Modbus Protocol

eYc PHD330

Differential Pressure Transmitter



Introduction

This document describes the protocol detail of Modbus for PHD330

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)

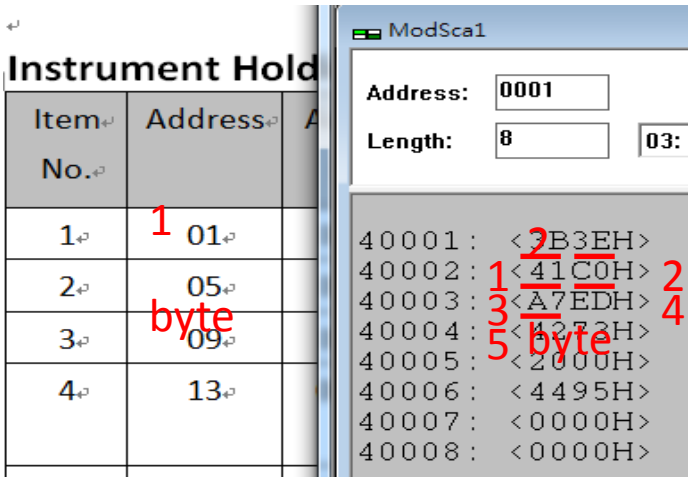
- Support RTU mode
- Broadcast support (Address 0)
- Bit addressable items (i.e. Coils and Discrete inputs) will not be implemented
- Measurement Values are represented in IEEE 754 single-precision 32-bit floating point type http://en.wikipedia.org/wiki/IEEE_754
- Modbus protocol structure:
  - 1st byte: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

Instrument Holding Registers for application engineering(ex: ModScan)

Item No.	Address	Address HEX	Parameter	Point Type	Data Type	Unit	Value
1	1025	0401H	Pressure	Holding Register	Floating Pt.	mBar	
2	1029	0405H	Pressure	Holding Register	Floating Pt.	Pa	
3	1033	0409H	Pressure	Holding Register	Floating Pt.	hPa	
4	1037	040DH	Pressure	Holding Register	Floating Pt.	kPa	
5	1041	0411H	Pressure	Holding Register	Floating Pt.	mmH2O	
6	1045	0415H	Pressure	Holding Register	Floating Pt.	mmWS	
7	1049	0419H	Pressure	Holding Register	Floating Pt.	inH_2O	
8	1053	041DH	Pressure	Holding Register	Floating Pt.	mmHg	
9	1057	0421H	Pressure	Holding Register	32-bit Integer	mBar	x10000
10	1061	0425H	Pressure	Holding Register	32-bit Integer	Pa	x10000
11	1065	0429H	Pressure	Holding Register	32-bit Integer	hPa	x10000
12	1069	042DH	Pressure	Holding Register	32-bit Integer	kPa	x10000
13	1073	0431H	Pressure	Holding Register	32-bit Integer	mmH_2O	x10000
14	1077	0435H	Pressure	Holding Register	32-bit Integer	mmWS	x10000
15	1081	0439H	Pressure	Holding Register	32-bit Integer	inH_2O	x10000
16	1085	043DH	Pressure	Holding Register	32-bit Integer	mmHg	x10000
17	1089	0441H	Pressure	Holding Register	Floating Pt.	mmAq	
18	1093	0445H	Pressure	Holding Register	32-bit Integer	mmAq	x10000
19	1097	0449H	Velocity	Holding Register	Floating Pt.	Config.	
20	1101	044DH	Volumetric	Holding Register	Floating Pt.	Config.	
21	1105	0451H	Velocity	Holding Register	32-bit Integer	Config.	x10000
22	1109	0455H	Volumetric	Holding Register	32-bit Integer	Config.	x10000

- 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)

- The unit of quantities 19 ... 22 is configurable. Please configures proper unit and span by using provided UI



Instrument Holding Registers for software engineering

Item No.	Address	Address HEX	Parameter	Data Bytes	Data Type	Unit	Value
Information							
1	49-64	0031H-0040H	Serial Number	16 bytes	ASCII		
2	65-74	0041H-004AH	Firmware version	10 bytes	ASCII		
RS-485 Slave Address, Baud rate, Data format							
3	83	0053H	Slave Address	1 bytes	unsigned Integer		1-247
4	85	0055H	Baud rate	1 bytes	unsigned Integer		0: 9600 1: 19200 2: 38400 3: 57600 4: 115200
5	87	0057H	Data type	1 bytes	unsigned Integer		0: N81 1: N82 2: E81 3: E82 4: O81 5: O82

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>

IEEE754 format

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 Pressure [mBar] IEEE 754

Request the host (PC or PLC) to polling the data of PHD330			
Field Name	Value	Type	Byte
Slave Address	1 ... 247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x04	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 Pressure IEEE 754 are 0x0400 ~ 0x0403

Response PHD330 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 Pressure [mBar] 32-bit Integer

Request the host (PC or PLC) to polling the data of PHD330			
Field Name	Value	Type	Byte
Slave Address	1 ... 247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x04	Byte	1
Starting Address Lo	0x20	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 pressure 32-bit Integer are 0x0420 ~ 0x0423

Response PHD330 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
Hi Word, Hi Byte	0x11	Byte	1
Hi Word, Lo Byte	0x22	Byte	1
Lo Word, Hi Byte	0x33	Byte	1
Lo Word, Lo Byte	0x44	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

* the 32-bit Integer number 287454020 is represented in byte of hexadecimal as <11><22><33><44>

Read Serial No.

Request the host (PC or PLC) to polling the data of PHD330			
Field Name	Value	Type	Byte
Slave Address	1 ... 247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x30	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 0x30 ~ 0x3F

Response PHD330 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 PHD330			
Field Name	Value	Type	Byte
Slave Address	1 ... 247	Byte	1
Read Holding registers	03	Byte	1
Starting Address Hi	0x00	Byte	1
Starting Address Lo	0x40	Byte	1
No. of registers Hi	0x00	Byte	1
No. of registers Lo	0x05	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Firmware Version are 0x40 ~ 0x49

Response PHD330 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	0x0A	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 2021_06_09 Initial

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