

DOP Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	16
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	8

DOP Object, Instance 1..16 Attributes

Attribute	Access	Name	Type	Value
3	Get/Set	Value	BOOL	State of Output
5	Get/Set	Fault Action	BOOL	0=fault value, 1=no chg
6	Get/Set	Fault Value	BOOL	0=Off, 1=On
7	Get/Set	Idle Action	BOOL	0=Idle value, 1=no chg
8	Get/Set	Idle Value	BOOL	0=Off, 1=On

DOP Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single

Output State – Attribute 3

The digital outputs are active low. Setting a DOP state to 1 forces the corresponding output pin low. The state of each DOP may be read back using the DOP state or the corresponding DIP state. The DIP state reflects the state of the I/O pin. If an I/O point is to be used as an input the corresponding DOP state must be set to 0 (off).

Instance 1..8 correspond to physical outputs. Instances 9..16 are mapped to internal control registers for use in CCO application programs. These instances will reflect the state last written to digital output instances 9..16.

Fault State – Attribute 5

The Fault State determines what action is taken if a software fault condition is detected due to a connection timeout.

Fault State	Action Taken
0	Set the output to the stated determined by the Fault Value
1	Leave the output in the current state

Fault Value – Attribute 6

The Fault Value determines the state of the DOP output if the Fault State bit is clear and a fault condition occurs.

Idle State – Attribute 7

The Idle State determines what action is taken if an idle condition is detected. Idle conditions occur if a Poll request packet is received with less than the calculated number of bytes. Refer to the Configuration object to determine the size of the Poll Request packets. A poll request of 0 bytes is typically used to force an idle condition.

Idle State	Action Taken
0	Set the output to the stated determined by the Idle Value
1	Leave the output in the current state

Idle Value – Attribute 8

The Fault Value is used to set the output if the Idle State bit is clear and an idle condition occurs.

Analog Input Point (AIP) Object Class Code: 10 (0x0A)

The Analog Input Point (AIP) Object models discrete analog inputs in a product. There is a separate instance for each discrete input available on the device.

AIP Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	2
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	8

AIP Object, Instance 1..2 Attributes

Attribute	Access	Name	Type	Value
3	Get	Value	UINT	0..4095
7	Get	Range	USINT	2 == 0-10 Vdc
8	Get	Type	USINT	6 == UINT

AIP Common Services

Service Code	Class	Instance	Service Name
16 (0x10)	No	Yes	Set_Attribute_Single

AIP Object Attributes

Value - Attribute 3

Analog input value reflects the associated channel input value. The exact format of the input is determined by the control words as defined in the Configuration Object.

Range – Attribute 7

The AIP Range value is fixed as type 2 (0-10 Vdc).

Type – Attribute 8

The AIP Type value is fixed as type 6 (UINT).

Analog Output Point (AOP) Object Class Code: 11 (0x0B)

The Analog Output Point (AOP) Object models discrete analog outputs in a product. You can use this object in applications as simple as a output or as complex as a discrete I/O control module. There is a separate instance for each discrete output available on the device.

AOP Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	2
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	12

AOP Object, Instance 1..2 Attributes

Attribute	Access	Name	Type	Value
3	Get	Value	UINT	0..4095
7	Get	Output Range	BYTE	2 == 0..10 Vdc
8	Get	Value Data Type	USINT	6 == UINT
9	Get/Set	Fault Action	BYTE	(1)
10	Get/Set	Idle Action	BYTE	(1)
11	Get/Set	Fault Value	INT	(2)
12	Get/Set	Idle Value	INT	(2)

AOP Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single

AOP Object Attributes

Value – Attribute 3

The analog output value is given in offset binary format. The value provided must be in the range 0..4095 (0 .. 0FFFH).

Value	Output voltage
0	-10 volts
800h (2048)	0 volts
FFFh (4095)	+10 volts

Range – Attribute 7

The analog output Range is fixed as 3 (-10 to +10 Vdc).

Type – Attribute 8

The analog output data type is fixed as 6 (UINT).

Fault State – Attribute 9

The Fault State determines what action is taken if a fault condition is detected. Fault conditions include software conditions (connection timeout).

Fault State	Action Taken
0	Hold the last value
1	Set to low limit (-10 Vdc)
2	Set to high limit (+10 Vdc)
3	Set to value determined by Fault Value.

Idle State – Attribute 10

The Idle State determines what action is taken if an idle condition is detected. Idle conditions occur if a Poll request packet is received with less than the calculated number of bytes. Refer to the Configuration object to determine the size of the Poll Request packets. A poll request of 0 bytes is typically used to force an idle condition.

Idle State	Action Taken
0	Hold the last value
1	Set to low limit (-10 Vdc)
2	Set to high limit (+10 Vdc)
3	Set to value determined by Idle Value.

Fault Value – Attribute 11

The Fault Value determines the output if the Fault State bit is set to 3 and a fault condition occurs. The value must be in the range 0..4095 (0..0FFFH).

Idle Value – Attribute 12

The Fault Value is used to set the output if the Idle State bit is set to 3 and an idle condition occurs. The value must be in the range 0..4095 (0..0FFFH).

Device Supervisor Object Class Code: 48 (0x30)

The Device Supervisor object provides summary information on the Device.

Device Supervisor Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	1
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	16

Configuration Object, Instance 1 Attributes

Attribute	Access	Name	Type	Value
3	Get	Manufacturer Type	SSTRING	MIXED IO
4	Get	Semi Revision Level	SSTRING	E00-0000
5	Get	Manufacturer Name	SSTRING	D.I.P. Inc.
6	Get	Manufacturer Model	SSTRING	CDN494
7	Get	Software Revision	SSTRING	XX.YYY (see below)
8	Get	Hardware Revision	SSTRING	XX.YYY (see below)
11	Get	Device Status	USINT	See Below
12	Get	Exception Status	USINT	
15	Get/Set	Alarm Enable	BOOLEAN	
16	Get/Set	Warning Enable	BOOLEAN	

Device Supervisor Object Common Services

Service Code	Class	Instance	Service Name
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single

Device Supervisor Object Attributes

Manufacturer Model – Attribute 6

The Manufacturer Model string will be CDN494 based on the product code (see Identity Object, Class 1, Instance 1, Attribute 3).

Software Revision – Attribute 7

The Software Revision will be a text string of the Major and Minor revision information of the Identity object. It will have the format XX.YYY, where XX is the major revision and YYY is the Minor revision. The revision code will match that provided by the Identity object.

Hardware Revision – Attribute 8

The Hardware Revision will be a text string reflecting the current revision of the hardware. It will have the format XX.YYY, where XX is the major revision and YYY is the Minor revision.

Device Status – Attribute 9

The Device Status reflects the current state of the Device Supervisor object.

Attribute Value	State
0	Undefined
1	Self Testing
2	Idle
3	Self-Test Exception
4	Executing
5	Abort
6	Critical Fault
7-50	Reserved – unused on CDN494
51-99	Device Specific – unused on CDN494
100-255	Vendor Specific – unused on CDN494

Exception Status – Attribute 12

The Exception status provides information on the current alarm and warning status of the device. This byte may be optionally reported as part of the Poll Response message. The byte provides a summary of the state of the Exception and Alarm Detail attributes and has the following interpretation.

Status Bit	Function
0	ALARM / Device Common

1	ALARM / Device Specific
2	ALARM / Manufacturer – specific
3	0
4	WARNING / Device Common
5	WARNING / Device Specific
6	WARNING / Manufacturer – specific
7	0 == No Expanded Mode

Alarm Enable – Attribute 15

The Alarm enable bit enables the reporting of alarm conditions. Clearing this bit causes alarm bits to be cleared. Setting the bit causes the alarm monitoring to be enabled.

Warning Enable – Attribute 16

The Alarm enable bit enables the reporting of alarm conditions. Clearing this bit causes alarm bits to be cleared. Setting the bit causes the alarm monitoring to be enabled.

Configuration Object Class Code: 64 (0x40)

The CDN494 poll request/response packets are large. In some applications it may be desired to reduce the packet size if not all the I/O channels are in use. The configuration object will adjust the poll request/response packet sizes. In addition, the configuration object gives access to several operational parameters such as power supply and temperature conditions.

Configuration Object Class Attributes

Attribute	Access	Name	Type	Value
1	Get	Revision	UINT	1
2	Get	Max Object Instance	UINT	1
6	Get	Max Class Identifier	UINT	7
7	Get	Max Instance Attribute	UINT	9

Configuration Object, Instance 1 Attributes

Attribute	Access	Name	Type	Value
1	Get/Set	Mode	USINT (1)	Configuration mode
2	Get/Set	Num Digital Input	USINT (1)	Poll response count
3	Get/Set	Num Digital Output	USINT (1)	Poll request count
4	Get/Set	Num Analog Input	USINT (1)	Poll response count
5	Get/Set	Num Analog Output	USINT (1)	Poll request count

Configuration Object Common Services

Service Code	Class	Instance	Service Name
05 (0x05)	No	Yes	Reset
14 (0x0E)	Yes	Yes	Get_Attribute_Single
16 (0x10)	No	Yes	Set_Attribute_Single

NOTE 1: Changing the configuration object will cause the CONSUMED and PRODUCED size of the POLL connection to be changed. These values are retained in E2 memory and may only be set when the POLL connection is not in the RUNNING state.

Configuration Reset Service

The Reset service causes the device configuration to return to a preset condition. The Reset service accepts a single byte to determine the configuration desired following the reset command.

Reset Command Byte	Reset Description
0	Reset to provide full configuration (all I/O options included in Poll transactions)
1	Reset to match CDN115 Version 1.0 I/O Block configuration

The CDN115 configuration uses the following configuration setup.

Attribute	Value	Description
Mode	81	Includes DSUP Analog Range byte. Forces Analog I/O update during POLL processing.
Num Digital Input	16	Returns 2 bytes during POLL response
Num Digital Output	16	Expects 2 byte POLL request
Num Analog Input	2	Returns 4 bytes during POLL response
Num Analog Output	2	Expects 4 bytes during POLL request

The CDN115 configuration uses the following configuration setup.

Attribute	Value	Description
Mode	080H	Include DSUP in poll response. No I/O updated between poll request and poll response. Analog I/O maintained on even boundary.
Num Digital Input	8	Returns 1 bytes (24 bits) during POLL response
Num Digital Output	8	Expects 1 bytes (24 bits) during POLL request
Num Analog Input	2	Returns 4 bytes during POLL response
Num Analog Output	2	Expects 4 bytes during POLL request

Configuration Object Attributes

Mode Byte – Attribute 1

The Mode byte determines the format of the POLL request and response packets and the overall operation of the unit during the I/O scanning function. The Mode byte consists of three bits with the following interpretation. Bits 3..5 should be set to 0.

Bit 7	Bit 6	Bit5	Bit4	Bit3	Bit 2	Bit 1	Bit 0
IncludeDSUP		0	0	0	NoPollUpdate		NoEvenByte

If the NoPollUpdate bit is set then the I/O is not updated between the POLL REQUEST and the POLL RESPONSE operations. Analog and digital input data will reflect data collected immediately prior to the current Poll request. Analog and digital output data will be updated after the POLL RESPONSE is generated. Note that data aging is ~ 2 msec.

If the NoEvenByte bit is set then no padding bytes will be inserted or expected during the POLL REQUEST and POLL RESPONSE processing. If this bit is cleared then the POLL REQUEST and POLL RESPONSE packets will be adjusted to ensure that the Analog I/O data starts on an even byte boundary. Pad bytes will be eliminated in the Poll Request if the Num Analog Input is 0. Pad bytes will be eliminated in the Poll Response if the Num Analog Output is 0.

If the IncludeDSUP bit is set the POLL response will include the Device Supervisor Status information in the Poll response.

Num Digital Input – Attribute 2

The Num Digital Input attribute determines the number of input channels to be returned in the POLL RESPONSE packet. The maximum number 16 bits. The number of poll response bytes can be calculated as:

Number of bytes = ((number of channels) + 7) / 8

Num Digital Output – Attribute 3

The Num Digital Output attribute determines the number of output bytes to be processed in the POLL REQUEST packet. The maximum number 16 bits. The number of poll response bytes can be calculated as:

Number of bytes = ((number of channels) + 7) / 8

Num Analog Input – Attribute 4

The Num Analog Input attribute determines the number of analog input channels returned in the POLL RESPONSE packet. The maximum number is 2. Each analog input produces 2 bytes of data in the poll response packet. The number of bytes may be calculated as:

Number of bytes = ((number of channels) * 2)

Num Analog Output – Attribute 5

The Num Analog Output attribute determines the number of analog output channels. The maximum size is 2. Each analog output consumes two bytes of data in the poll request packet. The number of bytes may be calculated as:

Number of bytes = ((number of channels) * 2)

Poll Packet Sizes

The Poll Request and Response formats are determined by the configuration class attributes.

[DOUT(0..4)] [PAD(0..1)] [AOUT(0..16)]

DOUT	will be either 0..2 bytes, determined by the Num Digital Output attribute.
PAD	will be either 0 or 1 byte. It is included to ensure that the AOUT are positioned on even byte boundaries if the MODE NoEvenByte attribute is cleared.
AOUT	will be 2 times the value set in the Num Analog Output attribute.

[DSUP] [DIN(0..4)] [PAD(0..1)] [AIN(0..16)]

DSUP	will be 1 byte, determined by Mode IncludeDSUP bit
DIN	will be either 0..4 bytes, determined by the Num Digital Input attribute.
PAD	will be either 0 or 1 byte. It is included to ensure that the AIN are positioned on even byte boundaries if the MODE NoEvenByte attribute is cleared.
AIN	will be 2 times the value set in the Num Analog Input attribute.

If the Num Digital Output and Num Analog Output are both 0 then the CONSUMED SIZE for the POLL connection will be 0. In this case there is no POLL IDLE condition.

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP