



MP6 Multi Gas Sensor Module

Modbus-RTU Communication Protocol

RS485 Interface

This document provides a detailed description of the Modbus-RTU communication protocol for the MP6 smart gas sensor, including the main instructions required by users when using the product.

1. Product Overview and Configuration Parameters

1.1 Product Overview

The product uses RS485 for communication. For specific configurations, please refer to chapter [1.2 RS485 Configuration Parameters].

1.2 RS485 Configuration Parameters

Baud Rate	Data Bits	Stop Bits	Parity Bits	Read/Write Data Interval
9600	8 Bits	1 Bit	None	>= 1 s

1.3 CRC-16/Modbus Calculation Method

The CRC-16 calculation follows the polynomial $x^{16} + x^{15} + x^2 + 1$. The calculation can be implemented in C as follows:

```
uint16_t get_modbus_crc(uint8_t *buffer, uint16_t len)
{
    uint16_t wrcr = 0xFFFF;
    uint8_t temp;
    uint16_t i = 0, j = 0;
    for (i = 0; i < len; i++)
    {
        temp = *buffer & 0X00FF;
        buffer++;
        wrcr ^= temp;
        for (j = 0; j < 8; j++)
        {
            if (wrcr & 0X0001)
            {
                wrcr >>= 1;
                wrcr ^= 0XA001;
            }
            else
            {
                wrcr >>= 1;
            }
        }
    }
    return wrcr;
}
```

2. Gas Concentration Unit Table

Value (Hex)	0x02	0x04	0x08	0x10
Concentration Unit	ppm	ppb	%vol.	%vol.

3. Sensor Type Table

Sensor Type	HCHO	VOC	CO	Cl ₂	H ₂	H ₂ S	HCl	HCN	HF	NH ₃	NO ₂	O ₂	O ₃	SO ₂
Value (Hex)	0x17	0x18	0x19	0x1A	0x1B	0x1C	0x1D	0x1E	0x1F	0x20	0x21	0x22	0x23	0x24
Sensor Type	HBr	Br ₂	F ₂	PH ₃	AsH ₃	SiH ₄	GeH ₄	B ₂ H ₆	BF ₃	WF ₆	SiF ₄	XeF ₂	TiF ₄	SMELL
Value (Hex)	0x25	0x26	0x27	0x28	0x29	0x2A	0x2B	0x2C	0x2D	0x2E	0x2F	0x30	0x31	0x32
Sensor Type	IAQ	AQI	NMHC	SO _x	NO _x	NO	C ₄ H ₈	C ₃ H ₈ O ₂	CH ₄ S	C ₈ H ₈	C ₄ H ₁₀	C ₂ H ₆	C ₆ H ₁₄	C ₂ H ₄ O
Value (Hex)	0x33	0x34	0x35	0x36	0x37	0x38	0x39	0x3A	0x3B	0x3C	0x3D	0x3E	0x3F	0x40
Sensor Type	C ₃ H ₉ N	C ₂ H ₇ N	C ₂ H ₆ O	CS ₂	C ₂ H ₆ S	C ₂ H ₆ S ₂	C ₂ H ₄	CH ₃ OH	C ₆ H ₆	C ₈ H ₁₀	C ₇ H ₈	CH ₃ COOH	ClO ₂	
Value (Hex)	0x41	0x42	0x43	0x44	0x45	0x46	0x47	0x48	0x49	0x4A	0x4B	0x4C	0x4D	
Sensor Type	H ₂ O ₂	N ₂ H ₄	C ₂ H ₈ N ₂	C ₂ HCl ₃	CHCl ₃	C ₂ H ₃ Cl ₃	H ₂ Se	LEL	CO ₂	PID_VOCS				
Value (Hex)	0x4E	0x4F	0x50	0x51	0x52	0x53	0x54	0x55	0x56	0x57				

4. Modbus Address and Read/Write Requirements

Factory Default Address: 0x01

The user can set the master and slave addresses through register 0x8000. When setting the address, please use the broadcast mode (broadcast address is 0x00). No data will be replied to the broadcast.

The read/write interval for each instruction must be >= 1 second.

The Modbus-RTU communication used by this product employs holding registers. Reading is performed using the 03H function code, while writing is done using the 06H and 10H function codes.

5. Holding Register Table and Read/Write Examples

Note:

R (Read) /W (Write)

Float Type Data Conversion:

Please refer to http://www.binaryconvert.com/convert_float.html

In C language, the conversion can be referenced using the following union:

```
typedef union {
    float data;
    uint32_t uint32_data;
    uint8_t uint8_data[4];
}FLOAT_DATA_U;
```

5.1 Real-Time Data Registers

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2000	Byte[0]	S1	Gas Concentration Value (byte[0]<<24) (byte[1]<<16) (byte[2]<<8) byte[3] Then, convert the result according to the 32-bit float data type.	float	R
	Byte[1]				
0x2001	Byte[2]				
	Byte[3]				
0x2002	Byte[4]		Maximum Range (Byte[4]<<8) Byte[5]	uint16	R
	Byte[5]				
0x2003	Byte[6]		Byte[6] is fixed to 0. For Byte[7]sensor type, please refer to [3. Sensor Type Table].	uint16	R
	Byte[7]				
0x2004	Byte[8]		Byte[8] is fixed to 0. For Byte[9]unit type, please refer to [2. Gas Concentration Unit Table].	uint16	R
	Byte[9]				
0x2005	Byte[10]		Byte[10] is fixed to 0. Byte[11] is Device Status 0: Device Normal 1: Sensor Replacement Recommended 2: Sensor Must Be Replaced	uint16	R
	Byte[11]				
0x2006	Byte[12]	S2	Gas Concentration Value (No Suppression) (byte[12]<<24) (byte[13]<<16) (byte[14]<<8) byte[15] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[13]				
0x2007	Byte[14]				
	Byte[15]				
0x2008	Byte[16]		Gas Concentration Value (byte[16]<<24) (byte[17]<<16) (byte[18]<<8) byte[19] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[17]				
0x2009	Byte[18]				
	Byte[19]				
0x200A	Byte[20]		Maximum Range (Byte[20]<<8) Byte[21]	uint16	R
	Byte[21]				
0x200B	Byte[22]		Byte[22] is fixed to 0. Byte[23] is sensor type, please refer to [3. Sensor Type Table].	uint16	R
	Byte[23]				
0x200C	Byte[24]		Byte[24] is fixed to 0. Byte[25] is unit type, please refer to [2. Gas Concentration Unit Table].	uint16	R
	Byte[25]				
0x200D	Byte[26]		Byte[26] is fixed to 0. Byte[27] is Device Status 0: Device Normal 1: Sensor Replacement Recommended 2: Sensor Must Be Replaced	uint16	R
	Byte[27]				
0x200E	Byte[28]		Gas Concentration Value (No Suppression) (byte[28]<<24) (byte[29]<<16) (byte[30]<<8) byte[31] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[29]				
0x200F	Byte[30]				
	Byte[31]				

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2010	Byte[32]	S3	Gas Concentration Value (byte[32]<<24) (byte[33]<<16) (byte[34]<<8) byte[35] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[33]				
0x2011	Byte[34]				
	Byte[35]				
0x2012	Byte[36]		Maximum Range (Byte[36]<<8) Byte[37]	uint16	R
	Byte[37]				
0x2013	Byte[38]		Byte[38] is fixed to 0. Byte[39] is sensor type, please refer to [3. Sensor Type Table].	uint16	R
	Byte[39]				
0x2014	Byte[40]	S4	Byte[40] is fixed to 0. Byte[41] is unit type, please refer to [2. Gas Concentration Unit Table].	uint16	R
	Byte[41]				
0x2015	Byte[42]		Byte[42] is fixed to 0. Byte[43] is Device Status 0: Device Normal 1: Sensor Replacement Recommended 2: Sensor Must Be Replaced	uint16	R
	Byte[43]				
0x2016	Byte[44]		Gas Concentration Value (No Suppression) (byte[44]<<24) (byte[45]<<16) (byte[46]<<8) byte[47] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[45]				
0x2017	Byte[46]				
	Byte[47]				
0x2018	Byte[48]	S4	Gas Concentration Value (byte[48]<<24) (byte[49]<<16) (byte[50]<<8) byte[51] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[49]				
0x2019	Byte[50]				
	Byte[51]				
0x201A	Byte[52]		Maximum Range (Byte[52]<<8) Byte[53]	uint16	R
	Byte[53]				
0x201B	Byte[54]		Byte[54] is fixed to 0. Byte[55] is sensor type, please refer to [3. Sensor Type Table].	uint16	R
	Byte[55]				
0x201C	Byte[56]		Byte[56] is fixed to 0. Byte[57] is unit type, please refer to [2. Gas Concentration Unit Table].	uint16	R
	Byte[57]				
0x201D	Byte[58]		Byte[58] is fixed to 0. Byte[59] is Device Status 0: Device Normal 1: Sensor Replacement Recommended 2: Sensor Must Be Replaced	uint16	R
	Byte[59]				
0x201E	Byte[60]		Gas Concentration Value (No Suppression) (byte[60]<<24) (byte[61]<<16) (byte[62]<<8) byte[63] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[61]				
0x201F	Byte[62]				
	Byte[63]				
0x2020	Byte[64]	Mainboard	Onboard Temperature (byte[64]<<24) (byte[65]<<16) (byte[66]<<8) byte[67] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[65]				
0x2021	Byte[66]				
	Byte[67]				

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2022	Byte[68]	Mainboard	Onboard Humidity (byte[68]<<24) (byte[69]<<16) (byte[70]<<8) byte[71] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[69]				
0x2023	Byte[70]				
	Byte[71]				
0x2024	Byte[72]	Mainboard (Optional)	External Temperature (byte[72]<<24) (byte[73]<<16) (byte[74]<<8) byte[75] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[73]				
0x2025	Byte[74]				
	Byte[75]				
0x2026	Byte[76]	Mainboard (Optional)	External Humidity (byte[76]<<24) (byte[77]<<16) (byte[78]<<8) byte[79] Then, convert the value according to the 32-bit float data type.	float	R
	Byte[77]				
0x2027	Byte[78]				
	Byte[79]				
0x2028	Byte[80]	S1	DS4 Status 0: Unknown Status 1: Online Normal Operation Status 2: Offline Status 3: Sleep Status	uint16	R
	Byte[81]				
0x2029	Byte[82]	S2	DS4 Status 0: Unknown Status 1: Online Normal Operation Status 2: Offline Status 3: Sleep Status	uint16	R
	Byte[83]				
0x202A	Byte[84]	S3	DS4 Status 0: Unknown Status 1: Online Normal Operation Status 2: Offline Status 3: Sleep Status	uint16	R
	Byte[85]				
0x202B	Byte[86]	S4	DS4 Status 0: Unknown Status 1: Online Normal Operation Status 2: Offline Status 3: Sleep Status	uint16	R
	Byte[87]				

Example of Reading Data from Registers 0x2000 to 0x2007:

Send: 0x01 0x03 0x20 0x00 0x00 0x08 0x4F 0xCC

Receive: 0x01 0x03 0x10 0x42 0x47 0x99 0x9A 0x03 0xE8 0x00 0x19 0x00 0x02 0x00 0x00 0x42 0x47 0x98 0xC6 0xA1 0x30

Send Analysis:

0x01-----Modbus Address

0x03-----Read Holding Registers

0x20 0x00-----Starting Register Address - 0x2000

0x00 0x08-----Read Register Length - 8 Registers

0x4F 0xCC-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x03-----Read Holding Registers
 0x10-----Read Length - 16 Bytes
 0x42 0x47 0x99 0x9A-----Concentration - 0x4247999A - 49.90 (IEEE754 single precision 32-bit)
 0x03 0xE8-----Range - 0x03E8 - 1000
 0x00 0x19-----Sensor Type - CO
 0x00 0x02-----Unit Type - ppm
 0x00 0x00-----Device Status - normal
 0x42 0x47 0x98 0xC6-----Concentration Value - 0x424798C6 - 49.90 (IEEE754 single precision 32-bit)
 0xA1 0x30-----Modbus-RTU CRC

5.2 Slave Device Software Version Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2100	Byte[0]	S1	Software Version "DS4-V00023"	ASCII	R
	Byte[1]				
0x2101	Byte[2]				
	Byte[3]				
0x2102	Byte[4]				
	Byte[5]				
0x2103	Byte[6]				
	Byte[7]				
0x2104	Byte[8]				
	Byte[9]				
0x2105	Byte[10]	S2	Software Version "DS4-V00023"	ASCII	R
	Byte[11]				
0x2106	Byte[12]				
	Byte[13]				
0x2107	Byte[14]				
	Byte[15]				
0x2108	Byte[16]				
	Byte[17]				
0x2109	Byte[18]				
	Byte[19]				

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x210A	Byte[20]	S3	Software Version "DS4-V00023"	ASCII	R
	Byte[21]				
0x210B	Byte[22]				
	Byte[23]				
0x210C	Byte[24]				
	Byte[25]				
0x210D	Byte[26]				
	Byte[27]				
0x210E	Byte[28]				
	Byte[29]				
0x210F	Byte[30]	S4	Software Version "DS4-V00023"	ASCII	R
	Byte[31]				
0x2110	Byte[32]				
	Byte[33]				
0x2111	Byte[34]				
	Byte[35]				
0x2112	Byte[36]				
	Byte[37]				
0x2113	Byte[38]				
	Byte[39]				

Example of Reading Registers 0x2100 to 0x2104:

Send: 0x01 0x03 0x21 0x00 0x00 0x05 0x8F 0xF5

Receive: 0x01 0x03 0x0A 0x44 0x53 0x34 0x2D 0x56 0x30 0x30 0x30 0x32 0x33 0x66 0xE9

Send Analysis:

0x01-----Modbus Address
 0x03-----Read Holding Registers
 0x21 0x00-----Starting Register Address - 0x2100
 0x00 0x05-----Read Register Length - 5 Registers
 0x8F 0xF5-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x03-----Read Holding Registers
 0x0A-----Read Length - 10 Registers
 0x44 0x53 0x34 0x2D 0x56 0x30 0x30 0x30 0x32 0x33-----Software Version (ASCII) - "DS4-V00023"
 0x66 0xE9-----Modbus-RTU CRC

5.3 Slave Device Manufacturer Identification Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2300	Byte[0]	S1	Manufacturer Identification Code "012345678901234567890123456789012"	ASCII	R/W
	Byte[1]				
0x2301	Byte[2]				
	Byte[3]				
0x2302	Byte[4]				
	Byte[5]				
0x2303	Byte[6]				
	Byte[7]				
0x2304	Byte[8]				
	Byte[9]				
0x2305	Byte[10]				
	Byte[11]				
0x2306	Byte[12]				
	Byte[13]				
0x2307	Byte[14]				
	Byte[15]				
0x2308	Byte[16]				
	Byte[17]				
0x2309	Byte[18]				
	Byte[19]				
0x230A	Byte[20]				
	Byte[21]				
0x230B	Byte[22]				
	Byte[23]				
0x230C	Byte[24]				
	Byte[25]				
0x230D	Byte[26]				
	Byte[27]				
0x230E	Byte[28]				
	Byte[29]				
0x230F	Byte[30]				
	Byte[31]				
0x2310	Byte[32]				
	Byte[33]				

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2311	Byte[34]	S2	Manufacturer Identification Code "012345678901234567890123456789012"	ASCII	R/W
	Byte[35]				
0x2312	Byte[36]				
	Byte[37]				
0x2313	Byte[38]				
	Byte[39]				
0x2314	Byte[40]				
	Byte[41]				
0x2315	Byte[42]				
	Byte[43]				
0x2316	Byte[44]				
	Byte[45]				
0x2317	Byte[46]				
	Byte[47]				
0x2318	Byte[48]				
	Byte[49]				
0x2319	Byte[50]				
	Byte[51]				
0x231A	Byte[52]				
	Byte[53]				
0x231B	Byte[54]				
	Byte[55]				
0x231C	Byte[56]				
	Byte[57]				
0x231D	Byte[58]				
	Byte[59]				
0x231E	Byte[60]				
	Byte[61]				
0x231F	Byte[62]				
	Byte[63]				
0x2320	Byte[64]				
	Byte[65]				
0x2321	Byte[66]				
	Byte[67]				

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2322	Byte[68]	S3	Manufacturer Identification Code "012345678901234567890123456789012"	ASCII	R/W
	Byte[69]				
0x2323	Byte[70]				
	Byte[71]				
0x2324	Byte[72]				
	Byte[73]				
0x2325	Byte[74]				
	Byte[75]				
0x2326	Byte[76]				
	Byte[77]				
0x2327	Byte[78]				
	Byte[79]				
0x2328	Byte[80]				
	Byte[81]				
0x2329	Byte[82]				
	Byte[83]				
0x232A	Byte[84]				
	Byte[85]				
0x232B	Byte[86]				
	Byte[87]				
0x232C	Byte[88]				
	Byte[89]				
0x232D	Byte[90]				
	Byte[91]				
0x232E	Byte[92]				
	Byte[93]				
0x232F	Byte[94]				
	Byte[95]				
0x2330	Byte[96]				
	Byte[97]				
0x2331	Byte[98]				
	Byte[99]				
0x2332	Byte[100]				
	Byte[101]				

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2333	Byte[102]	S4	Manufacturer Identification Code "012345678901234567890123456789012"	ASCII	R/W
	Byte[103]				
0x2334	Byte[104]				
	Byte[105]				
0x2335	Byte[106]				
	Byte[107]				
0x2336	Byte[108]				
	Byte[109]				
0x2337	Byte[110]				
	Byte[111]				
0x2338	Byte[112]				
	Byte[113]				
0x2339	Byte[114]				
	Byte[115]				
0x233A	Byte[116]				
	Byte[117]				
0x233B	Byte[118]				
	Byte[119]				
0x233C	Byte[120]				
	Byte[121]				
0x233D	Byte[122]				
	Byte[123]				
0x233E	Byte[124]				
	Byte[125]				
0x233F	Byte[126]				
	Byte[127]				
0x2340	Byte[128]				
	Byte[129]				
0x2341	Byte[130]				
	Byte[131]				
0x2342	Byte[132]				
	Byte[133]				
0x2343	Byte[134]				
	Byte[135]				

Example of Writing to Registers 0x2300 to 0x2310:

Send: 0x01 0x10 0x23 0x00 0x00 0x11 0x22 0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33 0x34 0x35
0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x00 0x82 0xD2

Receive: 0x01 0x10 0x23 0x00 0x00 0x11 0x0B 0x81

Send Analysis:

0x01-----Modbus Address
0x10-----Writing to Multiple Holding Registers
0x23 0x00-----Register Address - 0x2300
0x00 0x11-----Register Length - 17 Registers
0x22-----Write Data Length - 34 Bytes
0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33
0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x00-----Write Data - "012345678901234567890123456789012"
0x82 0xD2-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
0x10-----Writing to Multiple Holding Registers
0x23 0x00-----Register Address - 0x2300
0x00 0x11-----Register Length - 17 Registers
0x0B 0x81-----Modbus-RTU CRC

Example of Reading Registers 0x2300 to 0x2310:

Send: 0x01 0x03 0x23 0x00 0x00 0x11 0x8E 0x42

Receive: 0x01 0x10 0x23 0x00 0x00 0x11 0x22 0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33 0x34 0x35
0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x00 0x82 0xD2

Send Analysis:

0x01-----Modbus Address
0x03-----Read Holding Registers
0x23 0x00-----Starting Register Address - 0x2300
0x00 0x11-----Read Register Length - 17 Registers
0x8E 0x42-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
0x03-----Read Holding Registers
0x22-----Read Length - 34 Bytes
0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33 0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x33
0x34 0x35 0x36 0x37 0x38 0x39 0x30 0x31 0x32 0x00-----Software Version(ASCII) - "012345678901234567890123456789012"
0xE7 0x78-----Modbus-RTU CRC

5.4 User Calibration Enable Flag Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2500	Byte[0]	S1	User Calibration Enable Flag 0: Disabled 1: Enabled Other: Invalid	uint16	R/W
	Byte[1]				
0x2501	Byte[2]	S2	User Calibration Enable Flag 0: Disabled 1: Enabled Other: Invalid	uint16	R/W
	Byte[3]				
0x2502	Byte[4]	S3	User Calibration Enable Flag 0: Disabled 1: Enabled Other: Invalid	uint16	R/W
	Byte[5]				
0x2503	Byte[6]	S4	User Calibration Enable Flag 0: Disabled 1: Enabled Other: Invalid	uint16	R/W
	Byte[7]				

The user's calibration initial value is the same as the factory calibration. Before the user writes their own calibration, they must first enable the "User Calibration Enable Flag".

Example of Reading Register 0x2500:

Send: 0x01 0x03 0x25 0x00 0x00 0x01 0x8F 0x06

Receive: 0x01 0x03 0x02 0x00 0x00 0xB8 0x44

Send Analysis:

0x01-----Modbus Address
 0x03-----Read Holding Registers
 0x25 0x00-----Starting Register Address - 0x2050
 0x00 0x01-----Read Register Length - 1 Register
 0x8F 0x06-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x03-----Read Holding Registers
 0x23 0x00-----Read Length - 2 Bytes
 0x00 0x00-----User Calibration Enable Flag - 0x0000 - User Calibration Disabled
 0xB8 0x44-----Modbus-RTU CRC

Example of Writing to Register 0x2500:

Send: 0x01 0x10 0x25 0x00 0x00 0x01 0x02 0x00 0x01 0x13 0x52

Receive: 0x01 0x10 0x25 0x00 0x00 0x01 0x0A 0xC5

Send Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x00-----Register Address - 0x2050
 0x00 0x01-----Register Length - 1 Register
 0x02-----Data Length to Write - 2 Bytes
 0x00 0x01-----User Calibration Enable Flag - 0x0001 - Enable User Calibration
 0x13 0x52-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x00-----Register Address - 0x2500
 0x00 0x01-----Register Length - 1 Register
 0x0A 0xC5-----Modbus-RTU CRC

5.5 User 0-point Calibration Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2510	Byte[0]	S1	User 0-point Calibration 1: Set the current ambient target gas concentration as the zero point. Others: Invalid	uint16	W
	Byte[1]				
0x2511	Byte[2]	S2	User 0-point Calibration 1: Set the current ambient target gas concentration as the zero point. Others: Invalid	uint16	W
	Byte[3]				
0x2512	Byte[4]	S3	User 0-point Calibration 1: Set the current ambient target gas concentration as the zero point. Others: Invalid	uint16	W
	Byte[5]				
0x2513	Byte[6]	S4	User 0-point Calibration 1: Set the current ambient target gas concentration as the zero point. Others: Invalid	uint16	W
	Byte[7]				

Example of Writing to Register 0x2510:

Send: 0x01 0x10 0x25 0x10 0x00 0x01 0x02 0x00 0x01 0x11 0xC2

Receive: 0x01 0x10 0x25 0x10 0x00 0x01 0x0B 0x00

Send Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x10-----Register Address - 0x2510
 0x00 0x01-----Register Length - 1 Register
 0x02-----Write Data Length - 2 Bytes
 0x00 0x01-----Write Data - 0x0001
 0x11 0xC2-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x10-----Register Address - 0x2510
 0x00 0x01-----Register Length - 1 Register
 0x0B 0x00-----Modbus-RTU CRC

5.6 User Concentration Calibration Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2520	Byte[0]	S1	Set the current ambient target gas concentration as the calibration concentration. (byte[0]<<24) (byte[1]<<16) (byte[2]<<8) byte[3] Then, convert the value according to the 32-bit float data type.	float	W
0x2521	Byte[1]				
	Byte[2]	S2	Set the current ambient target gas concentration as the calibration concentration. (byte[4]<<24) (byte[5]<<16) (byte[6]<<8) byte[7] Then, convert the value according to the 32-bit float data type.	float	W
0x2523	Byte[3]				
0x2522	Byte[4]	S3	Set the current ambient target gas concentration as the calibration concentration. (byte[8]<<24) (byte[9]<<16) (byte[10]<<8) byte[11] Then, convert the value according to the 32-bit float data type.	float	W
0x2525	Byte[5]				
	Byte[6]	S4	Set the current ambient target gas concentration as the calibration concentration. (byte[12]<<24) (byte[13]<<16) (byte[14]<<8) byte[15] Then, convert the value according to the 32-bit float data type.	float	W
0x2527	Byte[7]				

Example of Writing to Registers 0x2520 to 0x2521 (Write 20.0f):

Send: 0x01 0x10 0x25 0x20 0x00 0x02 0x04 0x41 0xA0 0x00 0x00 0x43 0x38

Receive: 0x01 0x10 0x25 0x20 0x00 0x02 0x4B 0x0E

Send Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x20-----Register Address - 0x2520
 0x00 0x02-----Register Length - 2 Registers
 0x04-----Write Register Length - 4 Bytes
 0x41 0xA0 0x00 0x00-----Write Concentration - 0x41A00000 - 20.0f (IEEE754 single precision 32-bit)
 0x43 0x38-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x20-----Register Address - 0x2520
 0x00 0x03-----Register Length - 2 Registers
 0x4B 0x0E-----Modbus-RTU CRC

5.7 Factory Calibration Restore Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2540	Byte[0]	S1	Restore Factory Calibration	uint16	W
	Byte[1]		1: Restore factory calibration Others: Invalid		
0x2541	Byte[2]	S2	Restore Factory Calibration	uint16	W
	Byte[3]		1: Restore factory calibration Others: Invalid		
0x2542	Byte[4]	S3	Restore Factory Calibration	uint16	W
	Byte[5]		1: Restore factory calibration Others: Invalid		
0x2543	Byte[6]	S4	Restore Factory Calibration	uint16	W
	Byte[7]		1: Restore factory calibration Others: Invalid		

Example of Writing to Register 0x2540:

Send: 0x01 0x10 0x25 0x40 0x00 0x01 0x02 0x00 0x01 0x1D 0x92

Receive: 0x01 0x10 0x25 0x40 0x00 0x01 0x0B 0x11

Send Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x40-----Register Address - 0x2540
 0x00 0x01-----Register Length - 1 Register
 0x02-----Write Data Length - 2 Bytes
 0x00 0x01-----Restore Factory Settings
 0x1D 0x92-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x25 0x40-----Register Address - 0x2540
 0x00 0x01-----Register Length - 1 Register
 0x0B 0x11-----Modbus-RTU CRC

5.8 Sleep Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2600	Byte[0]	S1	Enter Sleep Mode	uint16	W
	Byte[1]		1: Enter sleep mode Others: No operation		
0x2601	Byte[2]	S2	Enter Sleep Mode	uint16	W
	Byte[3]		1: Enter sleep mode Others: No operation		
0x2602	Byte[4]	S3	Enter Sleep Mode	uint16	W
	Byte[5]		1: Enter sleep mode Others: No operation		
0x2603	Byte[6]	S4	Enter Sleep Mode	uint16	W
	Byte[7]		1: Enter sleep mode Others: No operation		

Example of Writing to Register 0x2600:

Send: 0x01 0x10 0x26 0x00 0x00 0x01 0x02 0x00 0x01 0x20 0x52

Receive: 0x01 0x10 0x26 0x00 0x00 0x01 0x0A 0x81

Send Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x26 0x00-----Register Address - 0x2600
 0x00 0x01-----Register Length - 1 Register
 0x02-----Data Length to Write - 2 Bytes
 0x00 0x01-----Enter Sleep Mode
 0x20 0x52-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x26 0x00-----Register Address - 0x2600
 0x00 0x01-----Register Length - 1 Register
 0x0A 0x81-----Modbus-RTU CRC

5.9 Wake-up Register

Register Address (Hex)	Byte	Device	Description	Data Type (Big Endian Mode)	R/W
0x2700	Byte[0]	S1	Exit Sleep Mode	uint16	W
	Byte[1]		1: Exit sleep mode Other: No operation		
0x2701	Byte[2]	S2	Exit Sleep Mode	uint16	W
	Byte[3]		1: Exit sleep mode Other: No operation		
0x2702	Byte[4]	S3	Exit Sleep Mode	uint16	W
	Byte[5]		1: Exit sleep mode Other: No operation		
0x2703	Byte[6]	S4	Exit Sleep Mode	uint16	W
	Byte[7]		1: Exit sleep mode Other: No operation		

Example of Wake-up:

Send: 0x01 0x10 0x27 0x00 0x00 0x01 0x02 0x00 0x01 0x30 0x92

Receive: 0x01 0x10 0x27 0x00 0x00 0x01 0x0B 0x7D

Send Analysis:

0x01-----Modbus Address
 0x10-----Write Multiple Holding Registers
 0x27 0x00-----Register Address - 0x2700
 0x00 0x01-----Register Length - 1 Register
 0x02-----Write Data Length - 2 Bytes
 0x00 0x01-----Wake up device
 0x30 0x92-----Modbus-RTU CRC

Receive Analysis:

0x01-----Modbus Address
0x10-----Write Multiple Holding Registers
0x27 0x00-----Register Address - 0x2700
0x00 0x01-----Register Length - 1 Register
0x0B 0x7D-----Modbus-RTU CRC



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