

# True Wind Calculator

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Installation and user manual



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## Abbreviation

- **EEPROM** - Electrically Erasable Programmable Read-Only Memory.
- **GPS** - Global Positioning System.
- **LED** - Light-emitting diode.
- **NDCU** - Navigation Data Computing Unit.
- **NMEA** - Electrical and data specification for communication between marine electronics instruments. It has been defined by, and is controlled by, the National Marine Electronics Association.

## Safety information



**Do not work inside the equipment unless totally familiar with electrical circuits.**

Hazardous voltage which can cause electrical shock, burn or serious injury exists inside the equipment.



**Turn off the power at the mains switchboard before beginning the installation.**

Post a sign near the switch to indicate it should not be turned on while the equipment is being installed.

Fire, electrical shock or serious injury can result if the power is left on or is applied while the equipment is being installed.



**Confirm that the power supply voltage is compatible with the voltage rating of the equipment.**

Connection to the wrong power supply can cause fire or equipment damage. The voltage rating appears on the last page of this manual.

## Description

True Wind Calculator software based on NDCU (Navigation Data Computing Unit) hardware has been designed to calculate True Wind Angle and Speed. Transmitted and received signal is galvanically isolated from power supply and all listeners. Unit can operate with signal baud rate up to 115200 bps and power supply range from 9 to 36 VDC. Unit has possibility to connect four independent NMEA transmitters such as GPS, Gyrocompass, Wind Sensor and Walker P1274 Remote Wind Control. Device retransfers received MWV telegrams to desired output together with calculated MWD or MWV (True Wind) telegram, system status telegram and \$PJLG telegram if Walker P1274 is connected to the system.

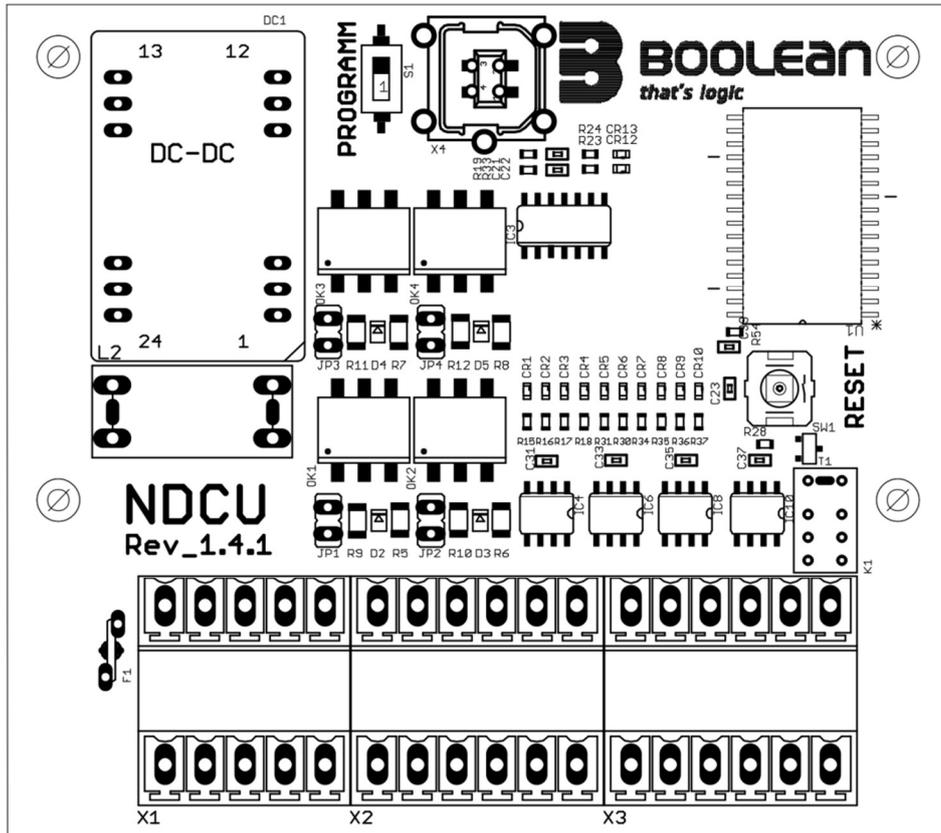
Once MWV (Relative Wind) is received and Gyro with GPS signals are valid, system will transmit calculated MWD or MWV (True Wind) string immediately after. True Wind transmission frequency is related to received MWV (Relative Wind) telegrams. If Wind Sensor transmits MWV telegrams with frequency 5Hz (5 times per second) system will retransmit then with the same frequency together with calculated True Wind telegrams for every received MWV string.



Therefore it is recommend to enable MWD or MWV (True Wind) transmission on the same port as Wind Sensor is connected or another with equal or higher baud rate, to avoid problems with overloading slower ports!

When True Wind transmission and Relative Wind retransmission is disabled system will send only alarm (system status) telegram to all outputs.

User has possibility to configure port baud rate separately for every system port by means of NDCU Configuration Tool application. System has been designed to check checksum of received telegram, disable / enable checksum of transmitted telegrams, change talker ID from WI to II for all transmitted telegrams (except \$PJLG), check of GPS and Wind Sensor string validity. All functions can be disabled by user.



Component layout.

## Terminal description

**DIP Switch S1.** Programming only!

**Jumpers JP1, JP2, JP3, JP4.** Close jumper in case of weak input signal. Normally leave opened. JP1 corresponds to input 1 and JP2 corresponds to input 2 and so on up to input 4.

**Connector X4 (USB)** . Programming only!

## LED Description.

LED number:	Colour / state:	Function:
CR1	Green / blinking	Input 1 data receiving
CR2	Green / blinking	Input 2 data receiving
CR3	Green / blinking	Input 3 data receiving
CR4	Green / blinking	Input 4 data receiving
CR5	Red / lit constantly	Power ON when lit
CR6	Red / lit constantly	System alarm when lit
CR7	Blue / blinking	Output 1 data transmission
CR8	Blue / blinking	Output 2 data transmission
CR9	Blue / blinking	Output 3 data transmission
CR10	Blue / blinking	Output 4 data transmission

**X1 to X3. Power and signal connection for NDCU hardware rev\_1.4.x.** Refer to below tables:

PWR+	PWR-	GND	IN2+	IN2-	IN4+	IN4-	OUT1A	OUT1B	OUT2A	OUT2B	OUT3A	OUT3B	OUT4A	OUT4B	AL COM	AL NC
6	7	8	9	10	7	8	9	10	11	12	7	8	9	10	11	12
PWR+	PWR-	GND	IN1+	IN1-	IN3+	IN3-	OUT1A	OUT1B	OUT2A	OUT2B	OUT3A	OUT3B	OUT4A	OUT4B	AL COM	AL NO
1	2	3	4	5	1	2	3	4	5	6	1	2	3	4	5	6
X1				X2						X3						

*NDCU 1.4.x Terminal description sticker*



**Note:** Power terminals 1 and 6, 2 and 7, 3 and 8 are connected parallel!



**Note:** Upper and Lower NMEA output terminals are NOT connected parallel. In example NMEA out 1 from lower terminal has separate output driver as NMEA out 1 from upper terminal. They work as 2 channel NMEA buffer on each output.

### **X1 Terminal description.**

<b>X1 Terminal number:</b>	<b>Description:</b>	<b>Function:</b>
1	PWR+	Power input Positive (9-36VDC)
2	PWR-	Power input Negative
3	GND	Grounding point
4	IN1+	Input 1 data receiving
5	IN1-	Input 1 data receiving
6	PWR+	Power input Positive (9-36VDC)
7	PWR-	Power input Negative
8	GND	Grounding point
9	IN2+	Input 2 data receiving
10	IN2-	Input 2 data receiving

### **X2 Terminal description.**

<b>X2 Terminal number:</b>	<b>Description:</b>	<b>Function:</b>
1	IN3+	Input 3 data receiving
2	IN3-	Input 3 data receiving
3	OUT1A	NMEA Data Output 1 – buffered
4	OUT1B	NMEA Data Output 1 – buffered
5	OUT2A	NMEA Data Output 2 – buffered
6	OUT2B	NMEA Data Output 1 – buffered
7	IN4+	Input 4 data receiving
8	IN4-	Input 4 data receiving
9	OUT1A	NMEA Data Output 1 – buffered
10	OUT1B	NMEA Data Output 1 – buffered
11	OUT2A	NMEA Data Output 2 – buffered
12	OUT2B	NMEA Data Output 2 – buffered

**X3 Terminal description.**

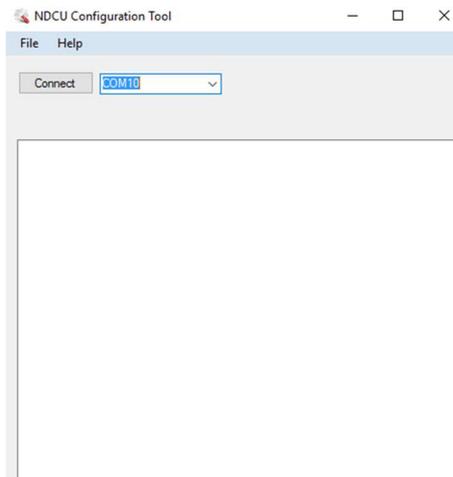
<b>X3 Terminal number:</b>	<b>Description:</b>	<b>Function:</b>
1	OUT3A	NMEA Data Output 3 – buffered
2	OUT3B	NMEA Data Output 3 – buffered
3	OUT4A	NMEA Data Output 4 – buffered
4	OUT4B	NMEA Data Output 4 – buffered
5	AL COM	Alarm relay Common contact
6	AL NO	Alarm relay Normally Opened contact
7	OUT3A	NMEA Superfast Data Output 3 – buffered
8	OUT3B	NMEA Superfast Data Output 3 – buffered
9	OUT4A	NMEA Data Output 4 – buffered
10	OUT4B	NMEA Data Output 4 – buffered
11	AL COM	Alarm relay Common contact
12	AL NC	Alarm relay Normally Closed contact

## System configuration

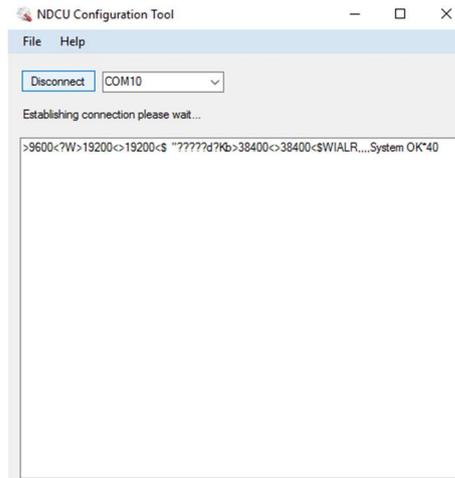
1. Connect USB A-B cable to NDCU USB Connector, install drivers, switch DIP Switch S1 to ON and proceed to next step, or connect any USB < > RS422 converter to Port 1 of NDCU according to connection scheme below:

USB < > RS422 converter	NDCU v1.2
Tx +	5. NMEA1 + input 1
Tx -	4. NMEA1 - input 1
Rx +	8 or 23. NMEA out 1 A
Rx -	9 or 24. NMEA out 1 B

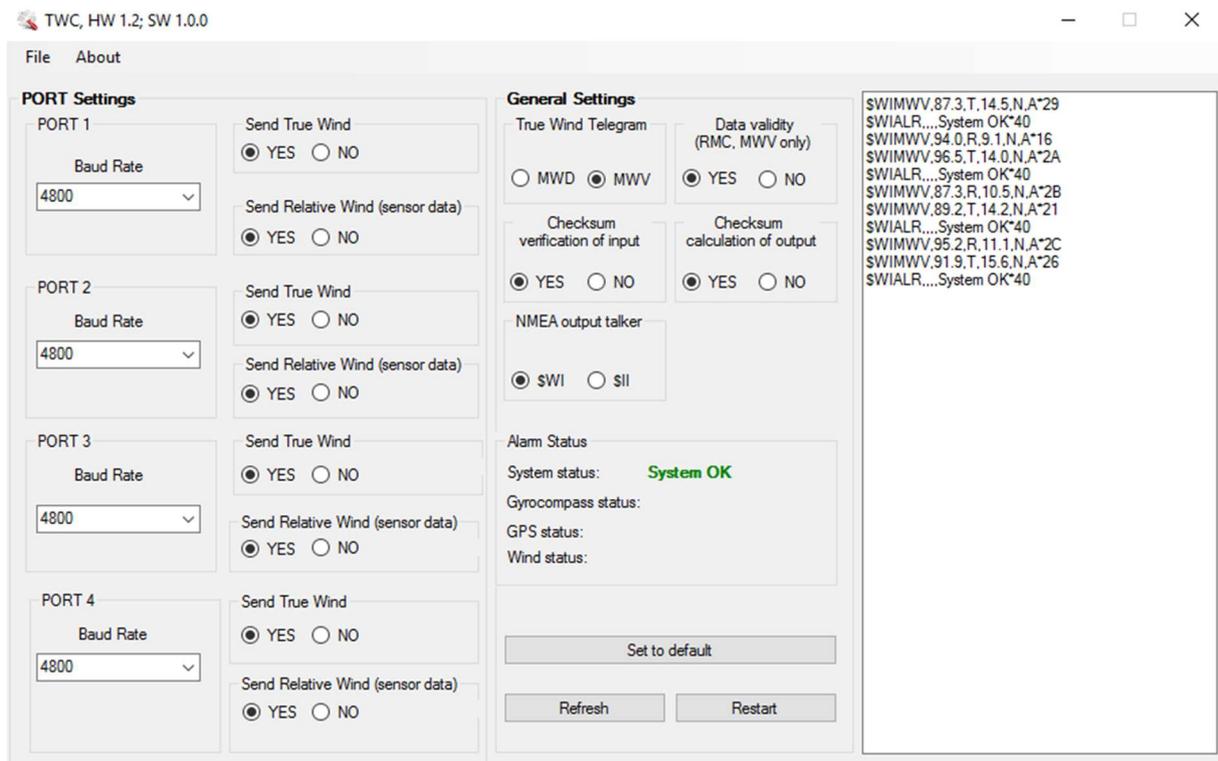
2. Launch NDCU Configuration Tool on service Laptop and select COM port corresponding to USB < > RS422 converter.



3. Press “Connect” Button and wait for connection with NDCU.



Application will find proper Baud rate to communicate with NDCU and configuration form starts automatically.



Any change on Configuration Application is immediately transferred to NDCU and stored in it's internal EEPROM.



**Note:** System reads Baud rate configuration ONLY during startup, therefore any change in Baud rate configuration must be followed by main power recycle or pressing “Restart” button! Baudrate 230400 bps is used as output only. System will not read any data at this speed.

## System alarms and troubleshooting

System transmits following information after startup to all 4 ports:

```
True Wind Converter version x.x.x  
for NDCU hardware rev_x.x  
Copyright Boolean 20xx
```

And system status every one second:

```
$xxALR,,,,System OK*40
```

String `$xxALR,,,,System OK*40` consists following fields:

```
$<field1>,<field2>,<field3>,<field4>,<field5>*hh<CR><LF>
```

Field1 contains always WIALR or IIALR talker.

Field2 contains Gyrocompass signal related alarms.

Field3 contains GPS signal related alarms.

Field4 contains Wind Sensor signal related alarms.

Field5 contains system status information System OK or System NG which appears in case of any alarm.

hh is XOR checksum calculated according to NMEA specification.

<CR><LF> is a Carriage Return and Line Feed



**Note:** No \$xxMWD or \$xxMWV (True Wind) telegram is transmitted in case of any alarm in the system!

## **Alarms and possible actions.**

### **Gyrocompass signal related alarms.**

- a) "No Heading input" – appears when there is no Gyro or Magnetic compass input within 30 seconds. Check Baud rate, Compass transmitter, cabling, signal level.
- b) "Wrong CHKSUM XXX" – appears when there is wrong checksum in incoming string in period of 30 seconds. XXX indicate problematic string, in example HDT. Solution: see System configuration – disable/enable Checksum verification of input. Check Compass Transmitter, cable screening, grounding, signal level.
- c) "Invalid data XXX" – appears when there is a continuous distortion in compass heading field or field is empty within 30 seconds. XXX indicate problematic string, in example HDT. Check Compass Transmitter, cable screening, grounding, signal level.

### **GPS signal related alarms.**

- a) "No GPS input" – appears when there is no GPS input within 30 seconds. Check Baud rate, GPS Unit, cabling, signal level.
- b) "Wrong CHKSUM XXX" – appears when there is wrong checksum in incoming string in period of 30 seconds. XXX indicate problematic string, in example RMC. Solution: see System configuration – disable/enable Checksum verification of input. Check GPS unit, cable screening, grounding signal level.
- c) "Invalid data XXX" – appears when there is a continuous distortion in GPS speed field or field is empty within 30 seconds. XXX indicate problematic string, in example RMC. It will also appear when GPS is not active (only RMC) – no "A" letter in field no. 3 in RMC telegram (See NMEA RMC specification). Check GPS unit, cable screening, grounding, signal level or disable this feature by "Data Validity" option.

### **Wind Sensor signal related alarms.**

- a) "No Wind input" – appears when there is no Wind Sensor input within 30 seconds. Check Baud rate, Sensor unit, cabling, signal level.
- b) "Wrong CHKSUM XXX" – appears when there is wrong checksum in incoming string in period of 30 seconds. XXX indicate problematic string, in example MWV. Solution: see System configuration – disable/enable Checksum verification of input. Check Sensor unit, cable screening, grounding, signal level.
- c) "Invalid data XXX" – appears when there is a continuous distortion in wind speed or angle field or field is empty within 30 seconds. XXX indicate problematic string, in example MWV. It will also appear when Wind Measurement is not active – no "A" letter in field no. 5 in MWV telegram (See NMEA MWV specification). Check Sensor unit, cable screening, grounding, signal level or disable this feature by "Data Validity" option.
- d) "No Relative Wind" – appears when MWV telegram received from sensor within 30 seconds contains True Wind data – "T" letter in field no. 3 in MWV telegram (See NMEA MWV specification). Check Sensor unit configuration.

## Technical data

- Power Supply: 24VDC (9 to 36VDC)
- Power consumption: maximum 7,5 W at 24VDC
- Number of inputs: 4, baudrate configured separately
- Number of outputs: 4 the same baudrate as input
- Input/output signal baudrate: 2400 – 115200 bps (230400 bps as output only) compatible with IEC 61162-1, IEC 61162-2
- Connection: cables diameter up to 1,5mm<sup>2</sup>
- Dimensions: L 102mm x W 87mm x H 60mm
- Mounting: DIN Rail.
- Data retention: 20 years at 85 °C / 100 years at 25 °C
- Galvanic isolation: Power supply 1,5kVDC, signal input/output up to 5kV<sub>RMS</sub>

## Accepted NMEA telegrams

1. **GPS:** \$xxVTG, \$xxRMC; IEC 61162-1, IEC 61162-2
2. **Gyrocompass:** \$xxHDT, \$xxHRC, \$xxTHS; IEC 61162-1, IEC 61162-2
3. **Magnetic compass:** \$xxHDM, \$xxHDG, \$xxRMC (for calculating of magnetic deviation in case of missing \$xxHDM and \$xxHDG); IEC 61162-1, IEC 61162-2
4. **Wind Sensors:** \$xxMWV (relative wind only); IEC 61162-1, IEC 61162-2
5. **Walker P1274 Remote Wind Control:** \$PJLG; IEC 61162-1, IEC 61162-2

## Warranty and after sales support

For warranty terms and conditions please refer to our website: <http://www.boolean.pl/>

Or contact via e-mail: [info@boolean.pl](mailto:info@boolean.pl)



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