

# Functional Description

## DeviceNet™ 5 IN, 5 OUT I/O Module

For:  
DN-500 Ver. 2.0

*HURON  
NET  
WORKS*

---

771 Airport Boulevard, Suite 2, Ann Arbor, Michigan 48108 Phone: (734) 995-2637 Fax: (734) 995-2876

## Revision History

| Rev  | Date       | Note(s)  |
|------|------------|--|
| 1.01 | 08/05/2004 | Original – from various source documents                     |
| 1.02 | 8/16/2004  | Added Input Return to Pin 5 of the Connector Pinout of J1-J5 |
| 1.03 | 8/19/2004  | Added Dip Switch Settings Section                            |

DeviceNet is a trademark of ODVA.

# **1. INTRODUCTION**

The DN-500 module provides a DeviceNet connection for general purpose I/O consisting of up to 5 inputs and 5 outputs. Inputs are 5VDC and typically connected to switch contacts. The outputs are switched at bus voltage and are capable of 40 mA each. Outputs are overload protected and overload faults are signaled on DeviceNet. The board is intended for two different applications. One application will be as a lighted push button pendant. The other application is interfacing to panel mounted switches and indicators.

Interfaces on the DN-500 includes the following:

## DeviceNet Connector – J6 & J7

These connectors are used for 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 to power all circuitry. J6 is a screw terminal header and J7 is a pluggable connector. Both are located on the top or 'socket' side of the board

## I/O Connectors – J1 through J5

These 5 pin screw terminal headers are each for an external connection to one input and one output. These are the same signals present on the I/O sockets and are on the bottom of the board. These would be used to wire to external panel mounted switches and indicators. In this application the board would likely be mounted 'top down' to allow direct access to switches, indicators, and I/O.

## I/O Sockets – S1 through S5

Square-D sockets (PN: ZB6Y010) are on the top of the board and are wired to accommodate ZB6 series lighted pushbutton assemblies. The sockets are wired to allow the switch module to be on either side of the switch assembly. Note that the LED lamps are polarized and the board legend includes this polarity indication as does the switch body. These are the same signals present on the I/O Connectors.

## RS232 Connector – J8

This connector is used for factory configuration and firmware upgrades. The possibility exists for upgrades to include RS232 to DeviceNet functions.

## Indicators and Switches

- The standard red/green bi-color DeviceNet Module Status LED and Network Status LED are supported.

- The DIP Switch allows setting of the DeviceNet Node Address (NA) and Data Rate (DR)

## **2. APPLICATION**

### **2.1. Mechanical and Mounting**

The DN-500 module will either be inserted into a pendant housing or mounted inside of a panel. Overall dimensions shown in Specifications section.

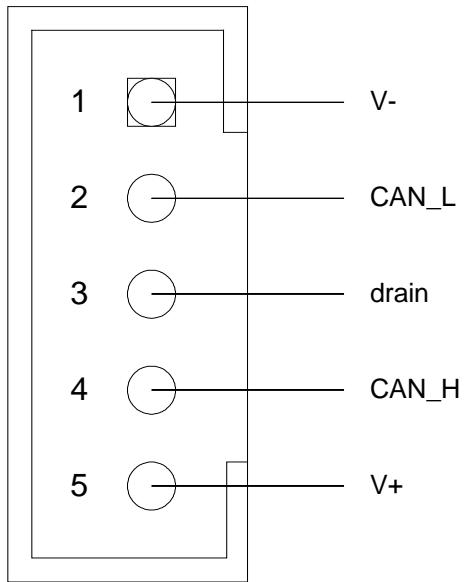
### **2.2. Wiring**

DeviceNet connector wiring should be as short as possible to J6 (or J7) to minimize capacitance on the signal lines. J8 provides serial connection for program updates and for possible expansion to DeviceNet RS232 functionality.

| Function (Connector)   | Connector Part Numbers |                       |
|------------------------|------------------------|-----------------------|
|                        | Board Hdr              | Mating                |
| RS232 (J8)             | S6B-PH-K (JST)         | PHR-6 (JST)           |
| I/O Connectors (J1-J5) | Screw terminal         | wire                  |
| I/O Sockets (S1-S5)    | ZB6-Y010 (Square-D)    | ZB6 switch (Square-D) |
| DeviceNet ( J6)        | Screw terminal         | wire                  |
| DeviceNet (J7)         | S5B-PH-K (JST)         | PHR-5 (JST)           |

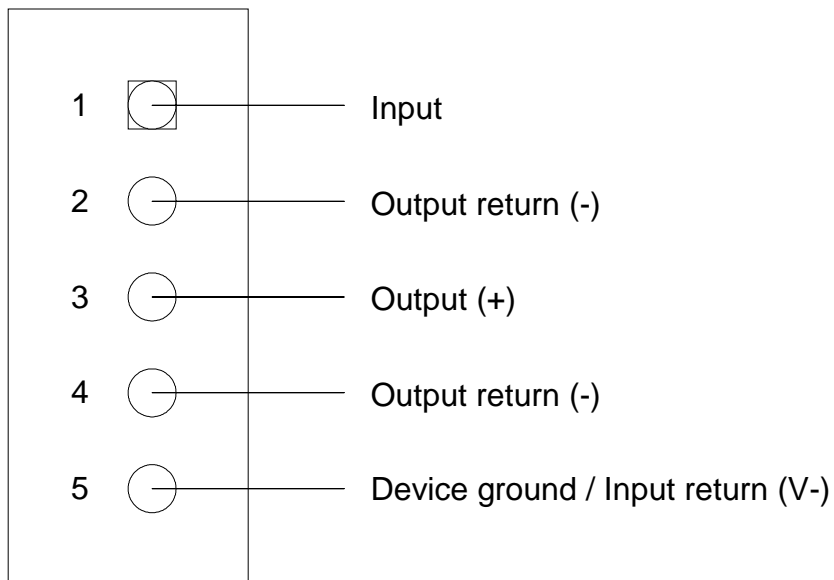
## 2.3. Connector Pinouts and Jumpers

J7 - 5 pin header for DeviceNet:

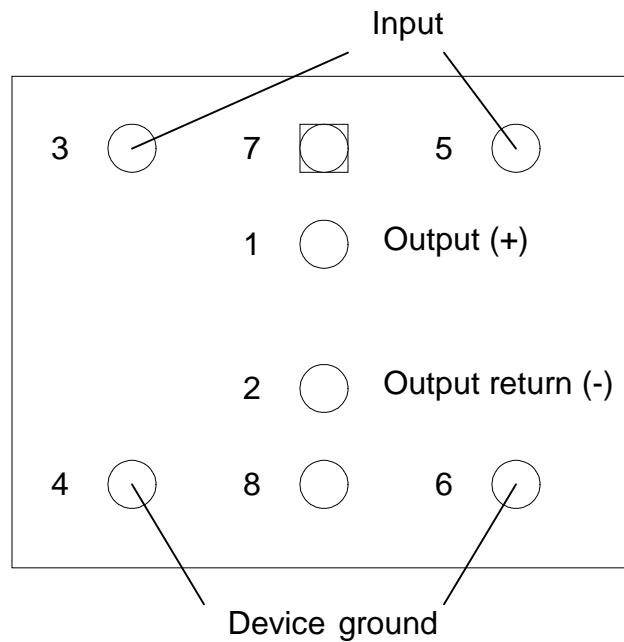


J6 – 5 pin screw terminal for DeviceNet uses the same pinout as J7.

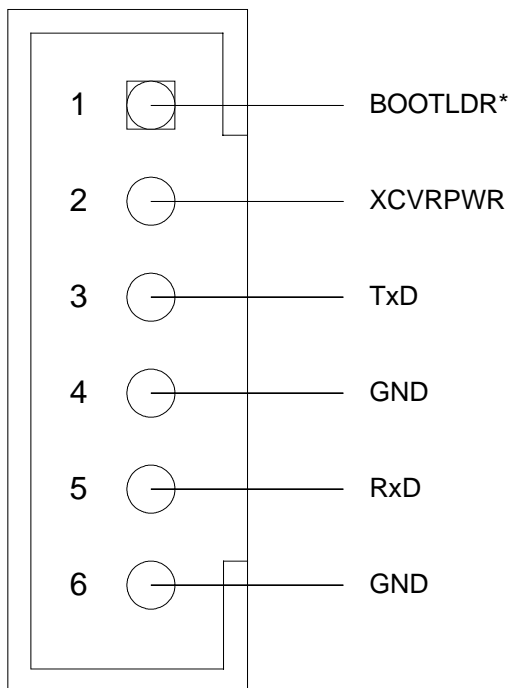
J1 through J5 - 5 pin screw terminal connectors for I/O:



S1 through S5 – push button switch sockets:



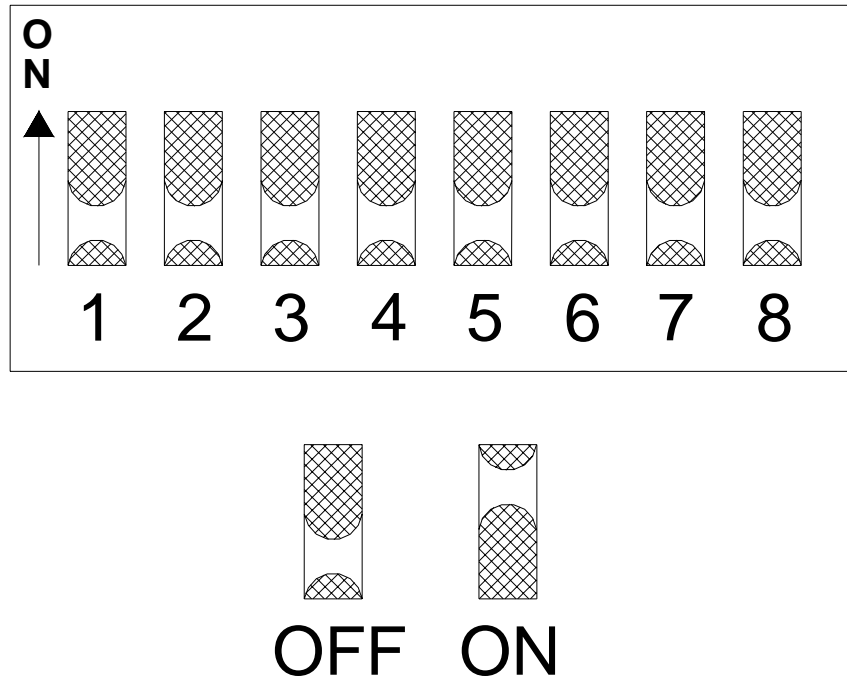
J8 – 6 pin header for RS232 connector:



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.

## 2.4. DIP Switches

The DN-500 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.

## **4. SPECIFICATIONS**

|  |  |
|--|--|
| <b>Overall Dimensions</b>                |  |
| Length                                   | 6.7 in.  |
| Width                                    | 1.6 in.  |
| Component height - top                   | 0.6 in. (socket)   |
| Component height - bottom                | 0.4 in (dip switch)  |
| Weight                                   | 3 oz.  |
| <b>Environmental</b>                     |  |
| Operating temperature range              | 0 to 60 °C   |
| Storage temperature range                | -20 to 85 °C   |
| Humidity                                 | 5 to 95% RH<br>non-condensing  |
| <b>DeviceNet</b>                         |  |
| Data rates & configuration               | 125, 250, 500 kBaud<br>Set via switch or over the network.<br>Non-volatile storage<br>factory default =125 |
| Node address & configuration             | 0 to 63<br>Set via switch or over the network.<br>Non-volatile storage<br>factory default =63              |
| Connectors                               | Screw terminal, Switch Sockets,<br>and JST header  |
| Indicators                               | Module and Network Status LEDs   |
| Bus power consumption<br>(excluding I/O) | 40 ma avg. (receive)<br>80 ma max. (xmit)  |
| Protocol capabilities*                   | Group 2 only slave with Explicit,<br>Polled, COS/Cyclic connections  |
| Device type                              | 0 (Generic)  |
| <b>Digital I/O</b>                       |  |
| Output Voltage                           | Bus voltage PNP (sourcing)   |
| Output Current                           | 40 mA max  |
| Total Combined Output Current            | 200 mA max   |
| Input Voltage                            | Switch closure NPN (sinking) –<br>5V logic   |
| Input Load                               | High impedance   |

\* For a more complete description for the DN-500 protocol capabilities see the DN-500 Device Profile, Publication # 2200013.

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 indicates that the associated output is to be turned off(on). A zero(one) in an I/O response bit indicates that the associated input is off(on).

### I/O Request format (outputs)

| Byte | 7              | 6        | 5 | 4    | 3    | 2    | 1    | 0    |
|------|----------------|----------|---|------|------|------|------|------|
| 0    | fault<br>reset | reserved |   | out5 | out4 | out3 | out2 | out1 |

bit positions 5 and 6 are unused and will be ignored by the device

### I/O Response format (inputs)

| Byte | 7            | 6            | 5 | 4     | 3     | 2     | 1     | 0     |
|------|--------------|--------------|---|-------|-------|-------|-------|-------|
| 0    | reserved (0) |              |   | in5   | in4   | in3   | in2   | in1   |
| 1    | LF           | reserved (0) |   | diag5 | diag4 | diag3 | diag2 | diag1 |

The diag1 through diag5 bits are the latched fault states of the outputs. These will be on (one) if there has been a fault on the associated output. LF is the latched fault bit and is the logical OR of the individual latched bits diagX.