

# Rain sensor manual

## 1. Product overview

The tipping bucket rainfall sensor is used to measure the rainfall in nature, and at the same time convert the rainfall into digital information output in the form of a switch, to meet the needs of information transmission, processing, recording and display. This instrument is designed and produced in strict accordance with the requirements of the national standard GB/T11832-2002 "Tipping Bucket Rain Gauge".

This instrument is a precision double tipping bucket rain gauge. The core component tipping bucket adopts a three-dimensional streamlined design, which makes the tipping bucket more smooth and easy to clean.

The tilt angle of the tipping bucket has been adjusted and locked at the best tilt position when the instrument is shipped from the factory. When installing the instrument, you only need to install the tipping bucket and adjust the level of the base according to the requirements of this manual before it can be put into use, and the tipping bucket tilt angle adjustment screw cannot be adjusted on site.

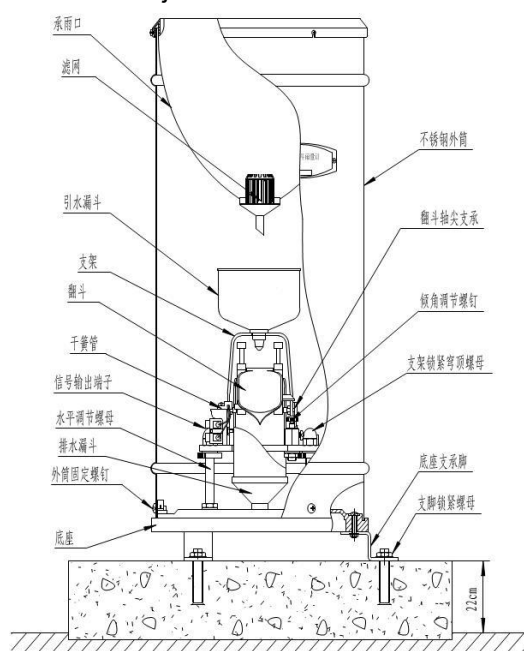


Figure 1

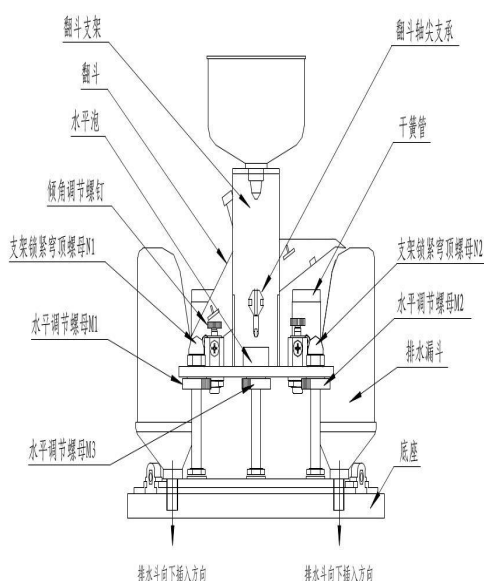


Figure 2

## 2. Scope of application

This product is widely used in weather stations, hydrological stations, agriculture and forestry and other related departments to measure liquid precipitation, precipitation intensity, and precipitation time.

## 3. technical parameters

Rain-bearing mouth size:  $\phi 200$  mm ; sharp cutting edge angle:  $40^{\circ} \sim 45^{\circ}$

Resolution: 0.2mm

Rain intensity range:  $\leq 4$ mm/min (allowable maximum rain intensity 8mm/min)

Measurement accuracy:  $\leq \pm 3\%$

Signaling method: two dry reed pipes or on or off signal output

Working environment: Ambient temperature:  $-10^{\circ}\text{C} \sim 50^{\circ}\text{C}$

Relative humidity;  $< 95\%$  ( $40^{\circ}\text{C}$ )

Size:  $\varnothing 216\text{mm} \times 460\text{mm}$

### RS485/232 communication protocol

The command subset of the MODBUS-RTU protocol is adopted, and the read register command (03) (06) is used.

#### 1. Data transmission method:

8 data bits, 1 stop bit, no parity bit.

#### 2. Data transmission rate:

The default baud rate is 9600bps and cannot be modified. If the user wants to use other baud rates, please declare it when ordering. Support baud rate: 9600bps, 4800bps, 2400bps, 1200bps.

#### 3. Data message format

(1)Function code 0x03---Query the contents of the slave device register

Master message	Correct message from the device
Slave device address (0x01-0xFE 1 byte)	Slave device address (0x01-0xFE 1 byte)
Function code (0x03 1 byte)	Function code (0x03 1 byte)
Start register address (2 bytes)	Number of bytes in data area (2*number of registers 1 byte)
Number of registers (2 bytes)	Data area (register content 2*register number 1 byte)
CRC check code (2 bytes)	CRC check code (2 bytes)

(2)Function code 0x06---set the number of the slave device register

Master message	Correct message from the device
Slave device address (0x01-0xFE 1 byte)	Slave device address (0x01-0xFE 1 byte)
Function code (0x06 1 byte)	Function code (0x06 1 byte)
Start register address (2 bytes)	Number of bytes in data area (2*number of registers 1 byte)
Data written to the register (2* number of registers 1 byte)	Data area ( register content 2*register number 1 byte)
CRC check code (2 bytes)	CRC check code (2 bytes)

Note: 1. CRC check code low bit first, high bit second, register address, register number, data are high bit first, low bit second; 2. The register word length is 16bit (two bytes);

#### 4. Register description and command format

##### 4.1 Parameter data register definition table

Register address (Hex)	Register content	Number of registers	Register status	data range	Defaults
0x002A	Rainfall value	1	Read only	0~20000	-
0x2000	Device No	1	Read and write	1~127	2
0x2001	Baud rate	1	Read and write	9600	9600
0x4000	Equipment type	1	Read only	The rain sensor is fixed at 3	3
0x4001	version number	1	Read only	Sensor version number value	-
0x4002	Clear mode	1	Read and write	0~3	1
0x4006	Storage interval time	1	Read and write	10~600	300
0x4007	Maximum data threshold	1	Read and write	100~60000	20000

**Note: The green ones are setting registers. If you need to set, please read the instructions carefully or modify them under the guidance of technicians!**

##### 4.2 Description of common address definitions

###### 1 ) Rainfall value ( 0x002A )

The unit is 0.1mm . That is, if the readout value is 100 (or 0x64 ), the rainfall value is 10.0mm

###### 2 ) Device number ( 0x2000 )

Range: 1~127 . After modifying the device number, restart to take effect.

###### 3 ) Clear mode ( 0x4002 )

The definition of the value in the clear mode address:

###### **0 value is reset to zero after power failure:**

In this mode, the rainfall value will be reset to zero and re-accumulate after the sensor is powered off and restarted. The maximum accumulation is 32767 and the cap remains unchanged

###### **1 value is cleared by overflow:**

In this mode, the rainfall value reaches the set overflow value and clears and re-accumulates the value.

###### **The value of 2 is read and cleared:**

In this mode, the rainfall value will be automatically cleared and re-accumulated as long as it is read. If the rainfall value has not been read since power-on, the maximum accumulation will be 32767 and the top will remain unchanged.

**3 value is written and cleared:**

In this mode, the maximum accumulation of rainfall value is 32467 and the cap remains unchanged. When clearing is required, only 0 (or any number) can be written to address 0x002A .

**It should be noted that except for the power-off reset mode, other modes have the power-off save function, and the save interval can be set. If the power is cut off during the saving time interval, the rainfall data for this time period will be lost.**

**4 ) Storage interval time ( 0x4006 )**

Unit: seconds. The range is 10~600 seconds.

In overflow clear mode, read clear mode and write clear mode, the sensor saves the current rainfall data once according to the storage interval.

**5 ) Maximum data threshold ( 0x4007 )**

Unit: mm . The range is 100~60000 (that is, 10.0~6000.0mm ).

The maximum accumulated value of the sensor rainfall value. In the overflow clear mode, the rainfall value is automatically cleared when the value is greater than or equal to this value.

**6 ) Digital filter coefficient ( 0xF011 )**

Setting range 0~65535

Eliminate the input interference coefficient, generally keep the factory value, please do not set it randomly. So as not to cause unnecessary malfunctions.

**Note: Except for the address 0x002A , all others have been configured by default at the factory. Please do not modify it at will without special circumstances, otherwise the sensor will work abnormally. If you need to modify it, please contact a technician.**

**4.3 Command examples:**

In the command, the address byte of all registers, the number of bytes of the register, and the high byte of the data byte are in front and the low byte is in the back; the low byte of CRC check code is in the front and the high byte is in the back;

**1 ) Read the sensor value**

Slave device address 02 , baud rate is 9600 , N,8,1

Host sends:

Slave address	function code	Starting address	register	Number registers	of	CRC-L	CRC-H
---------------	---------------	------------------	----------	------------------	----	-------	-------

0x02	0x03	0x00	0x2A	0x00	0x01	0xA5	0xF1
------	------	------	------	------	------	------	------

Response from device:

Slave address	function code	Number of bytes in data area	Register data		CRC-L	CRC-H
0x02	0x03	0x02	0x00	0x00	0xFC	0x44

## 2 ) Modify the device number

Slave address 02 number, revised to 03 Hao

Slave address	function code	Starting register address		Modified data		CRC-L	CRC-H
0x02	0x06	0x20	0x00	0x00	0x03	0xc2	0x38

Slave address	function code	Starting register address		Modified data		CRC-L	CRC-H
0x02	0x06	0x20	0x01	0x00	0x60	0xD3	0xD1

## 3 ) Modify the baud rate to 9600

The baud rate is an integer multiple of 100 , for example, the baud rate of 9600 should be set to 96 , which is 0x60

**Note: Modify the baud rate and device address to take effect after power off and restart.**

## 5. Wiring instructions

Line type	Common colors	Alternate color
Power cord color	Red (+) , black line (-)	
Signal wire color	Yellow ( A+ ), blue line ( B- )	

## Output signal and rainfall corresponding formula

Switch type: switch count \*0.2mm=rainfall

Other types:

Type 485 0~2000mm

4~20mA corresponds to 0~2000mm

0.4~2V corresponds to 0~2000mm