



Modbus Protocol For THS17

V1.0

Modbus Protocol of THS17

Introduction

This document describes the protocol detail of Modbus for THS17

1.Independent COM Port RS485 Connection

RS485 connections should be dedicated to connecting THS17 devices only, ensuring that all devices on the line are of the same model.

2.Maximum of 16 Devices per Batch

A maximum of 16 devices can be connected in each RS485 network.

3.Communication Protocol

Set the communication parameters as follows:

Baud rate: 9600

Parity: None

Data Bits: 8

Stop Bits: 1

4.Terminal Resistor Installation

Install a 120Ω terminal resistor at the last device (end of the line). Ensure the terminal resistor is connected between the A and B signal lines to prevent signal reflection and communication issues.

Installation Notes

Power Supply: Verify that the voltage and current supplied to each device meet the required specifications to avoid malfunction due to insufficient power supply.

Grounding: It is recommended to establish a common ground (GND) for RS485 communication to enhance noise immunity.

Testing: After installation, test communication step by step to ensure proper functionality, especially when adding new devices.

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Hardware interface

- The interface on the sensor is RS-485.
- Hardware named D+, D-
- Meet the standards TIA/EIA-232-F and TIA/EIA-485-A

RS-485 Address, Baud rate, Data format

- Address: 1~247
- Baud rate: 9600, 19200, 38400, 57600, 115200
- Parity: None, Even, Odd
- Data length: 8 bit
- Stop bit: 1 or 2 bit
- Default Address = 1, Data format= 9600, N81

About Modbus (ref PI-MBUS-300)

- Support RTU mode
- Broadcast support (Address 0)
- Bit addressable items (i.e. Coils and Discrete inputs) will not be implemented
- Measurement Values are represented in IEEE 754 single-precision 32-bit floating point type
http://en.wikipedia.org/wiki/IEEE_754
- Modbus protocol structure:
 - 1st byte: Address (1~247)
 - 2nd byte: Function code (1 byte)
 - 3~Nth bytes: Data bytes
 - N+1th~N+2th byte: CRC (16 bits), LSB first

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Instrument Holding Registers for application engineering (ex: ModScan)

Item No.	Address	Address HEX	Parameter	Point Type	Data Type	Value
1	1	0001H	Temperature	HOLDING REGISTER	Floating Pt.	°C
2	5	0005H	Relative Humidity	HOLDING REGISTER	Floating Pt.	%
3	33	0021H	Temperature	HOLDING REGISTER	Integer	°C x10
4	35	0023H	Relative Humidity	HOLDING REGISTER	Integer	% x10
5	1025	0401H	Temperature	HOLDING REGISTER	Floating Pt.	°C
6	1029	0405H	Relative Humidity	HOLDING REGISTER	Floating Pt.	%
7	1033	0409H	Dew Point Temperature	HOLDING REGISTER	Floating Pt.	°C
8	1037	040DH	Forst Point Temperature	HOLDING REGISTER	Floating Pt.	°C
9	1041	0411H	Wet Bulb Temperature	HOLDING REGISTER	Floating Pt.	°C
10	1045	0415H	Saturation Vapour Pressure	HOLDING REGISTER	Floating Pt.	mbar
11	1049	0419H	Vapour Pressure	HOLDING REGISTER	Floating Pt.	mbar
12	1053	041DH	Mixture Ratio	HOLDING REGISTER	Floating Pt.	g/kg
13	1057	0421H	Absolute Humidity	HOLDING REGISTER	Floating Pt.	g/m ³
14	1061	0425H	Specific Enthalpy	HOLDING REGISTER	Floating Pt.	kJ/kg

- The base address is 1 rather than 0 in ModScan application.
- The register shown on the table is 1 byte whereas the Modscan 2 bytes.
- So the corresponding value against address 5 of the "table" would be address 40003 of the Modscan

Item No.	Address	Data Type
1	01	1 byte
2	05	1 byte
3	09	1 byte
4	13	1 byte

Address	Value (Hex)	Value (Dec)
40001	3E3EH	15550
40002	41C0H	16928
40003	A7EDH	43005
40004	4273H	17011
40005	2000H	8192
40006	4495H	17589
40007	0000H	0
40008	0000H	0

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Instrument Holding Registers (rev 0.1)

Item No.	Address	Address HEX	Parameter	Data Bytes	Data Type	Value
Information						
1	65-80	0041H-0050H	Model Name	16 bytes	ASCII	
2	81-96	0051H-0060H	Serial Number	16 bytes	ASCII	
3	97-112	0061H-0070H	Firmware version	16 bytes	ASCII	
RS-485 Slave Address, Baud rate, Data format						
4	129	0081H	Slave Address	1 bytes	unsigned Integer	1-247
5	131	0083H	Baud rate	1 bytes	unsigned Integer	0: 9600 1: 19200 2: 38400 3: 57600 4: 115200
6	133	0085H	Data type	1 bytes	unsigned Integer	0: N81 1: N82 2: E81 3: E82 4: O81 5: O82

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ASCII format, Item No. 1-3

1st Word		2nd Word		3rd Word		4th Word		5th Word		6th Word		7th Word		8th Word	
Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo
byte	byte	byte	byte	byte	byte	byte	byte	byte	byte	byte	byte	byte	byte	byte	byte

“ABCDEF0123456789” is represented in byte of hexadecimal as

<41><42><43><44><45><46><30><31><32><33><34><35><36><37><38><39>

IEEE754 format, Item No. 7-12

Data Hi Word, Hi Byte		Data Hi Word, Lo Byte		Data Lo Word, Hi Byte		Data Lo Word, Lo Byte	
SEEE	EEEE	EMMM	MMMM	MMMM	MMMM	MMMM	MMMM

Where

S represents the sign bit where 1 is negative and 0 is positive

E is the two's complement exponent with an offset of 127 i.e. an exponent of zero is represented by 127, an exponent of 1 by 128 etc.

M is the 23-bit normal mantissa. The highest bit is always 1 and, therefore, is not stored.

Using the above format the floating point number 23.83 is represented in byte of hexadecimal as <41><BE><A3><D7>:

Data Hi Word, Hi Byte		Data Hi Word, Lo Byte		Data Lo Word, Hi Byte		Data Lo Word, Lo Byte	
0x41		0xBE		0xA3		0xD7	

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Communication Examples

Read Temperature Measurement Value

Request the host (PC or PLC) to polling the data of GTH53			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x00	Byte	1
No. of registers Hi	0x00	Byte	1
No. of registers Lo	0x02	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Temperature are 0x00 ~ 0x03

Response GTH53 response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	04	Byte	1
IEEE 754 Data Lo Word, Hi Byte	0xA3	Byte	1
IEEE 754 Data Lo Word, Lo Byte	0xD7	Byte	1
IEEE 754 Data Hi Word, Hi Byte	0x41	Byte	1
IEEE 754 Data Hi Word, Lo Byte	0xBE	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

* the floating point number 23.83 is represented in byte of hexadecimal as <41><BE><A3><D7>

Modbus Protocol of THS17

Read Relativity Humidity Measurement Value

Request the host (PC or PLC) to polling the data of THS17			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x04	Byte	1
No. of registers Hi	0x00	Byte	1
No. of registers Lo	0x02	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Relativity Humidity are 0x04 ~ 0x07

Response THS17 response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	04	Byte	1
IEEE 754 Data Lo Word, Hi Byte	0x77	Byte	1
IEEE 754 Data Lo Word, Lo Byte	0xCF	Byte	1
IEEE 754 Data Hi Word, Hi Byte	0x42	Byte	1
IEEE 754 Data Hi Word, Lo Byte	0x13	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

* the floating point number 36.87 is represented in byte of hexadecimal as <42><13><77><CF>:

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Read Temperature Measurement Value In Integer

Request the host (PC or PLC) to polling the data of THS17			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x20	Byte	1
No. of registers Hi	0x00	Byte	1
No. of registers Lo	0x01	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Register of Temperature is 0x0020

Response THS17 response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	02	Byte	1
Integer Data , Hi Byte	0x00	Byte	1
Integer Data, Lo Byte	0xEE	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

* the integer number 238 is represented in byte of hexadecimal as <00><EE> and the temperature reading is 23.8

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Read Relativity Humidity Measurement Value In Integer

Request the host (PC or PLC) to polling the data of THS17			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	00	Byte	1
Starting Address Lo	22	Byte	1
No. of registers Hi	00	Byte	1
No. of registers Lo	01	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Register of Relative Humidity is 0x022

Response THS17 response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	02	Byte	1
Integer Data , Hi Byte	0x02	Byte	1
Integer Data, Lo Byte	0x8E	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

* the integer number 654 is represented in byte of hexadecimal as <02><8E> and the humidity reading is 65.4

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Read Serial No.

Request the host (PC or PLC) to polling the data of THS17			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x50	Byte	1
No. of registers Hi	0x00	Byte	1
No. of registers Lo	0x08	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Serial No. are 0x50 ~ 0x5F

Response THS17 response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	10	Byte	1
1st Word, Lo byte	0x4E	Byte	1
1st Word, Hi byte	0x53	Byte	1
2nd Word, Lo byte	0x31	Byte	1
2nd Word, Hi byte	0x30	Byte	1
3rd Word, Lo byte	0x33	Byte	1
3rd Word, Hi byte	0x32	Byte	1
4th Word, Lo byte	0x35	Byte	1
4th Word, Hi byte	0x34	Byte	1
5th Word, Lo byte	0x37	Byte	1

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5th Word, Hi byte	0x36	Byte	1
6th Word, Lo byte	0x39	Byte	1
6th Word, Hi byte	0x38	Byte	1
7th Word, Lo byte	0x42	Byte	1
7th Word, Hi byte	0x41	Byte	1
8th Word, Lo byte	0x44	Byte	1
8th Word, Hi byte	0x43	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*example of Serial No. is "SN0123456789ABCD"

Read Firmware Version

Request the host (PC or PLC) to polling the data of THS17			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x60	Byte	1
No. of registers Hi	0x00	Byte	1
No. of registers Lo	0x08	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Firmware Version are 0x60 ~ 0x6F

Response THG17 response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Address of Transmit	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	10	Byte	1
1st Word, Lo byte	0x31	Byte	1
1st Word, Hi byte	0x56	Byte	1
2nd Word, Lo byte	0x33	Byte	1
2nd Word, Hi byte	0x32	Byte	1
3rd Word, Lo byte	0x2E	Byte	1
3rd Word, Hi byte	0x34	Byte	1
4th Word, Lo byte	0x36	Byte	1
4th Word, Hi byte	0x35	Byte	1

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5th Word, Lo byte	0x38	Byte	1
5th Word, Hi byte	0x37	Byte	1
6th Word, Lo byte	0x42	Byte	1
6th Word, Hi byte	0x41	Byte	1
7th Word, Lo byte	0x44	Byte	1
7th Word, Hi byte	0x43	Byte	1
8th Word, Lo byte	0x46	Byte	1
8th Word, Hi byte	0x45	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*example of Firmware Version is "V1234.5678ABCDEF"

Revise history

- V1 2017_11_22 Initial