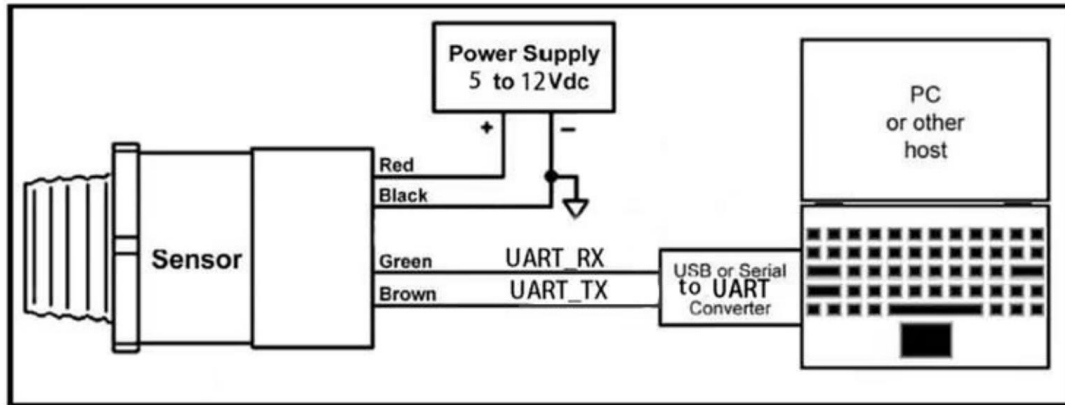


Ultrasonic sensor MODBUS Communication Protocol

Version -V2.2

MODBUS RTU Communication protocol

- 1、The hardware uses RS-485 / UART TTL, master-slave half duplex communication, master calls slave address, and slave replies



- 2、Data frame 10 bits, 1 start bit, 8 data bits, 1 stop bit, no check.

Baud rate 9600 19200 115200 (default is 9600)

- 3、Function code 03H: read register value

Host send:

1	2	3	4	5	6	7	8
ADR	03H	Data start reg hi	Data start reg low	Number of Regis hi Bytes	Number of Regs low Bytes	CRC 16 low	CRC16 hi

The first byte ADR: Slave address code (x01~0xFE default 0x01)

The second byte 03H: Read register function code

The 3、4 byte: Start address of register to be read

The 5、6 byte: Number of registers to be read

The 7、8 byte: CRC16 check from bytes 1 to 6

When the slave receives correctly, the slave sends back

1	2	3	4、5	6、7		M-1、 M	M+1	M+2
ADR	03H	Byte count	data 1	Data 2	...	data M	CRC 16 low	CRC 16 hi

The first byte ADR: Slave address code

The second byte 03H: Return read function code

The third byte: Return the total bytes from the fourth byte to M (including 4 and M)

The fourth to M byte: Register data

The M+1、 M+2 byte: CRC16 check from 1 to M.

4、Function code 06H: Write a single register value

Host send:

1	2	3	4	5	6	7	8
ADR	06	Data start reg hi	Data start reg low	Data hi	Data low	CRC 16 low	CRC 16 hi

When the slave receives correctly, the slave sends back

1	2	3	4	5	6	7	8
ADR	06	ADR HI	ADR LOW	Data hi	Data low	CRC 16 low	CRC 16 hi

When the slave receives an error, the slave sends back

1	2	3	4	5
ADR	86H	Error message code	CRC 16 low	CRC 16 hi

The first byte ADR: Slave address code (=001~254)

The second byte 86H: writing register Error value function code

The third byte: Message code: refer to message code table

The 4、5 byte: CRC16 check from byte 1 to 3.

5、Register definition table: (Note: register address code is hexadecimal)

Register ADR	Content Description	R	W	Register ADR	Content Description	R	W
1000	Measure distance (mm, 2 bytes, MSB first)	√		1001	Temperature instantaneous value (°C)	√	
100E	Device address (default address 01H)	√	√	100F	Remain		
1010	Baud rate (default 9600)	√	√	1011	Remain		
001A	Remain			001B	Remain		

Byte in hexadecimal represents, MSB first

1) Example of reading a single register: reading distance (current sensor address is 0x01)

Send out:

01 03 10 00 00 01 80 CA

Return:

01 03 02 06 78 BB C6

The two red bytes indicate that the current measurement value is 1656 (0x0678=1656 in mm)

(2) Example of reading multiple registers: reading distance and temperature (current sensor

address is 0x01)

Send out:

01 03 10 00 00 02 C0 CB

Return:

01 03 04 07 78 00 16 FA 90

The two red bytes represent the current water depth of 1912mm (0x0778) and temperature of 22 °C (0x0016);

(3) Example: Writing Baud Rate

send out:

01 06 10 10 00 01 4D 0F

Write Baud Rate 01 (9600)

return:

01 06 10 10 00 01 4D 0F

Returning 01 indicates successful writing

(4) Example: Change device address

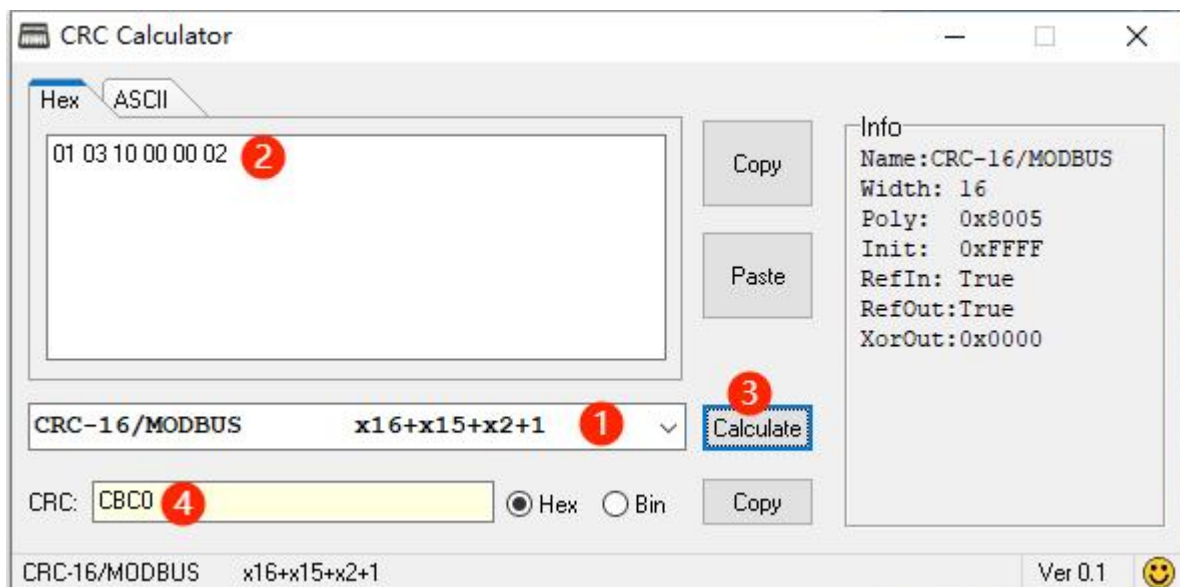
send out:

01 06 10 0E 00 02 6D 08

Change the device at address 01 to address 02

6、CRC check code

- 1) Enter a string of codes that require CRC check codes into the first box
- 2) Click confirm, the CRC check code will be generated
- 3) Select the CRC check result.



7、CRC check code program

- 1) Function description: Calculate the 16-bit CRC value of a data string
- 2) Membership module: public function module

3) Function properties

4) Parameter description:

puchMsg: Data string

byteLen: Data string length

uchCRCHi: CRC check and high 8 bits

uchCRCLo: CRC check and low 8 bits

5) Return description:

Note:

*****/

```
void CRCbyte(UCHAR8 puchMsg[], UINT16 byteLen, UCHAR8 *uchCRCHi, UCHAR8 *uchCRCLo)
```

```
{
    INT16 uIndex;
    UCHAR8 tempBYTE;
    UINT16 i;

    WatchDog();
    *uchCRCHi = 255;
    *uchCRCLo = 255;

    for (i=0; i<byteLen; i++)
    {
        tempBYTE = puchMsg[i];
        uIndex = ((*uchCRCLo) ^ tempBYTE);
        *uchCRCLo = (*uchCRCHi) ^ auchCRCHi[uIndex];
        *uchCRCHi = auchCRCLo[uIndex];
    }
}
```

```
const uint8_t auchCRCHi[] = {
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
    0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
    0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
    0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
    0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
    0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
    0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
    0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
    0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
    0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
    0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
```

```

0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40,
0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40
};

const uint8_t auchCRCLo[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06,
0x07, 0xC7, 0x05, 0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD,
0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA, 0xCB, 0x0B, 0xC9, 0x09,
0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA, 0x1A,
0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4,
0xD5, 0x15, 0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3,
0x11, 0xD1, 0xD0, 0x10, 0xF0, 0x30, 0x31, 0xF1, 0x33, 0xF3,
0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35, 0x34, 0xF4,
0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A,
0x3B, 0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29,
0xEB, 0x2B, 0x2A, 0xEA, 0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED,
0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27, 0xE7, 0xE6, 0x26,
0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60,
0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67,
0xA5, 0x65, 0x64, 0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F,
0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB, 0x69, 0xA9, 0xA8, 0x68,
0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE, 0x7E,
0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5,
0x77, 0xB7, 0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71,
0x70, 0xB0, 0x50, 0x90, 0x91, 0x51, 0x93, 0x53, 0x52, 0x92,
0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54, 0x9C, 0x5C,
0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B,
0x99, 0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B,
0x8A, 0x4A, 0x4E, 0x8E, 0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C,
0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46, 0x86, 0x82, 0x42,
0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};

```

8、Detailed code operation

The following instructions are all operated with the current instrument address as 1 (i.e., the first byte is 01);

Read the register value (the second is the function code, and the function code is 03)

(1) Read the instantaneous value of distance / level (in mm by default)

The current instrument address is 1 (i.e., the first byte is 01); The function code of the read register is 03 (the second byte is 03); The register address of the distance / level instantaneous value is 1000 (i.e., the third and fourth bytes are 100); The number of read registers is 2 (the fifth and sixth bytes are 00 02); The CRC check code is C0 CB (the seventh and eighth word sections are C0 CB);

Send:

01 03 10 00 00 02 C0 CB

Return:

01 03 02 06 78 BB C6

The 2 bytes in Red represents: The current measuring value is 1656 (0x0678=1656 unit mm)

Version record:

1、202506 Add an example of address modification;