

## GpsNeo converter

Converter GPS time and coordinates to Modbus

Real dimensions 1:1



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## 1. Design

Name	Coverage	Comments
GPSNEO X	IP67	Exterior

## 2. Hardware

2.1 Hardware parameters	
Measured parameters	Time from GPS system, Coordinates from GPS system
Calculated parameters	Sun elevation and azimuth
Power	8 - 26V DC/ max 0,5W
Interface	RS485
Hardware	uBlox NEO-8M GPS receiver
Communication speed	9600 or 115200 Bd
Dimensions with Case	Ø40 x 135 mm without holder, Ø40 x 200 mm with holder
Dimensions only PCB	120 x 30 x 10 mm [w x d x h]
Design	Exterior, IP 67
Setup	Via software Bootloader or via ModBus directly

2.2 Sending parameters to RS485 after RESET		
	Parameter	Comments
1.row	112:RESET=4<cr><lf>	112 – address (dec), 4 – com. Protocol

## 3. Wiring, standard cable length: 3 m

Wire color	Comment
Green	Ground
White	12-24V DC
Yellow	RS485 +
Brown	RS485 -

## 4. ModBus RTU communication protocol

4.1 Command 0x03 Read registers			
Register	Register name	Description	Units/Notes
0	GPS Quality Indicator	1 – Locked to GPS, 0 - Internal time	
1	Year	Current year; UTC	
2	Month	Current month; UTC	
3	Day	Current day; UTC	
4	Hour	Current hour; UTC	
5	Minute	Current minute; UTC	
6	Second	Current second; UTC	
7	Sun Elevation	Tenth of Degrees	calculated
8	Sun Azimuth	Tenth of Degrees	calculated
9	Degrees of latitude		
10	Minutes of latitude		
11	Ten thousandths of a minute of latitude		
12	Degrees of longitude		
13	Minutes of longitude		
14	Ten thousandths of a minute of longit.		

<b>15</b>	Altitude	Above sea level in meters	1 m
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**if the value is not available, the value is 0xff00h (65280)**

<b>4.2 Command 0x03 Read configuration registers</b>			
<b>Register</b>	<b>Register name</b>	<b>Description</b>	<b>Units/Notes</b>
<b>100</b>	Address	1 – 247	
<b>101</b>	Communication speed	0 – 115200, 1 – 9600	Bd
<b>102</b>	HWS version 0	Read Only	GP
<b>103</b>	HWS version 1	Read Only	SN
<b>104</b>	HWS version 2	Read Only	E*
<b>105</b>	HWS version 3	Read Only	:1
<b>106</b>	HWS version 4	Read Only	.0
<b>107</b>	Communication protocol		1 ÷ 5

<b>4.3 Command 0x06 Write Registers</b>			
<b>Register</b>	<b>Register name</b>	<b>Description</b>	<b>Units/Notes</b>
<b>100</b>	Address	1 – 247	
<b>101</b>	Communication speed	0 – 115200, 1 - 9600	Bd
<b>102-105</b>	Read Only		HWS version
<b>106</b>	Comm. Protocol	1 - INGSIMON 2 – HTML,3 - MODBUS ASCII 4 – MODBUS RTU 5 – MODBUS TCP	Default: Modbus RTU

<b>4.4 Default parameters</b>		
<b>Parameter</b>	<b>Value</b>	<b>Comment</b>
<b>Address</b>	0x70h (112d)	
<b>Communication speed</b>	115200, N, 8,1	
<b>Communication Protocol</b>	0x04	MODBUS RTU

<b>4.5 Range of address</b>	
<b>Address [dec]</b>	<b>Comment</b>
<b>1 - 247</b>	For sensors
<b>248 - 254</b>	Reserve
<b>255</b>	Universal address – used only to read registers Writing to registers does not work with this address

## 5. Examples for Modbus RTU

Example 5.1		
<b>Set the communication speed from 115200 Bd to 9600 Bd for Address 0x70 (112 dec)</b>		
<b>Poll</b>	70 06 00 65 00 01 52 F4	The response is at 115200 Bd. In the next communication will use 9600 Bd
<b>Response</b>	70 06 00 65 00 01 52 F4	

Example 5.2		
<b>Set the communication speed from 9600 Bd to 115200 Bd for Address 0x70 (112 dec)</b>		
<b>Poll</b>	70 06 00 65 00 00 93 34	The response is at 115200 Bd. In the next communication will use 9600 Bd
<b>Response</b>	70 06 00 65 00 00 93 34	

Example 5.3		
<b>Read 8 registers from 100 from Address 0x70 (112 dec)</b>		
<b>Poll</b>	70 03 00 64 00 08 0F 32	
<b>Response</b>	70 03 10 00 70 00 00 47 50 53 4E 45 2A 3A 31 2E 30 00 04 B7 E5	
<b>Meaning:</b>		
Byte [hex]	Description	Comment
70	Address	
03	function code	Read holding register
10	count of bytes (16 dec)	
00 70	Address	
00 00	communication speed	115200 Bd
47 50	GP	
53 4E	SN	
45 2A	E*	GPSNE*
3A 31	_1	
2E 30	.0	_1.0
00 04	communication protocol	4 - MODBUS RTU
B7 E5	Checksum	

Example 5.4		
<b>How to get the address from sensor with the unknow address with universal address 0xff</b>		
<b>Be aware, that only 1 equipment can be connected to the Modbus network.</b>		
<b>Poll</b>	FF 03 00 64 00 01 D0 0B	Read register 100
<b>Response</b>	FF 03 02 00 70 90 74	70 – equipment's address

Example 5.5		
<b>Changing the address from 70h to 1h.</b>		
<b>Be aware, that only 1 equipment can be connected to the Modbus network.</b>		
<b>Poll</b>	70 06 00 64 00 01 03 34	Write to register 100 value 1
<b>Response</b>	70 06 00 64 00 01 03 34	01 – equipment's new address
The next communication with equipment will be with address 1		

Example 5.6
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<b>Changing the address from 1h to 2h.</b>		
<b>Be aware, that only 1 equipment can be connected to the Modbus network.</b>		
<b>Poll</b>	<b>01 06 00 64 00 02 49 D4</b>	<b>Write to the register 100 value 2</b>
<b>Response</b>	<b>01 06 00 64 00 02 49 D4</b>	<b>02 – equipment’s new address</b>
<b>The next communication with equipment will be with address 2</b>		

<b>Example 5.7</b>		
<b>Reading measured values from 0. register, 16 registers. Address 70h.</b>		
<b>Poll</b>	<b>70 03 00 00 00 10 4E E7</b>	
<b>Response</b>	<b>70 03 20 00 01 00 15 00 07 00 06 00 07 00 38 00 13 01 CF 04 48 00 30 00 13 09 50 00 11 00 27 01 40 00 8B B8 8A</b>	
<b>Meaning:</b>		
<b>Byte [hex]</b>	<b>Description</b>	<b>Comment</b>
<b>70</b>	Address	
<b>03</b>	function code	Read holding register
<b>20</b>	count of bytes (32 dec)	
<b>00 01</b>	GPS Quality Indicator	Locked
<b>00 15</b>	Current year	21 (dec)
<b>00 07</b>	Current month	07 (dec)
<b>00 06</b>	Current day	06 (dec)
<b>00 07</b>	Current hour	07 (dec)
<b>00 38</b>	Current minute	56 (dec)
<b>00 13</b>	Current second	19 (dec)
<b>01 CF</b>	Sun elevation	479 (dec), 47.9 °
<b>04 48</b>	Sun azimuth	1123 (dec), 112.3 °
<b>00 30</b>	Degrees of latitude	48 (dec)
<b>00 13</b>	Minutes of latitude	19 (dec)
<b>09 50</b>	Ten thousandths of a minute of latitude	2384 (dec)
<b>00 11</b>	Degrees of longitude	17 (dec)
<b>00 27</b>	Minutes of longitude	39 (dec)
<b>01 40</b>	Ten thousandths of a minute of longitude	320 (dec)
<b>00 8B</b>	Altitude	139 (dec) m
<b>B8 8A</b>	Checksum	

## 6. Used sensors

### 6.1 uBlox NEO-8M GPS receiver and only fully functional PCB for Interior using

