

96PD-THS16B Modbus Protocol

Setup via Modbus RTU for 96PD-THS16B Transmitters. Supported function codes, Registers table and examples.

Rev. 2.2 April 2023

Contents

Introduction	1
1. Hardware interface.....	3
2. RS485 Slave ID, Baud rate, Data format	3
3. Modbus protocol	3
4. Supported function codes	4
5. Data Encoding.....	4
6. Holding Registers Table.....	5
6-1 Device information.....	5
6-2 RS485 parameters.....	5
6-3 Physical Quantities (IEEE 754 Floating Pt)	6
6-4 Physical Quantities (16-bit integer).....	7
6-5 Physical Quantities (32-bit integer).....	8
7. Data types.....	9
7-1 ASCII format	9
7-2 IEEE 754 format	9
7-3 16-bit integer format.....	9
7-4 32-bit integer format.....	9
8. Communication Examples	10
8-1 Setting Slave ID	10
8-2 Setting Baud rate	10
8-3 Reading Temperature of floating point type	11
8-4 Reading Temperature of 16-bit integer type	11
8-5 Reading Temperature of 32-bit integer type	11
8-6 Reading Relativity Humidity of floating point type	12
8-7 Reading Relativity Humidity of 16-bit integer type	12
8-8 Reading Serial No.	13
9. Revise history.....	14

1. Hardware interface

- The hardware of digital interface for the transmitter is RS485.
- RS485 signal wires are named D+, D-
- RS485 signal is meet the standards TIA/EIA-485-A

2. RS485 Slave ID, Baud rate, Data format

- Support range of Slave ID: 1 ... 247
- Baud rate: 9600, 19200, 38400, 57600, 115200
- Parity: NONE, EVEN, ODD
- Data length: 8 bit
- Stop bit: 1, 2 bit
- Factory default is is ID 1, 9600 baud, none parity, 8 bit data length and 1 stop bit

3. Modbus protocol

- Modbus Protocol reference as below
 - http://www.modbus.org/docs/Modbus_Application_Protocol_V1_1b3.pdf
- Modbus protocol structure:
 - 1st byte: Slave ID
 - 2nd byte: Function code
 - 3~Nth bytes: Data
 - last 2 bytes: CRC (Error check)
- Support MODBUS RTU mode
- Broadcast address = Slave ID 0
- Not implemented bit addressable items (i.e. Coils and Discrete inputs)
- Measured values are represented in 3 types
 - IEEE 754 single-precision 32-bit floating point type
 - 16-bit integer type, values are stored with a scaling of 1:100
 - 32-bit integer type, values are stored with a scaling of 1:100

4. Supported function codes

Following function codes are supported:

- 0x03 Read Holding Registers
- 0x06 Write Single Register
- 0x10 Write Multiple Registers

The measured values can be read by using 0x03 codes. The RS485 and unit can be set by using 0x06 or 0x10 code. The register numbers and the corresponding physical quantities are listed as below “Register Table”.

5. Data Encoding

96PD-THS16B uses a ‘big-Endian’ representation for addresses and data items. This means that when a numerical quantity larger than a single byte is transmitted, the most significant byte is sent first. So for example

<u>Register size</u>	<u>value</u>	
16 - bits	0x1234	the first byte sent is 0x12 then 0x34
<u>Register size</u>	<u>value</u>	
32 - bits	0x12345678	the first byte sent is 0x12 then 0x34, 0x56, 0x78

6. Holding Registers Table

6-1 Device information

No.	Register Address	Starting Address	Content	R/W	Data Bytes	Data Type	Value/ Unit
1	40033	0x20	Model Name	R	16 bytes	ASCII	
2	40049	0x30	Serial Number	R	16 bytes	ASCII	
3	40065	0x40	Firmware version	R	16 bytes	ASCII	

6-2 RS485 parameters

No.	Register Address	Starting Address	Content	R/W	Data Bytes	Data Type	Value/ Unit
1	40081	0x50	Slave ID	R/W	1 byte	unsigned Integer	1 ... 247
2	40083	0x52	Baud rate	R/W	1 byte	unsigned Integer	0: 9600 1: 19200 2: 38400 3: 57600 4: 115200
3	40085	0x54	Data type	R/W	1 byte	unsigned Integer	0: N81 1: N82 2: E81 3: E82 4: O81 5: O82
4	40087	0x56	Unit	R/W	1 byte	unsigned Integer	0: Metric 1: Imperial

6-3 Physical Quantities (IEEE 754 Floating Pt)

No.	Register Address	Starting Address	Content	R/W	Data Bytes	Data Type	Value/ Unit
1	41025	0x400	Temperature	R	4 bytes	Floating Pt.	°C. °F
2	41027	0x404	Relative Humidity	R	4 bytes	Floating Pt.	%

*When the dew point is below 0 °C, the transmitter outputs frost point temperature

6-4 Physical Quantities (16-bit integer)

Values are stored with a scaling of 1:100 (e.g.: 2230 is equivalent to 22.3°C)

If any value of reading is exceed 65535, please use 32-bit integer format

No.	Register Address	Starting Address	Content	R/W	Data Bytes	Data Type	Value/ Unit
1	41091	0x442	Temperature	R	2 bytes	16-bit integer	°C, °F
2	41094	0x446	Relative Humidity	R	2 bytes	16-bit integer	%

*When the dew point is below 0 °C, the transmitter outputs frost point temperature

6-5 Physical Quantities (32-bit integer)

Values are stored with a scaling of 1:100 (e.g.: 2230 is equivalent to 22.3°C)

No.	Register Address	Starting Address	Content	R/W	Data Bytes	Data Type	Value/ Unit
1	41089	0x440	Temperature	R	4 bytes	32-bit integer	°C.°F
2	41091	0x444	Relative Humidity	R	4 bytes	32-bit integer	%

*When the dew point is below 0 °C, the transmitter outputs frost point temperature

7. Data types

7-1 ASCII format

ASCII reference as below

- <https://www.asciitable.com/>

7-2 IEEE 754 format

IEEE 754 reference as below

- http://en.wikipedia.org/wiki/IEEE_754
- <https://www.h-schmidt.net/FloatConverter/IEEE754.html>

7-3 16-bit integer format

Data Hi Byte	Data Lo Byte
0x09	0x4F

Number 22.3 is represented as <09><4F> in 16-bit integer type

7-4 32-bit integer format

Data Hi Word, Hi Byte	Data Hi Word, Lo Byte	Data Lo Word, Hi Byte	Data Lo Word, Lo Byte
0x00	0x00	0x09	0x4F

Number 22.3 is represented as <00><00><09><4F> in 32-bit integer type

8. Communication Examples

8-1 Setting Slave ID

Request from the host

Slave ID	Function Code	Register Address		Register value		CRC	
1 ... 247	06	00	50	00	08	CRC Lo	CRC Hi

*setting Slave ID as 8

Response from the 96PD-THS16B

Slave ID	Function Code	Register Address		Register value		CRC	
1 ... 247	06	00	50	00	08	CRC Lo	CRC Hi

* setting done, new Slave ID is 8

8-2 Setting Baud rate

Request from the host

Slave ID	Function Code	Register Address		Register value		CRC	
1 ... 247	06	00	52	00	04	CRC Lo	CRC Hi

*setting baud rate as 115200

Response from the 96PD-THS16B

Slave ID	Function Code	Register Address		Register value		CRC	
1 ... 247	06	00	52	00	04	CRC Lo	CRC Hi

* setting done, new baud rate is 115200

8-3 Reading Temperature of floating point type

Request from the host

Slave ID	Function Code	Register Address		Number Of Registers		CRC	
1 ... 247	03	04	00	00	02	CRC Lo	CRC Hi

*Registers of Temperature floating type are 0x0400 ~ 0x0403

Response from the 96PD-THS16B

Slave ID	Function Code	Byte Count	2 Registers (4 bytes)				CRC	
1 ... 247	03	04	41	B2	66	66	CRC Lo	CRC Hi

* the floating point number 22.3 is represented as <41><B2><66><66>

8-4 Reading Temperature of 16-bit integer type

Request from the host

Slave ID	Function Code	Register Address		Number Of Registers		CRC	
1 ... 247	03	04	42	00	01	CRC Lo	CRC Hi

*Registers of Temperature 16-bit integer type are 0x0442 ~ 0x0443

Response from the 96PD-THS16B

Slave ID	Function Code	Byte Count	1 Registers (2 bytes)		CRC		
1 ... 247	03	02	08	B6	CRC Lo	CRC Hi	

* the 16-bit integer number 22.3 is represented as <08><B6>

8-5 Reading Temperature of 32-bit integer type

Request from the host

Slave ID	Function Code	Register Address		Number Of Registers		CRC	
1 ... 247	03	04	40	00	02	CRC Lo	CRC Hi

*Registers of Temperature 32-bit integer type are 0x0440 ~ 0x0443

Response from the 96PD-THS16B

Slave ID	Function Code	Byte Count	2 Registers (4 bytes)				CRC	
1 ... 247	03	04	00	00	08	B6	CRC Lo	CRC Hi

* the 32-bit integer number 22.3 is represented as <00><00><08><B6>

8-6 Reading Relativity Humidity of floating point type

Request from the host

Slave ID	Function Code	Register Address		Number Of Registers		CRC	
1 ... 247	03	04	04	00	02	CRC Lo	CRC Hi

*Registers of Relativity Humidity floating type are 0x0404 ~ 0x0407

Response from the 96PD-THS16B

Slave ID	Function Code	Byte Count	2 Registers (4 bytes)				CRC	
1 ... 247	03	04	42	2E	CC	CD	CRC Lo	CRC Hi

* the floating point number 43.7 is represented as <42><2E><CC><CD>:

8-7 Reading Relativity Humidity of 16-bit integer type

Request from the host

Slave ID	Function Code	Register Address		Number Of Registers		CRC	
1 ... 247	03	04	46	00	01	CRC Lo	CRC Hi

*Registers of Relativity Humidity 16-bit integer type are 0x0446 ~ 0x0447

Response from the 96PD-THS16B

Slave ID	Function Code	Byte Count	1 Registers (2 bytes)		CRC	
1 ... 247	03	02	11	12	CRC Lo	CRC Hi

* the 16-bit integer number 43.7 is represented as <11><12>

8-8 Reading Serial No.

Request from the host

Slave ID	Function Code	Register Address		Number Of Registers		CRC	
1 ... 247	03	00	30	00	06	CRC Lo	CRC Hi

*Registers of Serial No. are 0x30 ~ 0x3F

Response from the 96PD-THS16B

Slave ID	Function Code	Byte Count	6 Registers (12 bytes)												CRC	
1 ... 247	03	0C	53	4E	30	31	32	33	34	35	36	37	38	39	CRC Lo	CRC Hi

*example of Serial No. is "SN0123456789"

9. Revise history

- v1.0 Step 2016 Initial edit
- v1.1 20170608 Add
 - PPMv_float(0x0424)
 - PPMw_float(0x0428)
 - PPMv_int(0x0464)
 - PPMw_int(0x0468)
- v2.0 20180130 Add
 - Dew/Frost Point Temperature, converted to atmospheric pressure
 - Pressure, absolute
 - 16-bit integer data typeModify
 - Frost point to Dew / frost point
- v2.1 20180523 Modify general descriptions
- v2.2 20230420 Modify IEEE 754 Floating Pt Register