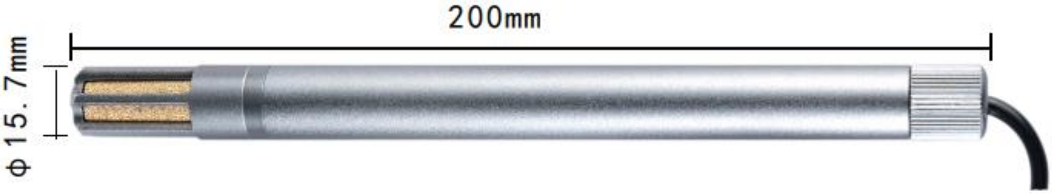
Instructions for Use of RS485 Temperature & Humidity Sensor

Introduction

This is a high-precision industrial-grade RS485 temperature and humidity sensor. It uses high-quality digital integrated transducer and reliable digital processing circuit to convert the temperature and humidity in the environment into corresponding RS485 signals. And it can reliably carry out centralized monitoring jobs with the host computer system.



Featuring a wide measurement range, a high detection accuracy and a fast response speed, the module supports temperature detection of -40 to 120 degrees and humidity detection of 0 to 99.9% RH. Fully wrapped by the aluminum alloy shell, the sensor is waterproof and heat resistant, which makes it suitable for harsh environments. Besides, its probe employs a breathable and dust-proof design that effectively protects the internal circuit board and prolongs the service validity period.

The product has remarkable long-term stability, low latency, high resistance to chemical pollution and superior repeatability. It is an ideal solution for accurately measuring relative humidity and temperature in HVAC(Heating, ventilation, and air conditioning) applications. This sensor can be widely used in building automation, climate and HVAC automatic control, climatology stations in museums and hotels, closed-loop control of HVAC systems, etc.

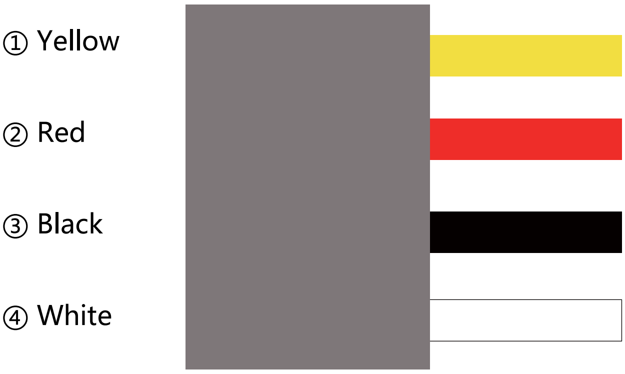
Specification

- Temperature Measurement Range: -40 ~ 120℃
- Humidity Measurement Range: 0 ~ 99.9%RH
- Temperature Accuracy: ± 0.3°C (25°C)
- Humidity Accuracy: ± 2%RH (25℃)

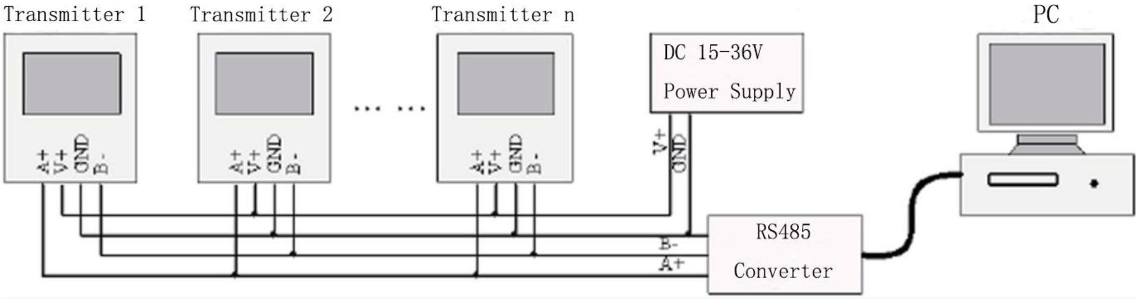
- Sampling Cycle Period: 3 sec
- Power Supply Voltage: 12 ~ 36V (DC)
- Product Size: 200mm(L) × 15.7mm(D) / 7.87×0.62 inch
- Output Signal: RS485 signal
- Communication Protocol: standard MODBUS RTU protocol
- Baud Rate: 9600 (default)
- Display Resolution: Temperature: 0.1℃; Humidity: 1%RH
- Sensitivity Attenuation Value: temperature < 0.1 ℃ /year; humidity < 0.5%RH/year

Pinout

Lead line	Name	Description
①	A+	Yellow: FG6485 A end
②	V+	Red: Power supply positive input
③	GND	Black: Power supply negative input
④	B-	White: FG6485 B end



Wiring Diagram



RS485 Communication Protocol

1. Internal Register Mapping Address

Register information	Address	Register information	Address
Humidity	0x0000	Device model	0x0008
Temperature	0x0001	Version number (lower 8 bits)	0x0009
Reserve	0x0002	Device ID high 16 bits	0x000A
Reserve	0x0003	Device ID low 16 bits	0x000B
Reserve	0x0004	Temperature upper limit alarm value	0x000C
Reserve	0x0005	Temperature upper limit alarm enable	0x000D
Reserve	0x0006	Temperature lower limit alarm value	0x000E
Reserve	0x0007	Temperature lower limit alarm enable	0x000F
Humidity upper limit alarm value	0x0010	Reserve	0x0018
Humidity upper limit alarm enable	0x0011	Reserve	0x0019
Humidity lower limit alarm value	0x0012	Reserve	0x001A
Humidity lower limit alarm enable	0x0013	Reserve	0x001B
Reserve	0x0014	Reserve	0x001C
Reserve	0x0015	Temperature correction value update	0x001D
Reserve	0x0016	Humidity correction value update	0x001E
Reserve	0x0017	Reserve	0x001F

2. Supported function codes

0x03: read multiple registers
0x10: write multiple registers

Read command:

Host frame format

Transmitter address + 0x03 + register start address (2 bytes) + number of registers (2 bytes) + CRC low bit + CRC high bit

Transmitter return format

Transmitter address+0x03+number of bytes returned (1 byte)+data 0+..+data n+CRC low bit+CRC high bit

Write command:

Host frame format

Transmitter address + 0x10 + register start address (2 bytes) + number of registers (2 bytes) + number of bytes sent (1 byte) + data 0 +... + data n + CRC low bit + CRC high bit

Transmitter return format

Transmitter address + 0x10 + register start address (2 bytes) + number of registers (2 bytes) + CRC low bit + CRC high bit

Instructions for writing function codes:

1. In the internal register mapping address, only the addresses 0x000C-0x001E can be written, and others are prohibited.
2. In address 0x000C-0x001B, if the host data writing is out of the range or not in accordance with the control logic, the transmitter register will not update the values but keep the original values.
3. 0x001C, 0x001d, 0x001E, the three registers, will be limited to boundary values if they exceed the range.
4. The host should send the actual value magnified 10 times to change decimal into integer.

3. Error code prompt

0x81 illegal function code (unsupported function code)
0x82 read illegal address
0x83 write illegal data (write to an unwritable register address or write-forbidden transmitter)

4. Examples for communication read instruction

The format of the message sent by the host: **01 03 00 00 00 02 C4 0B.** The following table is an introduction to the function codes:

Send by Host	Number of bytes	Message to send	Remarks
Slave address	1	01	Send to the slave with address 01
Function code	1	03	Read register
Initial address	2	0000	Start address is 0000
Read Number of registers	2	0002	Read 2 registers, a total of 4 bytes
CRC code	2	C40B	The CRC calculated by the host, the low byte first(C4) and high byte behind(0B)

The message format returned by the product response: **01 03 04 Humidity (16 bits) Temperature (16 bits) CRC check code**

The following table is an example of returning a set of temperature and humidity data: **01 03 04 01 D7 00 D6 CA 69**

Slave response	Number of bytes	Message returned	Remarks
Slave address	1	01	Data from address 01
Function code	1	03	Read the register
Number of bytes returned	1	04	Returned 4 registers, total 4 bytes
Register 0 high byte	1	01	The content of address 0x00 (humidity high byte)
Register 0 low byte	1	D7	The content of address 0x00 (humidity low byte)
Register 1 high byte	1	00	The content of address 0x00

			(temperature high byte)
Register 1 low byte	1	D6	The content of address 0x00 (temperature low byte)
CRC code	2	CA69	The returned CRC calculated by the slave, the low byte first(CA)

Temperature and humidity output format and calculation example

The temperature and humidity resolution are 16-Bit, and the temperature and humidity are output in the actual positive and negative format, and the numerical value is 10 times the actual temperature and humidity value;

Humidity: 01D7 = 1×256+13×16+4= 471 => Humidity = 471÷10=47.1%RH

Temperature: 00D6 = 13×16+6= 214 => Temperature = 214÷10 = 21.4℃

Calculation of CRC code

1. Preset a 16-bit register as hexadecimal FFFF (that is, all 1); call this register CRC register;
2. The first 8-bit binary data (that is, the first byte of the communication information frame) XOR the lower 8 bits of the 16-bit CRC register, and then put the result in the CRC register;
3. Shift the contents of the CRC register one bit to the right (towards the low bit) and fill the highest bit with 0, and check the shifted bit ;
4. If the shifted bit is 0: repeat step 3 (shift one bit to the right again); if the shifted bit is 1: the CRC register XOR the polynomial A001 (1010000000000001);
5. Repeat steps 3 and 4 until you move 8 times, so that the entire 8-bit data is processed;
6. Repeat steps 2 to 5 to process the next byte of the communication information frame;
7. After calculating all the bytes of the communication information frame according to the above steps, exchange the high and low bytes of the resulting 16-bit CRC register;
8. The final content of the CRC register is: CRC code.

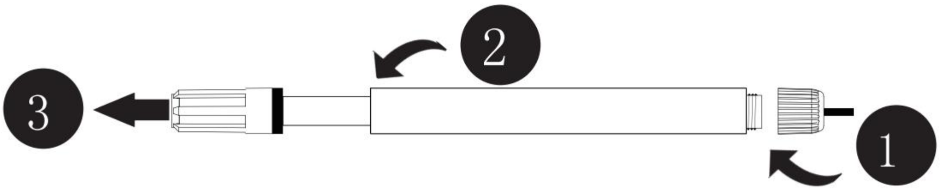
CRC Code Calculation Program in C Language

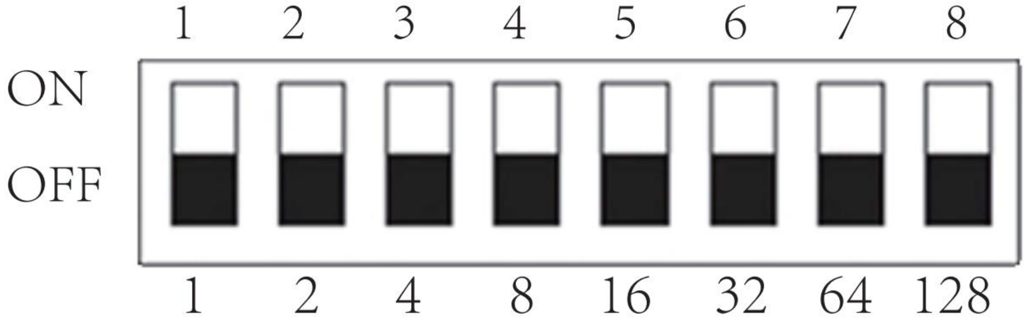
Note: This program calculates the CRC code of the bytes of first len length in * ptr.

```
unsignedshortcrc16(unsignecdhar*ptr, unsignedcharlen)
{
unsignedshortcrc=0xFFFF;
                unsignedchari;
        while(len--)
         {
                  crc ^=*ptr++;
                  for(i=0;i<8;i++)
              {
                  if(crc& 0x01)
                  {
                  crc>>=1;
                  crc^=0xA001;
                           }else
                           {
                                    crc>>=1;
                           }
                  }
         }
         returncrc;
}
```

Code Description

Set slave address: Each terminal should have an address according to the ModBus-RTU Protocol. Follow the steps below to disassemble the product, then you can use the 8-digits DIP switch inside to set the communication address as per your needs.





Calculation: the DIP digits1~8 respectively correspond to number 1, 2, 4, 8, 16, 32, 64, 128(as shown in the figure above); Add all the values corresponding to the DIP digits 1-8 dialed to NO , that is the value of the address code. For example:

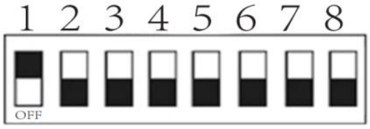


Figure 1

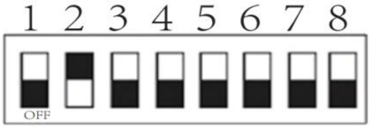


Figure 2

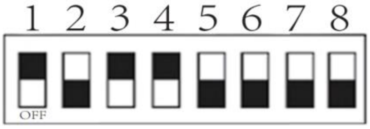


Figure 3

In figure 1, address=1 (Only DIP digit 1 is dialed to ON, and it corresponds to number 1, so the address is 1.)

In figure 2, address=2(Only DIP digit 2 is dialed to ON, and it corresponds to number 2, so the address is 2.)

In figure 3, address=13 (DIP digits 1, 3, 4 are dialed to ON, so the address should be: 1+4+8=13.)

Note: Turn off the transmitter before selecting measurement range by jumper.