Functional Description

DeviceNet™
4 IN, 4 OUT I/O Module

Rev. 1.2

For:

DN-400
DN-410
DN-TC400
DN-TC400-0.5
DN-410-0.5
DN-TC400-0.5

HURON NET WORKS

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Revision History

Rev	Date	Note(s)
1.1	11/20/2002	Original – from merged DN-400 and DN-TC400 documents
1.2	05/22/2003	Added new Catalog numbers, connector options, Added Mechanical Drawing P/N and minor edits.
1.03	09/09/2003	Replaced Microsoft Draw pictures with Microsoft Visio pictures Minor clerical edits
1.03	04/12/2004	Add in3 and in4 to DN-TC400 and DN-TC400-0.5
1.04	4/21/2004	Added IN3 & IN4 to TC400/TC400-0.5, Updated block diagram
1.05	8/11/2004	Added section 2.4 Dip Switch

1. INTRODUCTION

The DN-400/410 (Family includes the DN-400, DN-410, DN-TC400, DN-400-0.5, DN-410-0.5, and DN-TC400-0.5) is a DeviceNet I/O interface designed for general 4 Input, 4 Output applications. This module provides the interface to control and monitor I/O points, as well as two extra inputs to monitor on-board and external 24 VDC auxiliary power.

Interfaces on the DN-400/410 includes the following:

DeviceNet Connector – J8

This connector has the standard five DeviceNet signals; V+, CAN_H, shield drain, CAN_L, and V-. The shield drain wire has no connection on the module. The DeviceNet bus power (11 - 25 VDC) is used for all circuitry except the outputs in the default configuration (See jumper configuration information listed at the end of section 2).

Input Connectors - J5 (Inputs 1 and 2) and J6 (Inputs 3 and 4)

- 4 inputs - digital, supports inputs from contact closure or PNP high side proximity switches.
- DeviceNet bus power is also routed to these connectors to provide up to 100 mA of bus referenced power for sensors.

Output Connector - J4

The output driver is powered from a separate external 24VDC auxiliary supply (Vaux). All Vaux referenced circuitry is ground isolated from the DeviceNet bus referenced circuitry. Four factory installed **jumpers**, JP-1 through JP-4, provide options for the device to be completely powered from Vaux or completely powered from DeviceNet bus power (See jumper configuration information listed at the end of section 2).

- 4 output – digital, 24 VDC PNP (sourcing) each to provide up to 1000 mA.
- Vaux+ for the positive side of an external 24 VDC. Circuits are protected from damage due to accidental reverse connection of 24 VDC.
- Vaux_sen for monitoring an externally processed or filtered Vaux signal. For instance, in conjuction with the on-board power sense input, this input could monitor interlock switch closure or fuse status.
- Vaux- connection of the negative side of an external 24 VDC.

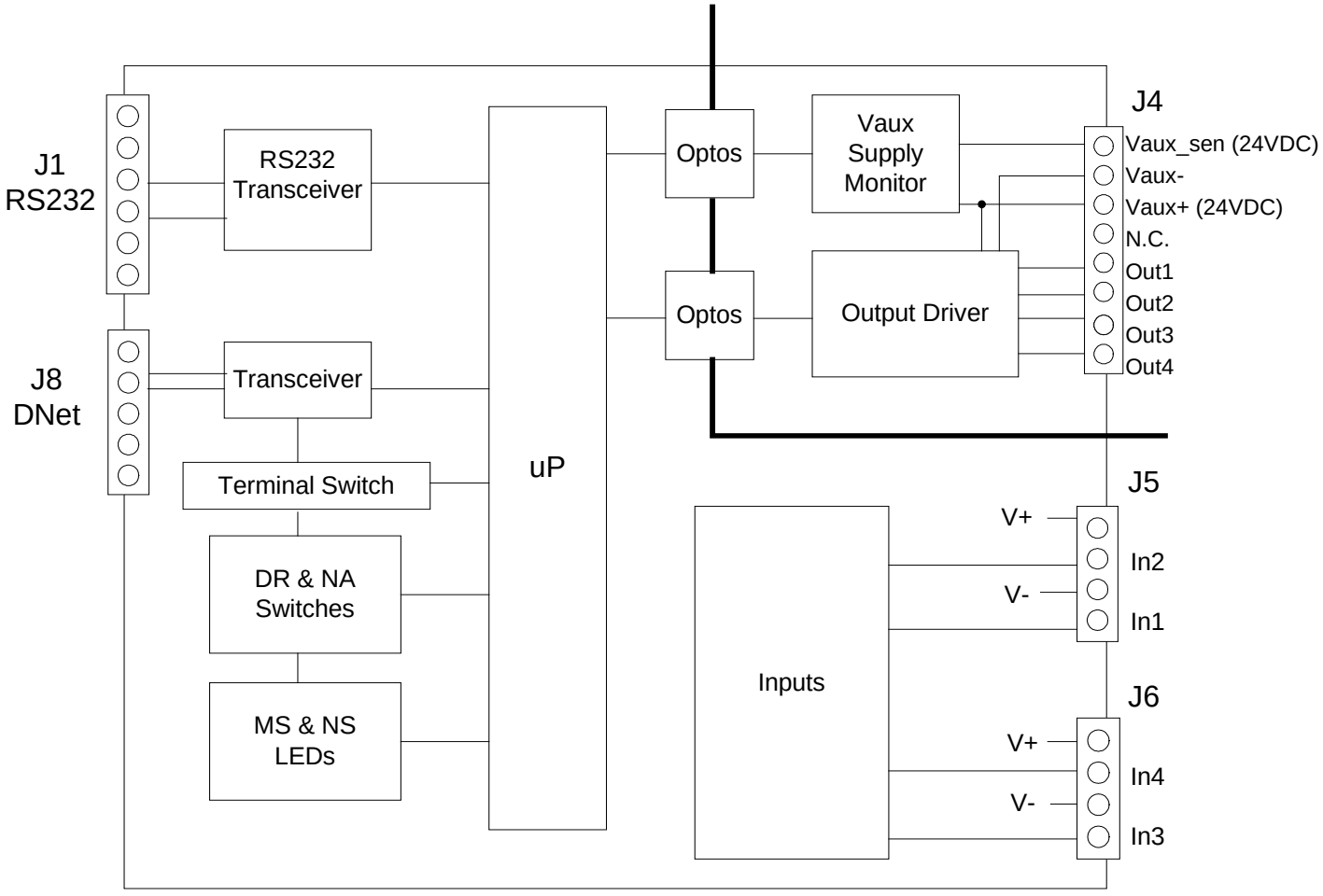
RS232 Connector – J1

This connector is used for firmware flash updates. On the DN-410 module, this connector supports the DN-SLIP protocol.

Indicators and Switches

- The standard red/greed bi-color DeviceNet Module Status LED and Network Status LED are supported.
- Switches allow setting of the DeviceNet Node Address (NA) and Data Rate (DR) as well as selection of optional terminating resistor.

A block diagram of the module is shown below.



2. APPLICATION

2.1. Mechanical and Mounting

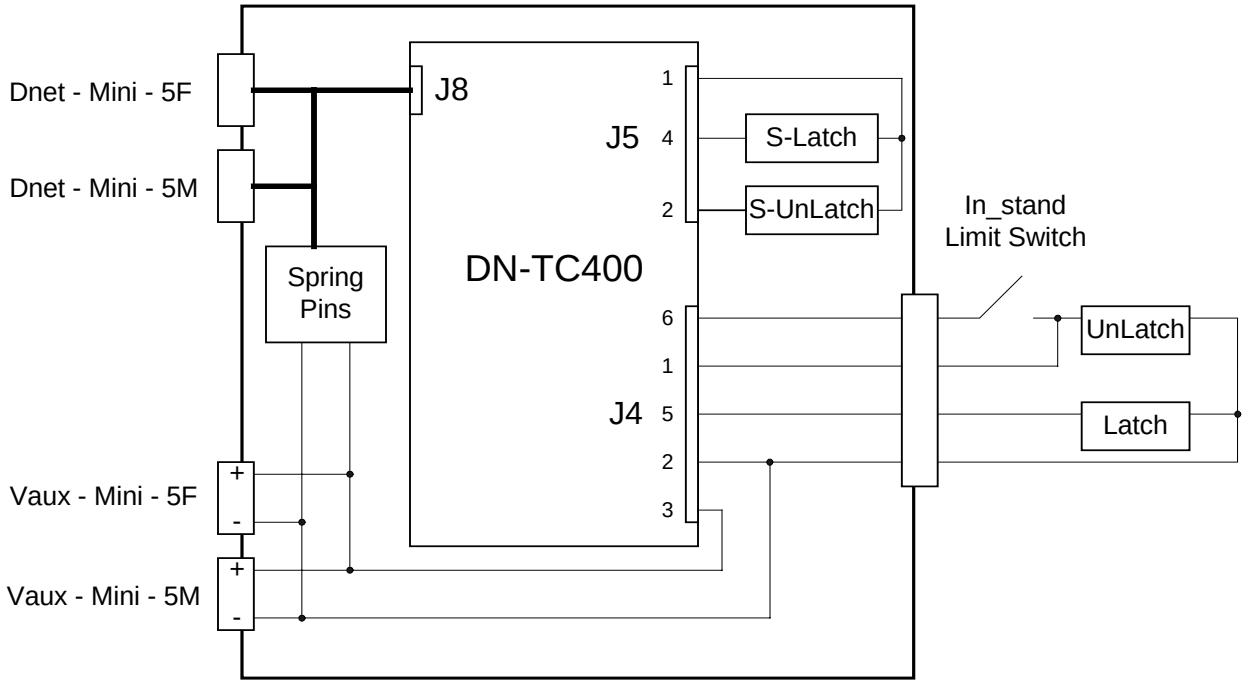
Refer to Mechanical Drawing 2800044 for the DN-400, DN-410, and DN-TC400 and to Mechanical Drawing 2800045 for the DN-400-0.5, DN-410-0.5, and DN-TC400-0.5. Overall dimensions shown in Specifications section.

2.2. Wiring

A variety of optional connectors and wire harnesses are available for the DN-400/410 family. Direct plug in of the DN-400/410 modules as a daughter card is an option. With other options, DeviceNet and the I/O can be attached through mini connectors, micro connectors, or wire pigtails. DeviceNet connector wiring should be as short as possible to J8 to minimize capacitance on the signal lines. Aux power and the outputs are attached using header J4. 4-pin headers J5 and J6 provide connection for each of the PNP input connectors. The pinning on these headers matches that of standard sensor connectors so that these connectors will wire directly to standard proximity switches. J1 provides serial connection for program updates and for DeviceNet to ASCII functionality for those modules that support ASCII protocol. Wire harnesses and mating connectors, except for the board headers, are not included as part of the DN-400/410.

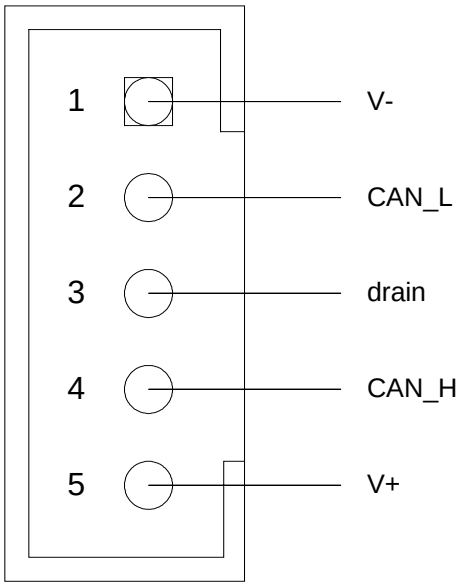
Function (Connector)	Daughter Card (Samtec P/N or equivalent)		Wire Harness (JST P/N or equivalent)	
	Board Hdr (M)	Mating (F)	Board Hdr (M)	Mating
RS232 (J1)	TMM-106-01-G-S	SMM-106-01-S-S	S6B-PH-K	PHR-6
Outputs (J4)	TMM-108-01-G-S	SMM-108-01-S-S	S8B-PH-K	PHR-8
Inputs (J5, J6)	TMM-104-01-G-S	SMM-104-01-S-S	S4B-PH-K	PHR-4
DeviceNet (J8)	TMM-105-01-G-S	SMM-105-01-S-S	S5B-PH-K	PHR-5

Example: Tool changer wiring using DN-TC400 or DN-TC400-0.5:

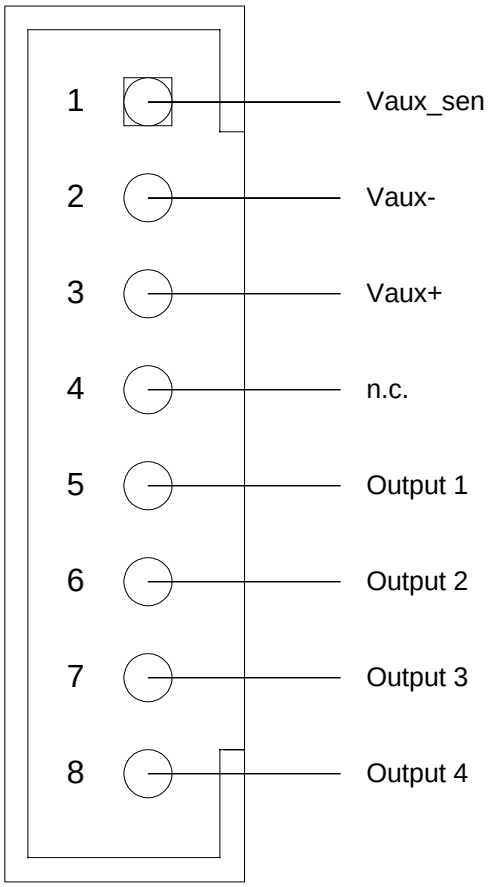


2.3. Connector Pinouts and Jumpers

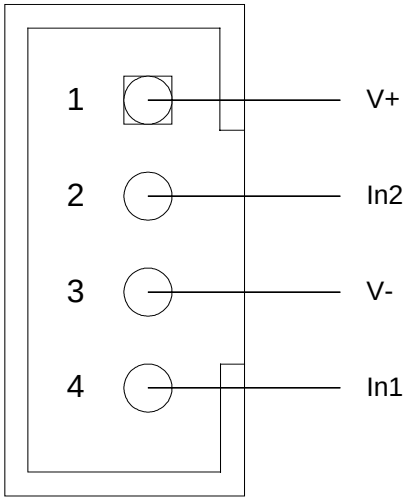
J8 - 5 pin header for the DeviceNet:



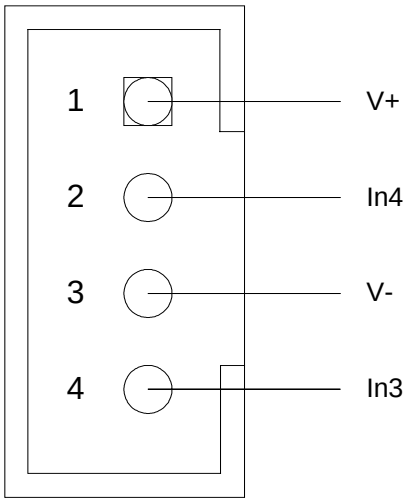
J4 - 8 pin header for output connector:



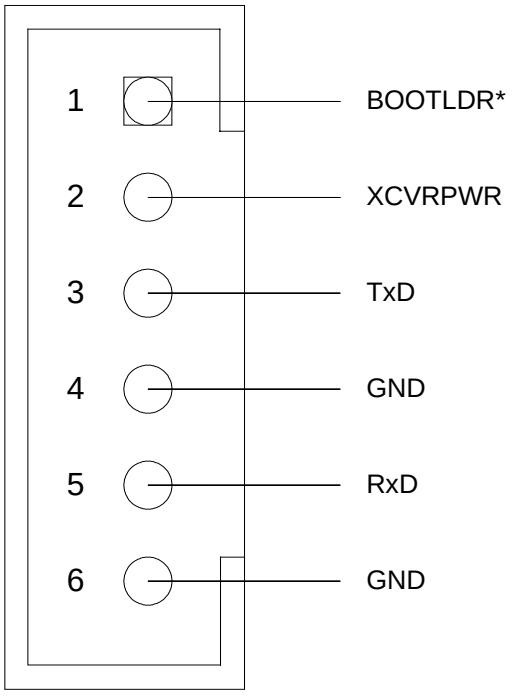
J5 - 4 pin header for input connector:



J6 - 4 pin header for input connector:



J1 – 6 pin header for RS232 connector:



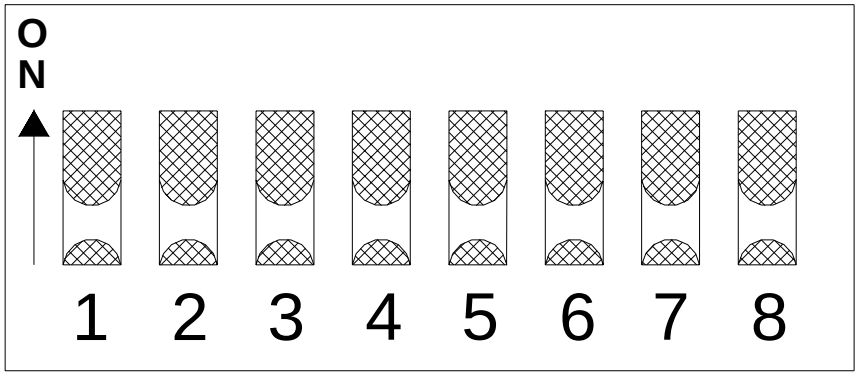
pin 1 – BOOTLDR*, pin2 – XCVRPWR, and pin 6 – GND are not used in normal applications.
pins 3, 4, and 5 provide a 3-wire RS232 connection with no handshaking.

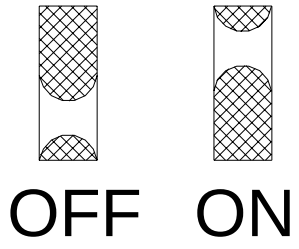
Jumper Options JP1 through JP4

Power	JP1	JP2	JP3	JP4
Isolated	in (short)	in (short)	out (open)	out (open)
DeviceNet only (no Vaux)	in (short)	out (open)	in (short)	in (short)
Vaux only (no DeviceNet)	out (open)	in (short)	in (short)	in (short)

2.4. DIP Switches

The DN-400 family has an eight(8) position DIP switch for setting the DeviceNet MacId and baudrate. This DIP switch will be readable by the processor. It is not user accessible when the controller card is mounted in the chassis.





2.4.1. Dip Switch Settings – Baudrate

Switch 1	Switch 2	Baudrate
OFF	OFF	125k
OFF	ON	250k
ON	OFF	500k
ON	ON	Soft Settable

2.4.2. Dip Switch Settings – MacId

Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	MacId
OFF	OFF	OFF	OFF	OFF	OFF	0
OFF	OFF	OFF	OFF	OFF	ON	1
OFF	OFF	OFF	OFF	ON	OFF	2
OFF	OFF	OFF	OFF	ON	ON	3
OFF	OFF	OFF	ON	OFF	OFF	4
OFF	OFF	OFF	ON	OFF	ON	5
OFF	OFF	OFF	ON	ON	OFF	6
OFF	OFF	OFF	ON	ON	ON	7
OFF	OFF	ON	OFF	OFF	OFF	8
OFF	OFF	ON	OFF	OFF	ON	9
OFF	OFF	ON	OFF	ON	OFF	10
OFF	OFF	ON	OFF	ON	ON	11
OFF	OFF	ON	ON	OFF	OFF	12
OFF	OFF	ON	ON	OFF	ON	13
OFF	OFF	ON	ON	ON	OFF	14
OFF	OFF	ON	ON	ON	ON	15
OFF	ON	OFF	OFF	OFF	OFF	16
OFF	ON	OFF	OFF	OFF	ON	17
OFF	ON	OFF	OFF	ON	OFF	18
OFF	ON	OFF	OFF	ON	ON	19
OFF	ON	OFF	ON	OFF	OFF	20
OFF	ON	OFF	ON	OFF	ON	21
OFF	ON	OFF	ON	ON	OFF	22
OFF	ON	OFF	ON	ON	ON	23
OFF	ON	ON	OFF	OFF	OFF	24
OFF	ON	ON	OFF	OFF	ON	25
OFF	ON	ON	OFF	ON	OFF	26
OFF	ON	ON	OFF	ON	ON	27
OFF	ON	ON	ON	OFF	OFF	28
OFF	ON	ON	ON	OFF	ON	29
OFF	ON	ON	ON	ON	OFF	30
OFF	ON	ON	ON	ON	ON	31
ON	OFF	OFF	OFF	OFF	OFF	32
ON	OFF	OFF	OFF	OFF	ON	33
ON	OFF	OFF	OFF	ON	OFF	34
ON	OFF	OFF	OFF	ON	ON	35
ON	OFF	OFF	ON	OFF	OFF	36
ON	OFF	OFF	ON	OFF	ON	37

Switch 3	Switch 4	Switch 5	Switch 6	Switch 7	Switch 8	MacId
ON	OFF	OFF	ON	ON	OFF	38
ON	OFF	OFF	ON	ON	ON	39
ON	OFF	ON	OFF	OFF	OFF	40
ON	OFF	ON	OFF	OFF	ON	41
ON	OFF	ON	OFF	ON	OFF	42
ON	OFF	ON	OFF	ON	ON	43
ON	OFF	ON	ON	OFF	OFF	44
ON	OFF	ON	ON	OFF	ON	45
ON	OFF	ON	ON	ON	OFF	46
ON	OFF	ON	ON	ON	ON	47
ON	ON	OFF	OFF	OFF	OFF	48
ON	ON	OFF	OFF	OFF	ON	49
ON	ON	OFF	OFF	ON	OFF	50
ON	ON	OFF	OFF	ON	ON	51
ON	ON	OFF	ON	OFF	OFF	52
ON	ON	OFF	ON	OFF	ON	53
ON	ON	OFF	ON	ON	OFF	54
ON	ON	OFF	ON	ON	ON	55
ON	ON	ON	OFF	OFF	OFF	56
ON	ON	ON	OFF	OFF	ON	57
ON	ON	ON	OFF	ON	OFF	58
ON	ON	ON	OFF	ON	ON	59
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

3. CONFIGURATION

To configure the Node Address (NA) and the Data Rate (DR) the on-board switch can be used, or a separate DeviceNet configuration tool can be used to program these values over the network. The switch is labeled on the module indicating which switches are used for Data Rate, and which are used for Node Address. The binary value of the switches defines these values. For programming over the network, the Data Rate switches must be set to a binary "11". The factory default values are 63 for the node address and 125 Kbaud for the data rate. Any modification of these values should be done before the module is connected to the DeviceNet network. After the node address has been changed the module will re-start. This can be observed on the Module/Network Status LEDs. The use of a newly set data rate will not happen until the unit is reset by switching the power on then off, or by a reset service over the network.

A separate switch allows the addition of a bus terminating resistor* for modules used at

the end of the trunkline. Factory default will be not terminated to conform to the DeviceNet Specification.

*** Caution!!! Unnecessary usage of the bus terminating resistor can cause improper termination of the network and can lead to network failure!!!**

4. SPECIFICATIONS

Overall Dimensions	DN-400 DN-410 DN-TC400	DN-400-0.5 DN-410-0.5 DN-TC400-0.5
Length	68 mm.	63.5 mm.
Width	60 mm.	38.1 mm.
Component height	12 mm.	
Weight	0.9 oz.	0.8 oz.
Environmental		
Operating temperature range	0 to 60 °C	
Storage temperature range	-20 to 85 °C	
Humidity	5 to 95% RH non-condensing	
DeviceNet		
Data rates & configuration	125, 250, 500 kBaud Set via switch or over the network. Non-volatile storage factory default =125	
Node address & configuration	0 to 63 Set via switch or over the network. Non-volatile storage factory default =63	
Connector	JST header	
Indicators	Module and Network Status LEDs	
Bus power consumption (excluding sensors)	70 ma avg. (receive) 120 ma max. (xmit)	
Protocol capabilities*	Group 2 only slave with Explicit, Polled, COS/Cyclic connections	
Device type	0 (Generic)	
Digital I/O		
Output Voltage	24 VDC PNP (sourcing)	
Output Current	1000 mA max	
Total Combined Output Current	2000 mA max	
Input Voltage	DNet bus voltage	
Input Load	10.0K to V-	

* For a more complete description for the DN-400/410 family protocol capabilities see the DN-400 Family Device Profile, Publication # 2200093.

See below for I/O message content.

I/O Message Content:

There is 1 byte contained in the I/O request Message. The I/O response also contains 1 byte. The outputs are mapped into the I/O request and the inputs are mapped into the I/O response bytes as shown below. A zero(one) in an I/O request bit 0 indicates that the associated output is to be turned off(on). A zero(one) in an I/O response bit 0 indicates that the associated input is off(on).

Default I/O Request format (outputs)

Byte	7	6	5	4	3	2	1	0
0	unused - ignored				out4	out3	out2	out1

bit postitions 4 through 7 are unused and will be ignored by the device

For the DN-TC400 and DN-TC400-0.5, outputs usage is:
out1 - Latch Tool Plate
out2 - Unlatch Tool Plate
out3 - Extra Output
out4 - Extra Output

I/O Response format for DN-400, DN-410, DN-400-0.5, and DN-410-0.5 in I/O mode (inputs)

Byte	7	6	5	4	3	2	1	0
0	ps2	ps1	unused (0)		in4	in3	in2	in1

I/O Response format for DN-TC400 and for DN-TC400-0.5 (inputs)

Byte	7	6	5	4	3	2	1	0
0	unused (0)		in4	in3	ps2	ps1	in2	in1

Unused bit positions will always be returned as zero

ps1 - Unlatch Solenoid Energized (SW Vaux > 20.4 V and out2 is on)
ps2 - Aux Power Available (Vaux > 20.4 V)
polartiy for ps1 and ps2 is configurable

For the DN-TC400 and DN-TC400-0.5, input usage is:
in1 - Tool Plate Latched

in2 - Tool Plate Unlatched
in3 - Extra Input
in4 - Extra Input