# NoLand Engineering, Inc.
# N183-41 Serial Multiplexer

## 1.    General Description

Each **N183-41** Serial Multiplexer provides four NMEA 0183 Standard *listener* ports and one *talker* port.  Multiple units may be interconnected to provide up to ten *listener* ports (i.e. two units will provide seven *listener* ports and three units will provide ten *listener* ports.)  The *talker* port is provided to enable the computer to send specific NMEA 0183 messages to instruments equipped with a *listener* port, such as a LORAN,  GPS  or autopilot.

- The N183-41 is fully compatible with the "National Marine Electronics Association NMEA 0183 Standard for Interfacing Marine Electronic Devices, Version 2.00, 1992.

- A standard RS-232 communications port is provided for interfacing to the host computer.  (The output of this port can also be used to drive the input of a second N183-41 as mentioned above.)

- The *Talker* port utilizes a standard RS-422 differential driver as specified by the Standard.

## 2.    Installation

Installation of the N183-41 requires connection to a power source (9-16VDC), the instruments, and the computer.  All connections are made via a sixteen position terminal strip and are detailed below:  (See Fig. 1)
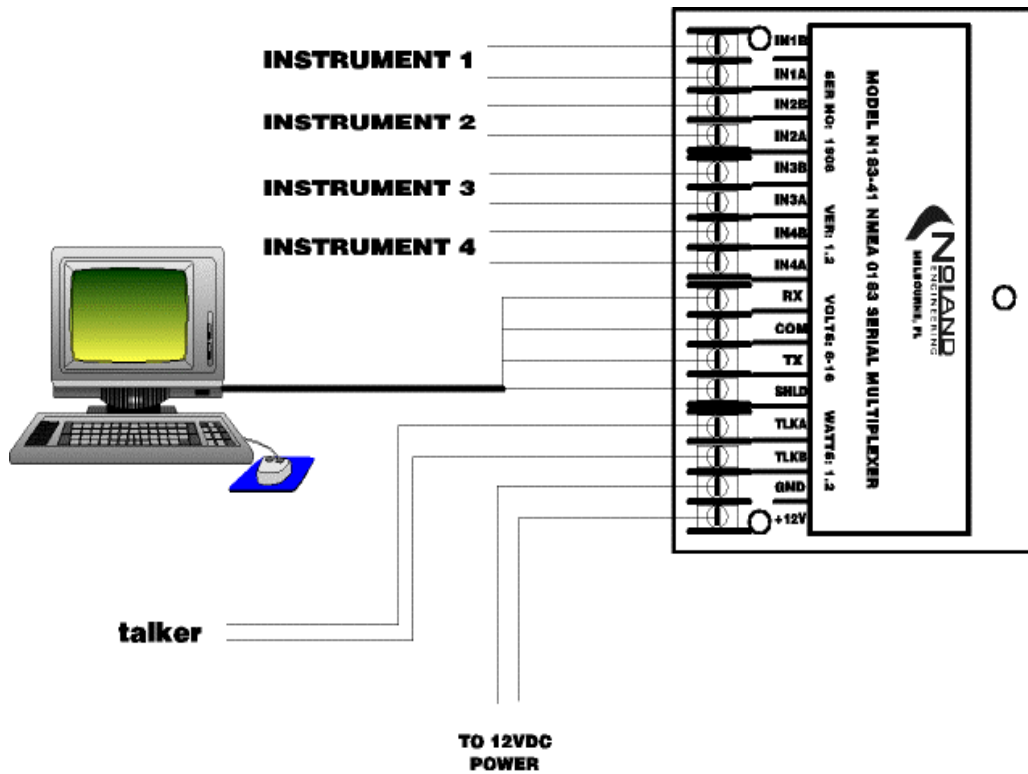
**Figure 1. N183-41 Multiplexer Typical Installation**

## Power/Ground Connection

The power (+12V) and ground (GND) connections are located at one end of the terminal strip. It is recommended that these be connected to the same power source (e.g., circuit breaker) as the ships instruments and/or computer, since it will be used only when both the instruments and computer are also in use. There is no ON/OFF switch provided on the **N183-41** due to its low power consumption.

## NMEA 0183 *listener* Connections

The **N183-41** input connections are labeled "IN1" through "IN4". When connecting instruments to the **N183-41**, it is important to maintain the proper polarity of the lines. Connect the "A" terminal of each input port of the **N183-41** to the corresponding "+" or "A" output terminal of each

instrument.  Connect the "B" terminal of each input port of the N183 -41 to the corresponding "-" or "B" output terminal of each instrument.

> **CAUTION:**  Do not interconnect the "B" terminals of the N183 - 41 and instruments as some instruments use single ended drivers and some use differential.  This will not damage the N183-41, but could cause erratic operation and may damage the instruments.

> **NOTE:**  If a particular instrument has only one NMEA terminal, it can be assumed that it is a single ended active line.  In this case, connect this line to the "INA" terminal of the **N183-41** and connect the corresponding "INB" terminal of the **N183-41** to instrument ground.

### NMEA 0183 *talker* Connection

The **N183-41** also features a *talker* (TLK) port which may be connected to any instrument which has an NMEA 0183 *listener* port such as a LORAN or GPS receiver.  Connection of this port follows the same convention as above except that any shield connection is now made at the N183-41 rather than at the instrument.  Also note that multiple *listeners* may be connected to this (TLK) *talker* port.

### RS-232 Computer Connection

For most applications the **N183-41** RS-232 output (RX, COM, and TX), will be connected to a computer via the DB-9 connector (supplied).  This connection is shown below in Fit. 2(a).  Some applications, however, may require a DB-25 connector as shown in Fig. 2 (b).  In this case a custom cable can be assembled or a standard DB-9 to DB-25 adapter may be purchased.

## 3.   Operation

### The *listener* (IN1A,IN1B,….IN4A,IN4B) ports

The **N183-41** features four independent NMEA 1083 *listener* ports. Each port receives data from the instrument connected to it on a character-by-character basis and is stored in a memory buffer exclusive to that port. Upon reception of a complete message, (i.e., a string of ASCII characters terminated by a CR,LF), the message is transferred from the port buffer to an output buffer for transmission via the RS-232 port to the computer. Messages from each port are transferred to the output buffer in the order that they are received.

### The *talker* (TLKA,TLKB) port

The **N183-41** features one NMEA 0183 *talker* port. The **N183-41** receives data to be sent out of the *talker* port from the host computer via the RS-232 port on a character-by-character basis storing the data in the *talker* buffer until a complete message is received. (A complete NMEA 0183 message is defined as a string of ASCII characters beginning with a $, and terminated by a (CR,LF). (See the Appendix A for details.) As soon as a complete message is received from the computer, it is transmitted out the *talker* port.

### The RS-232 (RX,COM,TX) port

A standard RS-232 port is provided for the communication interface to the host computer. This port is utilized for transmitting and receiving NMEA 0183 *listener/talker* messages to and from the host computer. Listed below are a series of control characters which are available to the host for controlling the **N183-41:**

$\wedge$R = 'Reset' the N183 -41
$\wedge$S = 'Stop' sending data
$\wedge$C = 'Re -Start' sending data
$\wedge$H = Change Baud rate from 4800-9600
$\wedge$L = Change Baud rate from 9600 to 4800

Note: On initial power-up, the **N183-41** will start transmitting received data at 4800 Baud automatically without any user intervention.

## 4. Programming

This section describes the communication protocol and programming features of the **N183-41**. Most users will find the supplied software adequate for basic data acquisition while others may wish to use the supplied programs as a starting point for the development of more sophisticated programs.

> Note: Refer to the program disc for instructions on loading and using the supplied software.

## Data Acquisition

Acquiring data from marine navigational instruments is the primary function of the N183-41. Under the NMEA 0183 specification, all data is transmitted as fields of ASCII characters assembled into specific messages. The format of every NMEA 0183 message is defined the standard. There are three basic sentence structures defined by the standard.

| | |
|---|---|
| *talker* | sentence |
| *query* | sentence |
| *proprietary* | sentence |

## *talker* Sentence

The general format for a *talker* (instrument) message is:

$aabbb,df1,df2,….<CR><lf>

All messages start with a Dollar sign ($) and are terminated with a Carriage Return/Line feed (<CR/LF>). Between these are the actual data fields (df1,df2,…) of the messages. The data fields are separated (delimited) by commas.

The first data field always consists of a five character string immediately following the '$" sign and is termed the *address field*. The first two characters are termed the *talker identifier* while the next three are the *sentence formatter*. The *sentence formatter* defines the remaining data fields, (i.e., the number of fields and whether they are fixed or variable length).

## *query* Sentence

A *query* message is intended to request approved messages to be transmitted from a *talker*. For example, a *query* message might be sent to a GPS receiver to request "DISTANCE-TO-WAYPOINT" information to be transmitted.

The general format of a *query* message is:

$aaaaQ,ccc,<CR><LF>

Where the first two characters of the address field are termed the *talker identifier* of the requester and the next two characters are the *talker identifier* of the device being queried. The fifth character is always a "Q" defining the message as a query. The next field (ccc) contains the three letter mnemonic of the message being requested.
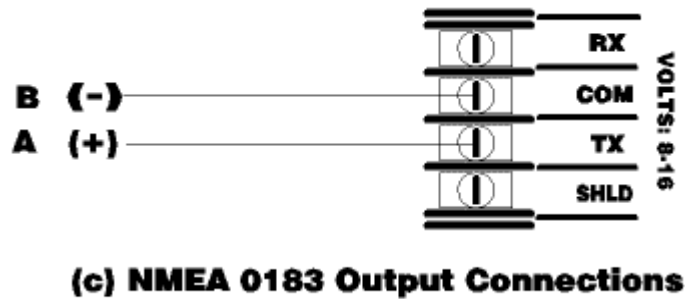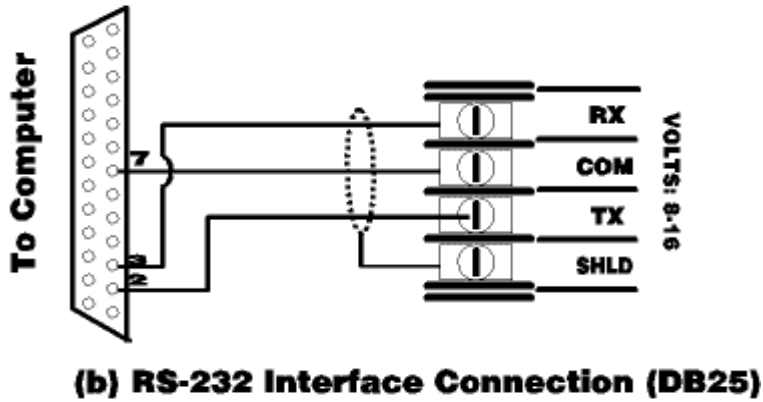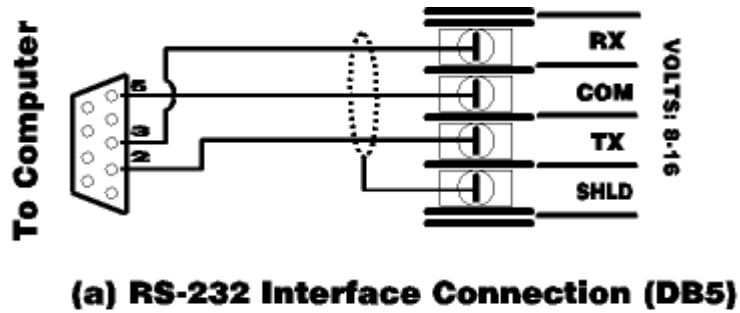
## *Proprietary* Sentence

The Standard defines a proprietary message as:

"A means for manufacturers to use the sentence structure definitions of the standard to transfer data which does not fall within the scope of approved sentences."

The general format of a *proprietary* message is

$Paaa,)oooooooooooo(,CR><LF>

Where the "P" indicates that it is a *proprietary* message and that the data fields which follow do not necessarily correspond to any approved sentence structure. The "aaa" is defined as the manufacturers mnemonic code.

(a) RS-232 Interface Connection (DB5)

(b) RS-232 Interface Connection (DB25)

(c) NMEA 0183 Output Connections

**Figure 2.  Serial Interface Connections.**

For installations requiring more than four instruments to be interfaced, multiple **N183-41's** may be used.  Two or **three N-183-41'**s may be interconnected as shown in **Fig. 3** to provide seven and ten *listener* ports respectively.  In this case the RS-232 output of one **N183-41** may be used to drive an input (*listener*) port of a second **N183-41**.  For

NMEA 0183 compatibility, the connection should be made as shown in **Fig. 2(c).**
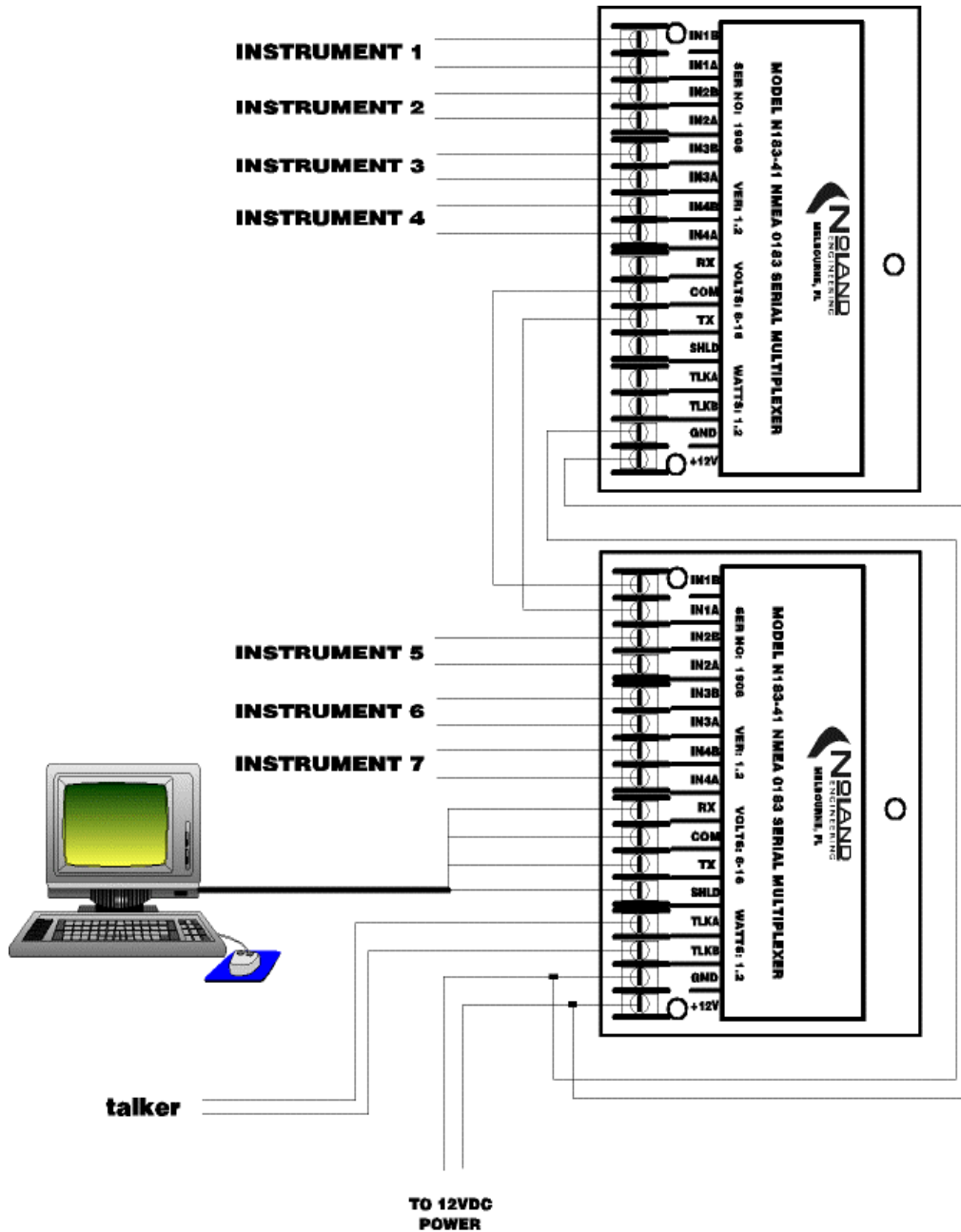


**Figure 3. N183-41 Configured for Seven Inputs**

### Mounting

Three through holes are provided for mounting the N183-41 to any convenient surface.  Although the unit is watertight, it is best to mount it away from direct sunlight and/or water spray to prevent excessive heating of the unit or corrosion of the terminals.  If the N183-41 is exposed to excessive humidity, it is recommended that the terminal connections be treated with an anti-corrosion compound.

> **Note:** Refer to Figure 4 on the back cover of this document.

## 5.    Troubleshooting

In general, most users will find the installation and operation of the **N183-41** to be trouble-free.  However, if faults should arise, the following procedures are recommended to diagnose the problem:

The majority of faults with electronic equipment are due to worn or incorrect wiring.  In case of trouble, the following should be checked first:

> Power Supply Connections
> Instrument Connections
> RS-232 Interface

If all connections seem to be correct and a suitable ammeter is available, the power supply current should be checked.  The power supply current should be approximately 0.075A.  Readings significantly above or below this figure indicate a defective unit.  Please contact NoLand Engineering for further assistance.

## 6.    Warranty

NoLand Engineering, Inc., provides a two year replacement warranty against manufacturing faults or component faults.  A dated purchasing receipt must be provided.

# APPENDIX A

# NMEA 0183 STANDARD

NMEA 183 is a standard for interfacing marine electronic devices. This standard defines the electrical signal requirements, data transmission protocol, data transmission timing, and specific message formats for a 4800 baud serial data bus. Each bus may have only a single *talker*, but may have multiple *listeners.* The complete document describing this standard will not be reproduced here, but rather summarized for use by the general programmer.

NMEA 0183 devices employ an asynchronous serial interface with the following parameters:

| | |
|---|---|
| Baud Rate | 4800 |
| Data Bits | 8(d7-0) |
| Parity | None |
| Stop Bits | One (or more) |

Devices are designated as either *talkers* or *listeners* with some devices being both. All data is transmitted or received is interpreted as 8 bit ASCII (d7=0).

*talker(s)*

A *talker* is any device which sends data to other devices within the NMEA 0183 specification.

*listener(s)*

A *listener* is any device which receives data from other devices within the NMEA 0183 specification.

Electrical Specifications

*talker*: The drive circuit shall provide a signal line "A" and a return line "B" and shall meet, as a minimum, the requirements of EIA-422-A (1978). (Differential)

Note:  Earlier versions of the NMEA 0183 standard specify single ended drive circuitry for *talker(s)* (i.e. 0 to +15VDC)

*Listener:*    Within a *listener* there shall be no direct electrical connection between the signal line "A", the return "B", o r shield and ships ground or power.  (The **N183-41,** and most other listener devices accomplish this through the use of opto-isolation.)

Message Format

The general NMEA 0183 message format is shown below:

$AABBB,df1,df2,…<CR><F>

All NMEA 0183 messages start with a "$" and are terminated by a <CR><LF>.  The first two characters after the "$" are an instrument identifier while the next three characters are a sentence type identifier.  Multiple data fields follow the instrument and sentence type identifiers and are delimited by commas.

Note:    Refer to the user manuals of the particular instruments being interfaced for the formats of the sentences being used.

### PC INTERFACE CABLE CONNECTIONS

| | | |
|---|---|---|
| **RED** | **to** | **"TX" of N183-41** |
| **GRN** | **to** | **"COM" of N183-41** |
| **ORG** | **to** | **"RX" of N183-41** |
| **No Connection** | **to** | **"SHLD" of N183-41** |

# N183-41 Technical Specifications

| | |
|---|---|
| Supply Voltage | 8-16 VDC |
| Supply Current | 75 mA (typical) |
| Input Drive Voltage | 4-15 V (Active State) |
| Input Impedance | 500 Ohms (Min.) |
| Talker Output | Differential as pre EIA-422 |
| RS-232 Output | 4800,9600 baud (selectable) |
| Operating Temperature | -20 deg C to +70 deg C |
| Storage Temperature | -40 deg C to +95 deg c |
| Humidity | 90% |
| Size | 4.5" x 3.25" x 0.875" |
| Weight | 8 oz. |
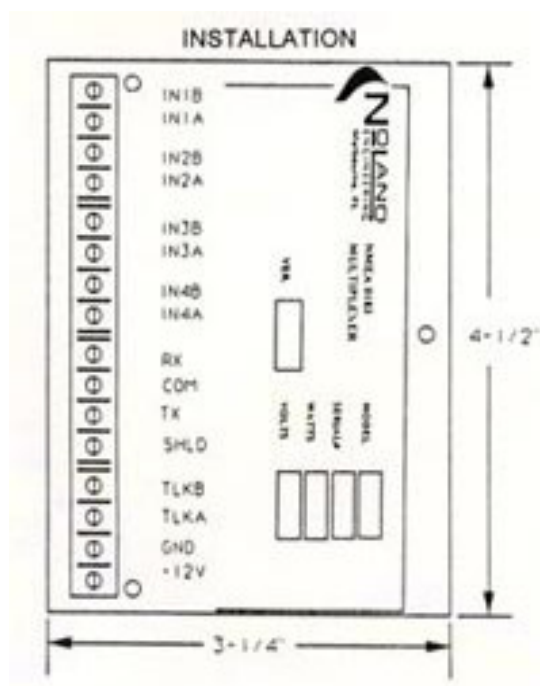


**NoLand Engineering Inc**
**728 E Lincoln Ave**
**Suite 3**
**Melbourne, FL 32901**

**Tel: (321) 951 –7329  Fax: (321) 951-8773**
**email: info@ nolandengineering.com**