Modbus Protocol of DPM02 / DPT02

Introduction

This document describes the Modbus slave protocol detail of DPM02 and DPT02

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 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

Modbus device type and slave mode

DPM02 and DPT02 provide two type of Modbus device which are master and slave. Only one type is supported at one time. The selection of Modbus device type is operating by 3-bottom and 7-LED display on front panel, for more detail please refer to user's manual. While DPM02 and DPT02 setting as a master is able to read data from Modbus slave device.

DPM02 and DPT02 supports two modes of Modbus slave device. One is the ordinary mode slave device. It provides data to Modbus master device and another mode display data from Modbus master device say it is display mode. Types and modes are list as below.

Modbus device type

- Modbus master device
- Modbus slave device

Modbus slave mode

- Ordinary mode
- Display mode

Ordinary Mode

In ordinary mode, the master device poll data from DPM02 and DPT02. There are two data types have supported which are float and S32. The float type presents on register Out_float. The S32 type data present on register Out_S32 and the value was multiplied 10,000 from original value.

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Display Mode

In display mode, the master device writes data to register Display_Data and DPM02 and DPT02 will display this data by 7-LED. The RW_Register supports five data types are U16, S16, U32, S32 and Float. The format of float type is IEEE 754 and support swap function for hi-word and lo-word exchange. The decimal point setting is support when data type is integer U16, S16, U32 and S32. The register Display_Config handles Display_Data settings of data type, swap function and decimal point.

Note: U of U16 or U32 represent unsigned, S if S16 or S32 represent signed

Instrument Holding Registers for application engineering (ex: ModScan)

Item No.	Address	Address HEX	Parameter	Point Type	Data Type	R/W	Value
1	1	0001H	Out_float	Holding Register	Floating Pt.	R	
2	21	0015H	Out_S32	Holding Register	32-bit Integer	R	x10000
3	41	0029H	Display_Data	Holding Register	by Display_Config	R/W	

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 v0.6 for software engineering

Item No.	Starting Address		Parameter	Data Bytes	R/W	Data Type	Value
	Hi byte	Lo Byte					
Information							
1	00	50-5F	Serial number	16 bytes	R	ASCII	
2	00	60-6F	Firmware version	16 bytes	R	ASCII	
Setting							
3	00	80	Slave address	1 bytes	R/W	unsigned Integer	1-247
4	00	82	Baud rate	1 bytes	R/W	unsigned Integer	0: 9600 1: 19200 2: 38400 3: 57600 4: 115200
5	00	84	Data format	1 bytes	R/W	unsigned Integer	0: N81 1: N82 2: E81 3: E82 4: O81 5: O82
6	00	86	Display_Config	1 byte	R/W	bit	Bit7...4 0: U16 1: S16 2: U32 3: S32 4: FLOAT Bit3 0: NO SWAP 1: SWAP Bit2...0 0: XXXXX 1: XXXX.X 2: XXX.XX 3: XX.XXX

							4: X.XXXX
Data							
7	00	00	Out_Float	4 bytes	R	IEEE 754	
8	00	14	Out_S32	4 bytes	R	32-bit Integer	X10,000
9	00	28	Display_Data	2 or 4 bytes	R/W	by Display_Config	

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 as

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

IEEE754 format, Item No. 6-14

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 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 Output Data of Float type

Request the host (PC or PLC) to polling the data of DPM02 and DPT02			
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	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 Out_Float are 0x0000 ~ 0x0003

Response DPM02 and DPT02 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 as <42><13><77><CF>:

Read Output Data of 32-bit signed Integer

Request the host (PC or PLC) to polling the data of DPM02 and DPT02			
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	14	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 Out_S32 are 0x0014 ~ 0x0017

Response DPM02 and DPT02 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 as <11><22><33><44>, output value is 28745.4020

Read Serial No.

Request the host (PC or PLC) to polling the data of DPM02 and DPT02			
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	50	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 0x50 ~ 0x5F

Response DPM02 and DPT02 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 DPM02 and DPT02			
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	08	Byte	1
CRC Lo	CRC Lo	Byte	1
CRC Hi	CRC Hi	Byte	1

*Registers of Firmware Version are 0x60 ~ 0x6f

Response DPM02 and DPT02 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
6th Word, Lo byte	0x30	Byte	1
6th Word, Hi byte	0x39	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 Firmware Version is “V1234.567890ABCD”

Revise history

- V1 2017_05_02 Initial