



DELTA uno Lite Modbus User Guide

[Home](#) » [Delta](#) » DELTA uno Lite Modbus User Guide 

Contents

- [1 DELTA uno Lite Modbus](#)
- [2 Overview](#)
- [3 Hardware Interface](#)
- [4 Serial Configuration](#)
- [5 Modbus Read Data](#)
- [6 Modbus Write Command](#)
- [7 Modbus Examples](#)
- [8 Modbus Exception Response](#)
- [9 Documents / Resources](#)
 - [9.1 References](#)
- [10 Related Posts](#)



DELTA uno Lite Modbus



Revision

Date	Version	Description
2022/ 11 / 11	0.1	Initial Version

Overview

UNOlite is an indoor air quality monitor to measure the space temperature / humidity / CO2 / PM2.5 / PM10 / PM1 / TVOC and expose the measurements directly onto a BACnet MS/TP or Modbus RTU network. Moreover, the measurements are also accessible with UNO apps through BLE or UNO web through Wi-Fi (Wi-Fi model). Please refer to UNOlite official website for more information. This document is primarily concerned how to add UNOlite to Modbus/RTU network.

Hardware Interface

Buttons

Key	Description
Hardware reset	Push this button will trigger a power cycle.
Factory reset	After booting, press this button three times within 2 seconds will trigger factory reset. The values below will be restored to default: - s Modbus baudrate - s BACnet saved mac address - s Wi-Fi MQTT broker setting (Wi-Fi model)

NOTE: /t's recommended to use a paper clip to press the keys.

Terminal block

Terminal	Description
V+	Power input. For more information, please refer to production specification.
V-	Power input. For more information, please refer to production specification.
A+	RS485(+) data pin. For Modbus/BACnet network.
B-	RS485(-) data pin. For Modbus/BACnet network.
GND	Ground terminal. Each RS485 driver in an installation is recommended to connect to the same ground to get a common reference.

DIP switch

DIPs	Description	ON	OFF
1 – 6	Refer to the later sections for the definition of each pin		n
7	BACnet mode switch. ON : BACnet mode OFF : Modbus mode		n
8	RS485 terminator resistor (120 ohm)		n

NOTE The dips should be adjusted to proper position in power off state. Adjust the dips, then power on device.

Modbus Mode

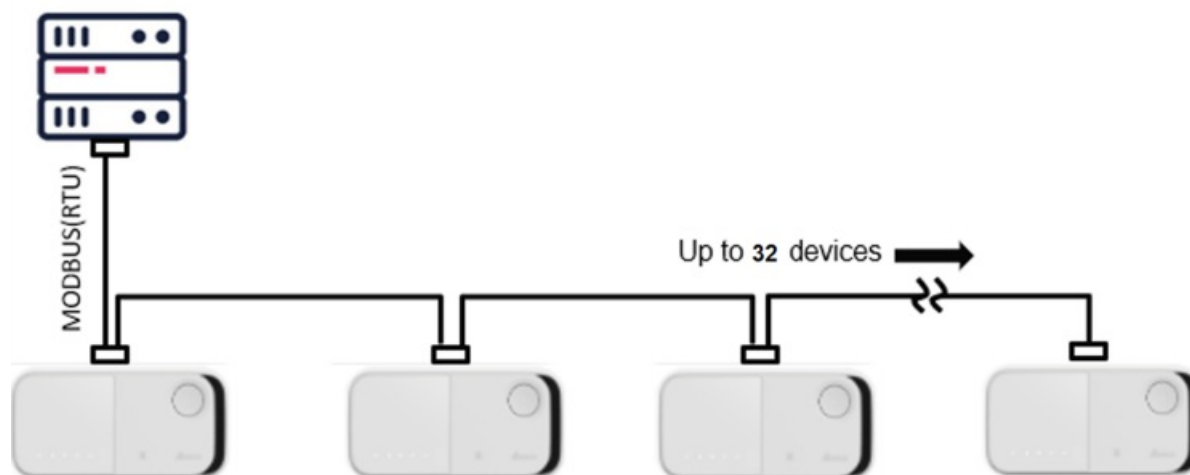
UNOlite follows Modbus over serial line specification and will run on Modbus/RTU mode if the 7th pin is set to OFF state. The definition of the dips in Modbus mode as listed below:

DIP	Description	ON	OFF
1	Modbus slave address (<i>check address table</i>)		n
2	Modbus slave address (<i>check address table</i>)		n
3	Modbus slave address (<i>check address table</i>)		n
4	Modbus slave address (<i>check address table</i>)		n
5	Modbus slave address (<i>check address table</i>)		n

- **NOTE:** The definitions of dip are different from Modbus mode. Please make sure which mode is chosen.
- **NOTE:** Pin6 is not defined in Modbus mode

Serial Configuration

UNOlite can directly connect to a controller with RS485 interface, up to 32 UNOlite devices can be joined to a Modbus serial bus.



NOTE: Suggestion to use 22AWG shielded twisted pair cable to connect devices in sequence

Default Serial Configuration:

- **Baud:** 9600
- **Data-Bit:** 8
- **Parity:** None
- **Stop-Bit:** 1

Note: perform factory reset to restore default value if the configuration is missing

Modbus Slave Address

The DIP pins 1~5 represent for binary number 0~31, pin 1 is most significant bit (MSB) and pin 5 is least significant bit (LSB). Notice that Modbus slave address starts from 208, therefore, UNOlite can be configured address from 208 to 239:

Modbus Slave Address Table

DIP pin					Modbus Slave Addr
1	2	3	4	5	
↓	↓	↓	↓	↓	208 (0xD0)
↓	↓	↓	↓	↑	209 (0xD1)
↓	↓	↓	↑	↓	210 (0xD2)
↓	↓	↓	↑	↑	211 (0xD3)
↓	↓	↑	↓	↓	212 (0xD4)
↓	↓	↑	↓	↑	213 (0xD5)
↓	↓	↑	↑	↓	214 (0xD6)
↓	↓	↑	↑	↑	215 (0xD7)
↓	↑	↓	↓	↓	216 (0xD8)
↓	↑	↓	↓	↑	217 (0xD9)
↓	↑	↓	↑	↓	218 (0xDA)
↓	↑	↓	↑	↑	219 (0xDB)
↓	↑	↑	↓	↓	220 (0xDC)
↓	↑	↑	↓	↑	221 (0xDD)
↓	↑	↑	↑	↓	222 (0xDE)
↓	↑	↑	↑	↑	223 (0xDF)

DIP pin					Modbus Slave Addr
1	2	3	4	5	
↑	↓	↓	↓	↓	224 (0xE0)
↑	↓	↓	↓	↑	225 (0xE1)
↑	↓	↓	↑	↓	226 (0xE2)
↑	↓	↓	↑	↑	227 (0xE3)
↑	↓	↑	↓	↓	228 (0xE4)
↑	↓	↑	↓	↑	229 (0xE5)
↑	↓	↑	↑	↓	230 (0xE6)
↑	↓	↑	↑	↑	231 (0xE7)
↑	↑	↓	↓	↓	232 (0xE8)
↑	↑	↓	↓	↑	233 (0xE9)
↑	↑	↓	↑	↓	234 (0xEA)
↑	↑	↓	↑	↑	235 (0xEB)
↑	↑	↑	↓	↓	236 (0xEC)
↑	↑	↑	↓	↑	237 (0xED)
↑	↑	↑	↑	↓	238 (0xEE)
↑	↑	↑	↑	↑	239 (0xEF)

Modbus Read Data

UNOlite supports function code both 0x03 and 0x04 to read following registers

- 0x03: read holding registers
- 0x04: read input registers

Request				
Slave Address	Function code	Register	Length [N]	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes
Response				
Slave Address	Function code	Count [2*N]	Data	CRC16
1 byte	1 byte	1 byte	N * 2 bytes	2 bytes

Sensor Measurement			
Register		Name	Description
30001	0x0000	IAQ index	Give an index according to current PM2.5, PM10, and CO2 concentration. The index also be referenced by IAQ LED: GREEN: 0~80 YELLOW: 81~100 RED: 101~400 PURPLE: 401~
30002	0x0001	Concentration of PM2.5	Unit: µg/m3

30003	0x0002	Concentration of PM10	Unit: µg/m3
30004	0x0003	Concentration of carbon dioxide (formula CO2)	Unit: ppm
30005	0x0004	Concentration of total volatile organic compound (TVOC)	Unit: ppb
30006	0x0005	Concentration of total volatile organic compound (TVOC)	Unit: µg/m3 (factor 1 ppb = 4.5 µg/m3)
30009	0x0008	Humidity	Unit: 0.01%
30011	0x000A	Celsius temperature	Real Temp = (Value – 4500) * 0.01 Unit: °C
30018	0x0011	Fahrenheit temperature	Real Temp = (Value – 4500) * 0.01 Unit: °F

30020	0x0013	Concentration of PM1	Unit: µg/m3
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Sensor State

Register		Name	Description
30033	0x0020	PM2.5 sensor	State of sensor hardware module 0x0000: Power of f or does not exist 0x0001: Sensor Ready 0x0002: Warming up 0x0003: Busy 0x00FE: CSER ROR 0x00FF: FAIL
30034	0x0021	PM10 sensor	
30035	0x0022	CO2 sensor	
30036	0x0023	TVOC sensor	
30037	0x0024	Humidity sensor	
30038	0x0025	Temperature sensor	
30042	0x0029	PM1 sensor	
30044	0x002B	IAQ LED state	0x0000: LED off 0x0001: LED on

Device Information			
Register		Name	Description
30145	0x0090- 0x009F	Model and Product Serial Number	An ASCII string consists model name and serial number, separated by a comma. For example: "UNO-L,2250L01F9999"
30209	0x00D0	Main firmware version	Number 1 to 65535 0x0000: device is initializing
30257	0x0100- 0x0102	BT MAC address	6 groups of two hexadecimal digits, e.g. F2:11:8F:36:F6:93
30260	0x0103- 0x0105	WIFI MAC address	6 groups of two hexadecimal digits

Modbus Write Command

UNOlite supports function code 0x06 and 0x10 to write request

0x06: write single register

Request				
Address 1 byte	Function code 1 byte	Register 2 bytes	Data 2 bytes	CRC16 2 bytes
Response				
Address 1 byte	Function code 1 byte	Register 2 bytes	Data 2 bytes	CRC16 2 bytes

0x10: write multiple registers

Request						
Address 1 byte	Fn. Code 1 byte	Register 2 bytes	Length[N] 2 bytes	Count[2*N] 1 byte	Data N * 2 bytes	CRC16 2 bytes
Response						
Address 1 byte	Function code 1 byte	Register 2 bytes	Length [N] 2 bytes		CRC16 2 bytes	

Device Information																						
Register		Name	Description																			
40012	0x000B	Temperature calibration	0~9998: directly set Celsius temperature from 0°C to 99.98°C 9999: reset to default																			
40097	0x0060-0x0062	Serial configuration	Data format: <table><tr><td>1st word 0x60</td><td>2nd word 0x61</td><td>3rd word 0x62</td></tr></table> First 4 bytes are baud : 1200 2400 4800 9600 19200 38400 57600 115200 (bps) 0x62 format: <table><tr><th colspan="4">3rd word</th></tr><tr><th colspan="2">Hi byte</th><th colspan="2">Lo byte</th></tr><tr><td>Bit7-4</td><td>Bit3-0</td><td>Bit7-4</td><td>Bit3-0</td></tr><tr><td>Databit</td><td>Parity</td><td>Stopbit</td><td>Presets</td></tr></table> Databit: 0x8 (RTU)	1 st word 0x60	2 nd word 0x61	3 rd word 0x62	3 rd word				Hi byte		Lo byte		Bit7-4	Bit3-0	Bit7-4	Bit3-0	Databit	Parity	Stopbit	Presets
1 st word 0x60	2 nd word 0x61	3 rd word 0x62																				
3 rd word																						
Hi byte		Lo byte																				
Bit7-4	Bit3-0	Bit7-4	Bit3-0																			
Databit	Parity	Stopbit	Presets																			

			Parity: 0x0 (Even) 0x1 (Odd) 0x04 (None) Stopbit: 0x0(1 bit) 0x1(2 bits) Preset: other parameters are ignored if preset bits is assigned. 0: Use baud/databit/parity/stopbit params. 1: 9600 8 N 1 (default) 2: 9600 8 N 2 3: 9600 8 E 1 4: 19200 8 N 1 5: 19200 8 N 2 6: 19200 8 E 1 Data Examples (hexadecimal): [00 00 25 80 84 10]: set to 9600 8 N 2 [00 00 00 00 00 02]: set to 9600 8 N 2
40215	0x00D6	UNOlite operation	0x0010: perform factory reset (equivalent to press function key 3 times)

Modbus Examples

1. Read all sensor status from device 208 (0xD0)

Request	D0 03 00 20 00 0B 17 86
Response	D0 03 16 00 01 00 01 00 01 00 01 00 01 00 01 00 FE 00 FE 00 FF 00 00 00 01 60 8F

2. Read firmware version from device 208 (0xD0)

Request	D0 03 00 D0 00 01 97 B2
Response	D0 03 02 00 04 45 95

3. Set rs485 serial configuration, 115200-8-N-1

Request	D0 10 00 60 00 03 06 00 01 C2 00 84 00 BB 56
Response	D0 10 00 60 00 03 92 57

Modbus Exception Response

If device receives a request message without a communication error, but cannot handle the query. It will reply with requested function code plus 0x80. Example, function code 0x3 becomes 0x83

Response format

Address 1 byte	Function code 1 byte	Code 1 bytes	CRC16 2 bytes
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Code list

Code	Name
0x01	ILLEGAL FUNCTION
0x02	ILLEGAL DATA ADDRESS
0x03	ILLEGAL DATA VALUE
0x04	SERVER DEVICE FAILURE
0x05	ACKNOWLEDGE
0x06	SERVER DEVICE BUSY
0x08	MEMORY PARITY ERROR
0x0A	GATEWAY PATH UNAVAILABLE
0x0B	GATEWAY TARGET DEVICE FAILED TO RESPOND

Note: Please refer to “Modbus Application_Protocol_V1_1b3” from www.modbus.org

Documents / Resources

	DELTA uno Lite Modbus [pdf] User Guide uno Lite Modbus, uno Lite, Modbus
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References

- [M The Modbus Organization](#)
- [M The Modbus Organization](#)