Modbus Protocol
For THS/THM 30X&80X_Temp.&Humididy & THS8X/THM8X_Dew Point Series

V8.0

Modbus Protocol of THS/THM30X&80X & THS8X/THM8X

Introduction

This document describes the protocol detail of Modbus for THSXX

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 Slave Address, Baud rate, Data format

- Slave 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)

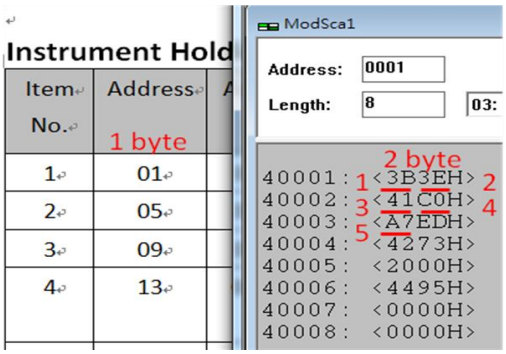
- Support RTU mode
- Broadcast support (Address 0)
- Bit addressable items (i.e. Coils and Discrete inputs) will not be implemented
- Measurement Values are represented in IEEE 754 single-precision 32-bit floating point type http://en.wikipedia.org/wiki/IEEE_754
- Modbus protocol structure:
  - 1st byte: 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	1025	0401H	Temperature	HOLDING REGISTER	Floating Pt.	℃
2	1029	0405H	Relative Humidity	HOLDING REGISTER	Floating Pt.	%
3	1033	0409H	Dew Point Temperature	HOLDING REGISTER	Floating Pt.	℃
4	1037	040DH	Forst Point Temperature	HOLDING REGISTER	Floating Pt.	℃
5	1041	0411H	Wet Bulb Temperature	HOLDING REGISTER	Floating Pt.	℃
6	1045	0415H	Saturation Vapour Pressure	HOLDING REGISTER	Floating Pt.	mbar
7	1049	0419H	Vapour Pressure	HOLDING REGISTER	Floating Pt.	mbar
8	1053	041DH	Mixture Ratio	HOLDING REGISTER	Floating Pt.	g/kg
9	1057	0421H	Absolute Humidity	HOLDING REGISTER	Floating Pt.	g/m^3
10	1061	0425H	Specific Enthalpy	HOLDING REGISTER	Floating Pt.	kJ/kg
11	1065	0429H	PPM on Weight	HOLDING REGISTER	Floating Pt.	PPMw
12	1069	042DH	PPM on Volume	HOLDING REGISTER	Floating Pt.	PPMv

- 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 1029 of the "table" would be address 1027 of the Modscan (e.g. 05 of the table equals to 40003 of the ModScan)



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Instrument Holding Registers for software engineering

Item No.	Address	Address HEX	Parameter	Data Bytes	Data Type	Value
Information						
1	17-26	0011H-001AH	Firmware version	10 bytes	ASCII	
2	33-48	0021H-0030H	Serial Number	16 bytes	ASCII	
3	1605-1620	0645H-0654H	Model Name	16 bytes	ASCII	
RS-485 Slave Address, Baud rate, Data format						
4	49	0031H	Slave Address	1 bytes	unsigned Integer	1-247
5	51	0033H	Baud rate	1 bytes	unsigned Integer	0: 9600 1: 19200 2: 38400 3: 57600 4: 115200
6	53	0035H	Data type	1 bytes	unsigned Integer	0: N81 1: N82 2: E81 3: E82 4: O81 5: O82
Physical Quantities						
7	1	0001H	OUT1	4 bytes	IEEE 754	relate to OUT1 setting
8	5	0005H	OUT2	4 bytes	IEEE 754	relate to OUT2 setting

ASCII format, Item No. 1-2

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

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IEEE754 format, Item No. 6-7

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

Communication Examples

Read Temperature Measurement Value

Request the host (PC or PLC) to polling the data of THSXX			
Field Name	Value	Type	Byte
Slave Address	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	04	Byte	1
Starting Address Lo	00	Byte	1
No. of registers Hi	00	Byte	1
No. of registers Lo	02	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Temperature are 0x0400 ~ 0x0403

Response THSXX response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Slave Address	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 THS/THM30X&80X & THS8X/THM8X

Read Relativity Humidity Measurement Value

Request the host (PC or PLC) to polling the data of THSXX			
Field Name	Value	Type	Byte
Slave Address	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	04	Byte	1
Starting Address Lo	04	Byte	1
No. of registers Hi	00	Byte	1
No. of registers Lo	02	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Relativity Humidity are 0x0404 ~ 0x0407

Response THSXX response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Slave Address	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>:

Read Serial No.

Request the host (PC or PLC) to polling the data of THSXX			
Field Name	Value	Type	Byte
Slave Address	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	00	Byte	1
Starting Address Lo	20	Byte	1
No. of registers Hi	00	Byte	1
No. of registers Lo	08	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Serial No. are 0x20 ~ 0x2F

Modbus Protocol of THS/THM30X&80X & THS8X/THM8X

Response THSXX response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Slave Address	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
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 THSXX			
Field Name	Value	Type	Byte
Slave Address	1~247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	00	Byte	1
Starting Address Lo	60	Byte	1
No. of registers Hi	00	Byte	1
No. of registers Lo	05	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Firmware Version are 0x10 ~ 0x19

Modbus Protocol of THS/THM30X&80X & THS8X/THM8X

Response THSXX response data to the host (PC or PLC)			
Field Name	Value	Type	Byte
Slave Address	1~247	Byte	1
Read Holding registers	03	Byte	1
Byte Count	0A	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
5th Word, Lo byte	0x38	Byte	1
5th Word, Hi byte	0x37	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*example of Firmware Version is “V1234.5678”

Revise history

- V1 2013_08_12 Initial
- V2 2013_10_04 swap field of Hi byte and Lo byte sequence in “Response” of example of “Read Firmware Version” and “Read Serial No.”
- V3 2015_04_09
  - Add Modbus address, Baud rate and Data format information
  - Remove RS-232 function description
- V4 2015_08_05
  - Add Saturation Vapour Pressure on 0414H
  - Add registers table for application engineering
  - Error correction for slave address from 1 to 247
  - V5 2015_11_09
  - Remove RS-232 stuff
  - Add OUT1 and OUT2 register
  - Add R/W for registers
  - V6 2017_11_06
  - Integrated communication address for ModScan
  - V7 2018_05_28
  - Add Holding Registers of PPM on Weight and Volume
  - V8 2018_12_05

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- Add Model Name Field on 0645H