# NM-251D-DTM

# Datum Generator - Data Multiplier
# User Guide
**V1.00**

### Introduction

The NM-251D-DTM is a member of the NM-251 Series family and is programmed to produce and output the $GPDTM string in order to identify the datum as the WGS84.

### Operation

The NM-251D-DTM acquires the NMEA-0183 sentences from the first input port only. Every four completed NMEA-0183 strings that the NM-251D-DTM, it produces and transmits the following sentence:

**$GPDTM,W84,,00.0000,N,00.0000,W,,W84\*53**

The $GPDTM indicates to the connected systems such as ECDIS and VDR systems that the datum used is the WGS84. All the inputted strings and the generated Datum sentence are then transmitted to the five outputs and the RS232 port (pass thru function).

### Input Ports (listeners)

The NM-251D-DTM uses one of the two input ports. The input port Inb is not available at the NM-251D-DTM custom interface and should not be connected. The listener port Ina is optically isolated as specified in NMEA-0183 protocol, thus data(-) pole should never been connected to NM-251D-DTM ground. If the instrument's talker port is single ended, connect that terminal to the Ina(+) input and tide the Ina(-) to instrument's ground. If an RS-232 level signal is connected, the ground pole (GND) should be connected to Ina(+) and the data pole (TXD) to Ina(-) respectively. The listener port Ina can acquire NMEA sentences carried in TTL, RS-232 and RS-485/422 signal levels.

**Output Ports (Talkers)**

Each of the four general purpose talker ports can output NMEA sentences in both RS422 and TTL signal levels, depending on the connection topology chosen (see figure 1, 2 and 3), and can fan out one instrument. Current drawn from all port can be up to 40mA (maximum rating 60mA @ 24VDC power supply) simultaneously, efficient enough to drive any NMEA compatible instrument.

The RS-232 port can deliver NMEA sentences to any modern computer running the appropriate software on Windows 98 and above. The RS-232 port is not optically isolated and should be used for testing purposes only to avoid DC leakage. It can be used though to interface a computer system if proper isolation is achieved or if the computer is supplied from an isolated power source.

The Out5 port has two functionality modes that can be selected via jumper J6 located inside NM-251D-DTM (see figure 4). By shorting poles 1-2 on J6, the Out5 converts signals received from computer to RS-422 signal level. This functionality is independent from the rest of the NM-251D-DTM circuits. By shorting poles 1-3 on J6, Out5 is configured as a fifth output of the NM-251D-DTM. Further details on how to configure the functions of the NM-251D-HDT are shown on table 1.

The NM-251D-DTM can be connected as shown in figures 1,2 and 3 using all RS-422 outputs (figure 1), all TTL outputs (figure 2) or using either the RS-422 or TTL output of each port taking care not to connect the same port for both signal level outputting (figure 3).
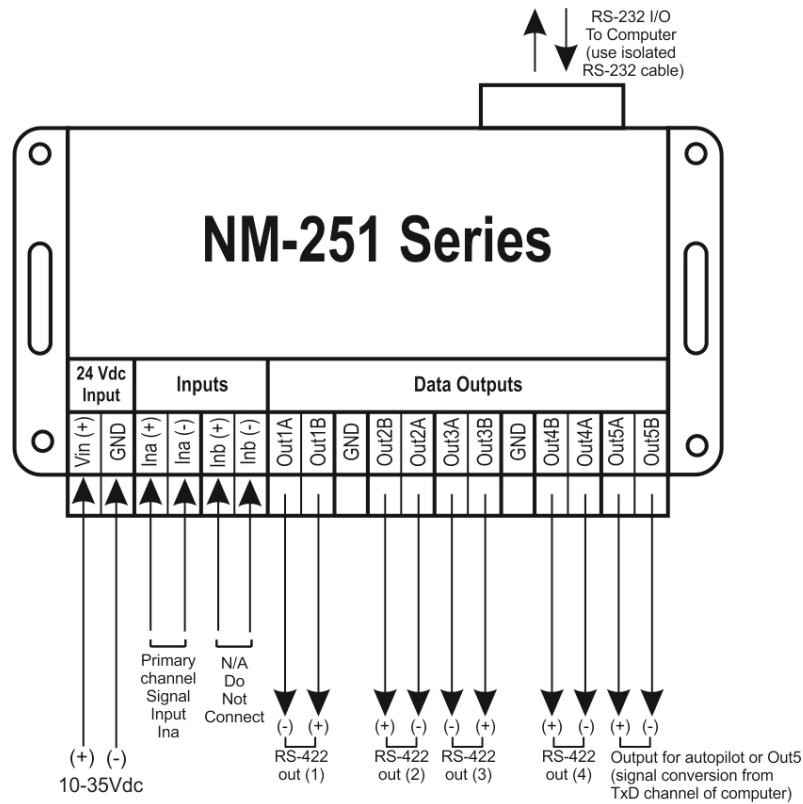


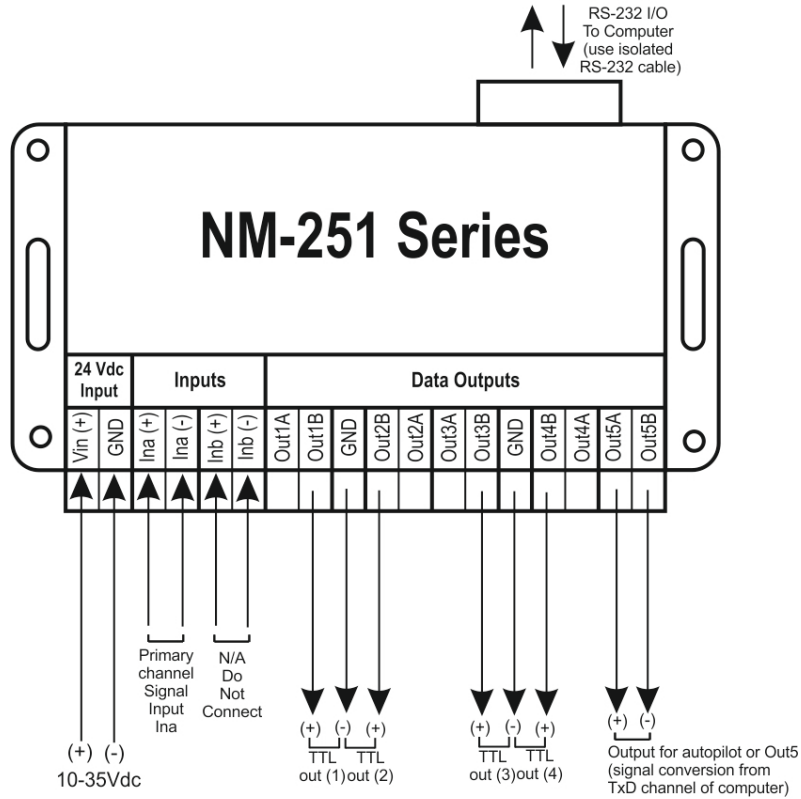Figure 1: Connection to RS-422 Outputs

RS-232 I/O
To Computer
(use isolated
RS-232 cable)

## NM-251 Series

| 24 Vdc Input | | Inputs | | | | Data Outputs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vin (+) | GND | Ina (+) | Ina (-) | Inb (+) | Inb (-) | Out1A | Out1B | GND | Out2B | Out2A | Out3A | Out3B | GND | Out4B | Out4A | Out5A | Out5B |

Primary channel Signal Input Ina

N/A Do Not Connect

(+) (-) (+)
TTL   TTL
out (1) out (2)

(+) (-) (+)
TTL   TTL
out (3) out (4)

(+) (-)
Output for autopilot or Out5 (signal conversion from TxD channel of computer)

(+) (-)
10-35Vdc

Figure 2: Connection to TTL outputs



RS-232 I/O
To Computer
(use isolated
RS-232 cable)

## NM-251 Series

| 24 Vdc Input | | Inputs | | | | Data Outputs | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vin (+) | GND | Ina (+) | Ina (-) | Inb (+) | Inb (-) | Out1A | Out1B | GND | Out2B | Out2A | Out3A | Out3B | GND | Out4B | Out4A | Out5A | Out5B |

Primary channel Signal Input Ina

N/A Do Not Connect

(+) (-)
TTL out (1)

(+) (-)
RS-422 out (2)

(+) (-)
TTL out (3)

(+) (-)
RS-422 out (2)

(+) (-)
Output for autopilot or Out5 (signal conversion from TxD channel of computer)
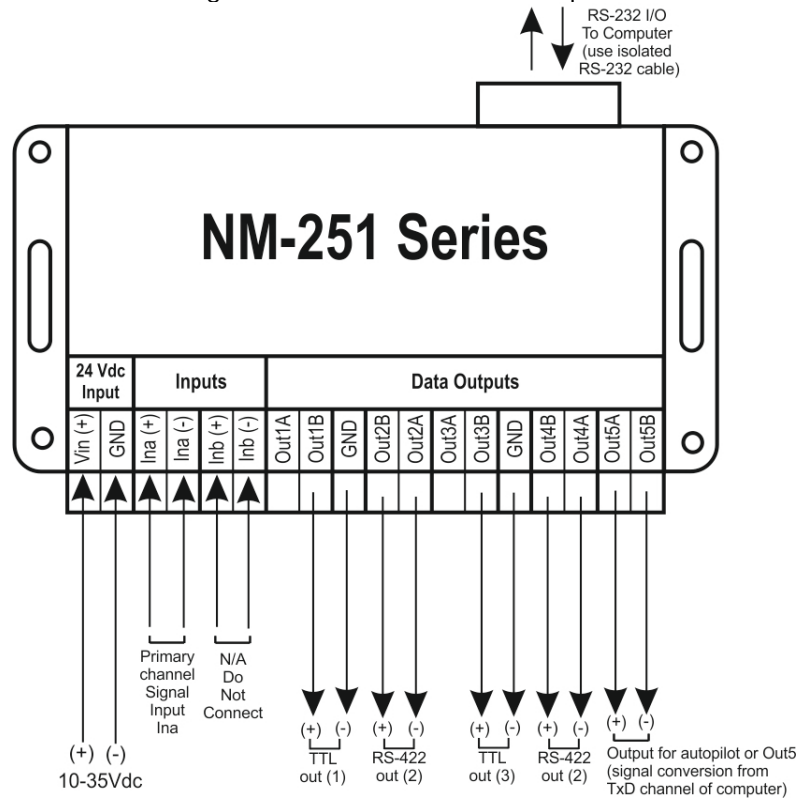
(+) (-)
10-35Vdc

Figure 3: Combined use of TTL and RS-422 outputs

**Power Supply**

The NM-251D-DTM can be powered within the range of 10-35 VDC. The nominal voltage of 24 VDC is advised for powering the device in normal operation.

Power input port has a protection for incorrect polarity connection of the supplying voltage.

**LED Indicator sequence**

| Inb LED | ON: Indicates normal state. Microcontroller is executing the custom firmware |
|---|---|
| Ina LED | |
| Out 3/4 LED | Flashing indicates data transmission to output port 3 and 4 |
| Out 1/2 LED | Flashing indicates data transmission to output port 1 and 2 |
| Out5 LED | Flashing indicates reception from RS-232 port and transmission to Out5 port if J6@1-2 or flashing indicates data transmission to Out5 port if J6@1-3 (configured as general purpose) |

**Jumper Settings**

| Configuration | | Functionality Description |
|---|---|---|
| **J5** | **J6** | |
| 1-2 | X | Input Signal at Ina is processed from the CPU. Baud rate and functionality at the output ports are defined from the software executed in the CPU (factory default) |
| 1-3 | X | Input Signal at Ina is not processed from the CPU. Signal output baud rate is the same as input (maximum 38.400 baud) |
| X | 1-2 | Output port Out5 converts signals received from a computer at the RS-232 (pin3 of the D-SUB9 connector) to RS-422 signal level |
| X | 1-3 | Output port Out5 is functioning as a general purpose output |

Table 1: NM-251D-DTM Jumper configuration

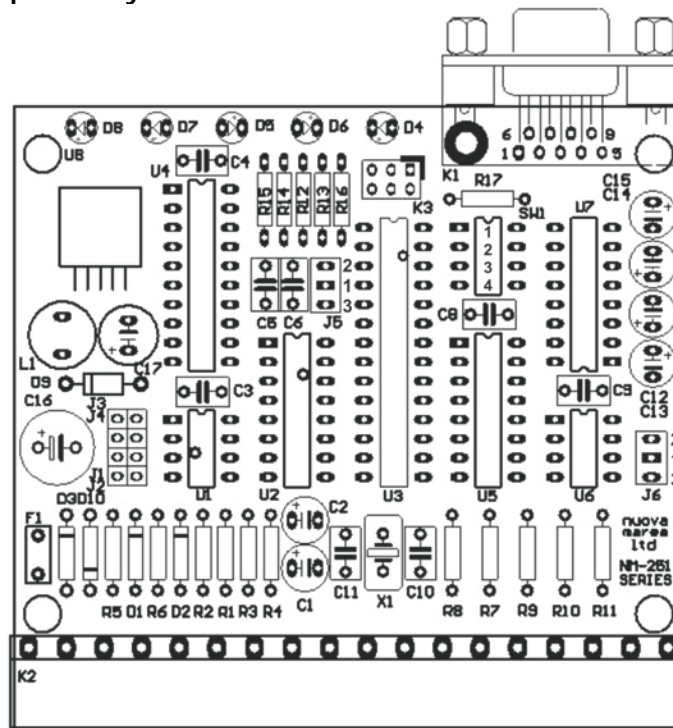**Printed Circuit Board composite layout**



Figure 4: Composite layout of NM-251D-DTM printed circuit board

**Specifications**

| | |
|---|---|
| Supply Voltage | 9 to 35 VDC |
| Power Supply Protection | PTC Resettable Fuse<br>Vmax: 60V, Imax: 40A, Ihold: 0,25A (23°C),<br>Itrip:0,5A (23°C), Max time to trip (23°C): 2,2sec for 1,25A |
| Current Consumption | 20mA in idle state @ 24VDC / 60mA in full output mode @ 24VDC |
| Inputs | 1 x NMEA-0183, optically isolated<br>Common Mode Rejection: 10kV/usec, Isolation: 480 Vrms |
| Input Resistance | 1,5 KOhm |
| Outputs | 4 x buffered RS-422/TTL (general purpose)<br>1 x RS-232<br>1 x RS-422 signal conversion from RS-232 RXD channel or as fifth output |
| Output protection | Buffered for all RS-422 outputs |
| Indicators | Input (Ina) & Input (Inb) – Always ON indicates custom firmware<br>Data transmission from output ports 1 and 2 (Out 1/2 LED)<br>Data transmission from output ports 3 and 4 (Out 3/4 LED)<br>Data reception from RS-232 interface or output 5 port (Out 5 LED) |
| Dimensions | Width  = 110mm/134,80 mm<br>Depth  = 82 mm<br>Height = 43 mm |

| Port ID | Wire ID / Color | Cable ID | Signal Description |
|---|---|---|---|
| Vin(+) | | | |
| GND | | | |
| Ina(+) | | | |
| Ina(-) | | | |
| Inb(+) | N/A | N/A | N/A |
| Inb(-) | N/A | | |
| Out1A | | | |
| Out1B | | | |
| GND | | | |
| Out2B | | | |
| Out2A | | | |
| Out3A | | | |
| Out3B | | | |
| GND | | | |
| Out4B | | | |
| Out4A | | | |
| Out5A | | | |
| Out5B | | | |

**SETTINGS**

**J5***

| 2 | 1 | 3 |
|---|---|---|
| | | |

**J6***

| 2 | 1 | 3 |
|---|---|---|
| | | |

**Dip Switches****

| ID | OFF | ON |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |

* Mark the positions that are occupied by the jumper
** Mark the position for every switch

**NOTES:**

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CERTIFICATE NUMBER
08-PR299432-1-PDA

DATE
01 March 2013

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# CERTIFICATE OF

# DESIGN ASSESSMENT

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assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

PRODUCT: **Programmable Controller, I/O Units, Operator & Communication Interfaces**

MODEL: **NM-251 Series**

This Product Design Assessment (PDA) Certificate 08-PR299432-1-PDA, dated 01/Mar/2013 remains valid until 19/Mar/2018 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

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