Wireless Temperature Receiver
RS485 Relay

▲ Function Introduction

is a transparent transmission device which integrates receiving, transmitting wireless data and RS485 forwarding data. It is a data transmission product with high processing speed and stability. With this communication repeater, users can easily realize network monitoring and management. The product uses low power data transmission module, which has the characteristics of high integration, low power consumption, high sensitivity, long distance, high anti-interference ability and so on. The main function is to transform the RS485 signal hubs into relay signals and transmit them to the background industrial computer.

Our company is also the main drafting unit of energy industry standard NB/T 42086-2016 *Technical requirements for wireless temperature measuring devices.*

▲ Application

This product is mainly used in various outdoor terminal boxes, high and low voltage switchgear cabinets, ring network cabinets, various box substations, circuit breaker mechanism boxes and other related fields used by the power sector. It is used in network with other wireless temperature measurement products of our company.

▲ Working principle

has three RS-485 isolation transceivers, which constitute a two-in-one-out serial concentrator. At the same time, it is equipped with an RF wireless transceiver module, which receives or transmits air wireless signals equipped with our wireless communication protocol. It has an output RS485 interface and two power interfaces. In the receiving mode (conventional), the RS-485 level signal S1 and S 2 ports transmitted from the lower equipment are sent to the background industrial computer through the M port after the calculation centralization to achieve real-time monitoring. The RS485 output interface can be set as Modbus communication. In the transmission mode, RS-485 level signals are transmitted from front-end devices through S1 and S 2 ports. After centralized calculation, they are sent by antenna ports through radio frequency signals, and then transmitted to the next receiving device to achieve the purpose of long-distance transmission. It can also be used as a remote signal relay product. When the effective signal passes through the corresponding channel, the corresponding signal lamp will flicker.

▲ Main Technical Specifications

Working voltage：AC 90～245V or DC 5V±0.2 ；

Environment temperature： -40～＋85℃；

Environment humidity：≤95％RH ；

Output rate of serial port：2400bps、4800bps、9600bps、19200bps，(Adjustable)；

Input rate of serial port：2400bps、4800bps、9600bps、19200bps、38400 bps、57600 bps，(Self-adaption)；

Protection level of shell：IP20；

RF working frequency：431～434MHz；

RF transmitting power：13mW(13dBm)；

RF maximum receiving sensitivity：-110dBm @1Kbps；

RF Wireless mode：Optional；

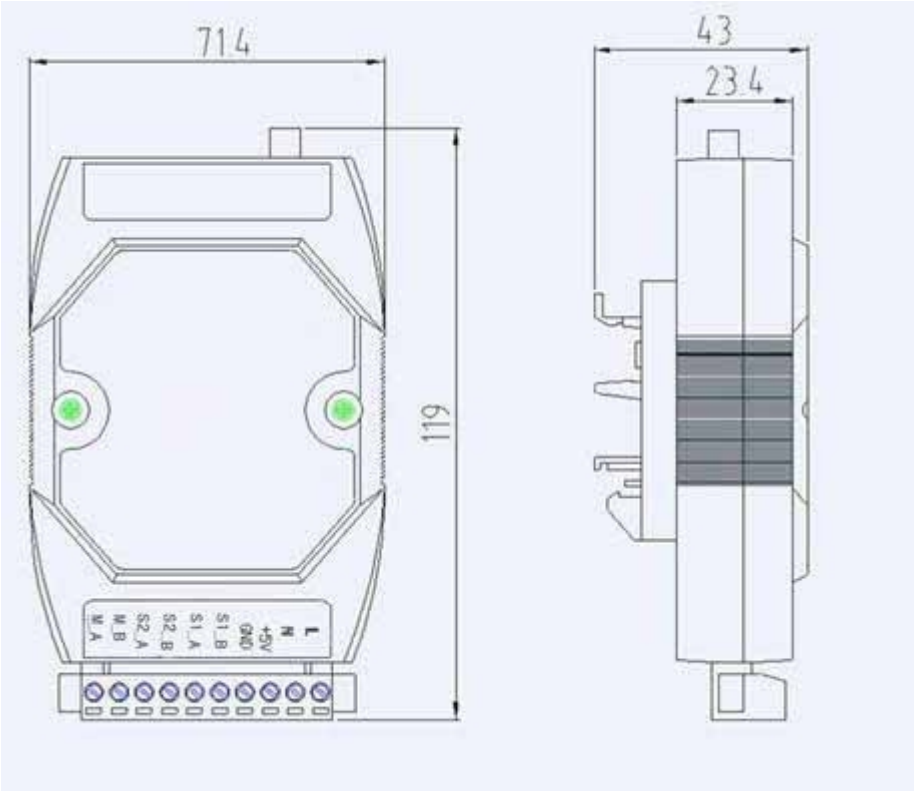
RS485 input port：S1_A 、S1_B ， S2_A、 S2_B ；

Modbus communication/RS485 output: port：M_A、M_B；

Class of pollution：Pollution level of installation site is level 2；

Installation location：Recommended for less exposed locations where there is no significant vibration or shock.

▲ **Dimensions**（Unit：mm）



Installation: Fixed installation of standard 35mm guide rail, according to the actual situation of the site to install.

▲ Wiring

Shown in the figure above.

1. Power：DC 5V power adapter(**+5V、GND**)； AC220V(**L、N**)；

2. RS485 communication interface: S1_A, S1_B, S2_A, S2_B are two RS485 signal input ports; M_A、M_B is RS485 signal output port (where A denotes "+" and B denotes "-");
3. SMA Header for installation of receiving/transmitting antennas.
4. This product is suitable for installation of 35mm guide rail.

▲ Dial Switch

Customers generally do not need to use the dial switch. When technicians use this function, they need to use a small cross screwdriver to open the product shell. Then they can see an 8-segment dial switch. Each dial function is shown as follows：

No.	Function	Up (0)	Down (1)
1	R/S	Receive	Send
2	Protocol	Active upload	MODBUS
3	Wireless mode	**00—10K rate**	01—LRM remote
4		10—LONG	11—200K rate
5	M_A、Bbaud rate	00—2400	01—4800
6		10—9600	11—19200
7	Wireless Frequency	00-431MHz	01-432MHz 10-433MHz
8		11-434MHz	

▲ Communication protocol（active upload by the equipment）14 bytes

```
struct STR_JDWDSEND
{
    Unsigned char  nStart1;          //0x09            (1 byte)
    Unsigned char  nStart2;          //0xaf            (1 byte)
    Unsigned char  nOrder;           //Control word          (1 byte)
    Unsigned long  nID;              //sensor number      (4 bytes) (Low byte in front)
    Signed   short nT;               //read temperature      (2 bytes) (Actual temperature x
10 times)
    unsigned short ntemp;            //Sending serial number      (2 bytes)
    unsigned short nCrc;             //CRC check code       (2 bytes) (Low byte in front)
    unsigned char  nEnd;             //0x16            (1 byte)
};
```

▲ Modbus Agreement

Ⅰ. Device Read Temperature

1、Main device sends commands

Host Send	Number of bytes	Message sent	Remarks
Slave address	1	01	Sent to slave of address 1
Function Code	1	03	Read register
Starting address	2	4000H	Starting address is 0x4000

Data Length	2	N	Read data from N sensors
CRC code	2	xxxx	CRC code calculated from host（Low byte in front）

2、Return from device

Slave response	Number of bytes	Message received	Remarks
Slave address	1	01	From slave 1
Function Code	1	03	Read register
Read Word	1	N*2	Register data（2 bytes per register）
Register data 1	2	0231	Content with address of 4000H memory
Register data 2	2	0233	Content with address of 4001H memory
Register data N	2	0222	Content with address of N memory
CRC code	2	XXXX	CRC code calculated from slave（Low byte in front）

3、Examples of read node temperature

3.1、Messages from host：

01 03 40 00 00 50 50 36

3.2、01 Equipment number (communication address)

03 Function Code

40 00 MB start address of node

00 50 Number of read is 80 nodes

Means this message is to get the node temperature of the first 80

3.3、Company Test Return Data (Example)

01 03 A0 02 31 02 33 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 02 2C 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 02 0E 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 02 01 00 00 00 00 00 00 02 22 1D 8E

3.4、 01 Equipment number (communication address)

03 Function Code

A0 Data length（160）,means 80 nodes

02 31 The first node data (56.1 degrees) corresponding to the first sensor on the product

1D 8E CRC

Ⅱ. Device Write Sensor ID Number

1、Main device sends commands

Host Send	Number of bytes	Message sent	Remarks
Slave address	1	01	Sent to slave of address 1
Function Code	1	10H	Write multipath register
Starting address	2	4000H	Written starting address of the register
Word length of saved data	2	N*2	Word length of saved data（N denotes the number of sensors, and one sensor address takes 2 words）
Byte length of	1	N*4	Byte length of saved data（N denotes the number

saved data			of sensors, and one sensor address takes 4 bytes）
Data saved 1	4	00000001H	Data address 1(No.1 sensor ID)
Data saved 2	4	00000002H	Data address 2(No.2 sensor ID)
Data saved N	4	0000000NH	Data address N(No.N sensor ID)
CRC code	2	XXXX	CRC code calculated from host （Low byte in front）

2、Return from device

Slave response	Number of bytes	Message received	Remarks
Slave address	1	01	From slave 1
Function Code	1	10H	Write multipath register
Starting address	2	4000H	Starting address is 4000H
Word length of saved data	2	N*2	Word length for preserving data
CRC code	2	XXXX	CRC code calculated from slave （Low byte in front）

3、Examples of read node temperature

3.1、Messages from host：

01 10 40 00 00 64 C8 00 00 00 01 00 00 00 02 00 00 00 03 00 00 00 04 ——00 00 00 32 41 4B

3.2、01 Equipment number (communication address)

10 Function Code

40 00 MB start address of node

00 64 The word length of the stored data is 100

C8 The word length of the stored data is 200

00 00 00 01 00 00 00 02 00 00 00 03 00 00 00 04 ——00 00 00 32

data address (sensor ID)is No.1、2、3、4——50

41 4B is CRC check code

3.3、Device Return Data (Example)

01 10 40 00 00 64 D4 22

3.4、 01 Equipment number (communication address)

10 Function Code

40 00 MB start address of node

00 64 The word length of the stored data is 100

D4 22 CRC check code

Note: In Modbus communication, the device keeps the ID number of the sensor continuously. When the device is powered on, the ID number of the sensor should be written to it first.

▲ Communication Address Setting

Format as follows（14 bytes in total）

Frame head			Add	Reserved			Control word		Reserved				Frame tail
0x09	0xAF	0xFF	0xXX	0xXX	0xXX	0xXX	0xFF	0x00	0xXX	0xXX	0xXX	0xXX	0x16

Note: Address range： 0x01~0xFE（1～254）。

▲ CRC algorithm table

```
const unsigned char chCRCHTalbe[] =                                  // CRC high byte value table
{
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 unsigned char chCRCLTalbe[] =                                  // CRC low byte value table
{
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
};

unsigned short int CRC16(unsigned char* pchMsg, int wDataLen)
{
        unsigned char chCRCHi = 0xFF; // high CRC byte initialization
        unsigned char chCRCLo = 0xFF; // low CRC byte initialization
        int wIndex;            // CRC index in the loop

        while (wDataLen--)
        {
                // calculate CRC
                wIndex = chCRCLo ^ *pchMsg++ ;
                chCRCLo = chCRCHi ^ chCRCHTalbe[wIndex];
                chCRCHi = chCRCLTalbe[wIndex] ;
        }
        return ((chCRCHi << 8) | chCRCLo) ;
}
```

▲ Attention

1、Each product includes: one main device, one antenna and an operation manual.

2、On the premise of reading the operation manual carefully, the connection according to the instructions can be electrified