YL01
Double tipping bucket rain gauge
User Manual
Type 485



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1. product description

1.1product description

This instrument is a primary precipitation measurement instrument, and its performance meets the requirements of the national standard GB/T 21978.2-2014 "Requirements for Precipitation Observation".

The core component of the instrument, the tipping bucket, adopts a three-dimensional streamlined design and is made of stainless steel, which makes the tipping bucket more smooth, and has the functions of self-cleaning dust and easy cleaning.

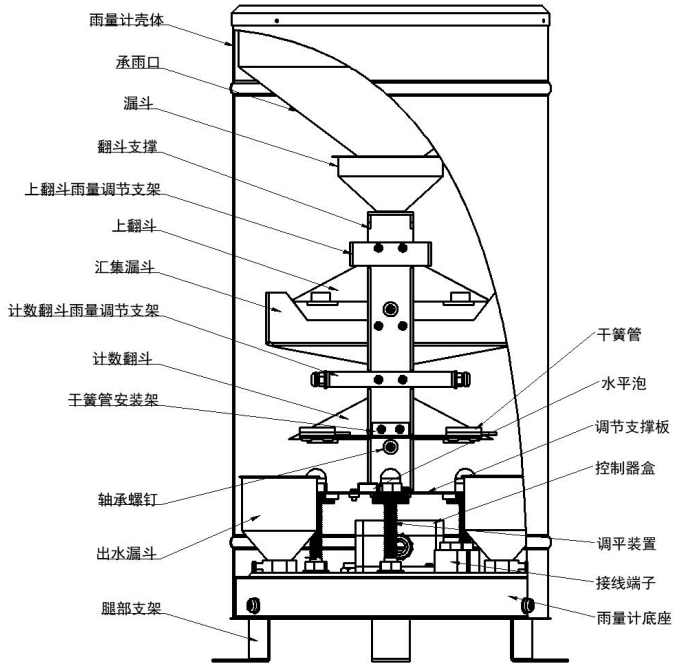
1.2Structural features

As shown in the figure, this instrument is composed of rain gauge housing, rain opening, funnel, tipping bucket support, upper tipping bucket rain adjustment bracket, upper tipping bucket, collecting funnel, counting tipping bucket rain adjustment bracket, counting tipping bucket, reed tube mounting frame, bearing It is composed of screws, water outlet funnel, leg support, dry reed pipe, horizontal bubble, adjustment support plate, control box, leveling device, terminal block, rain gauge base, etc. Among them, a tipping bucket bearing, a round horizontal bubble and a signal output terminal are installed on the rain gauge base. Unlike other tipping bucket rain gauges, the tipping bucket bushing of this instrument is an integrated positioning structure, and the tipping bucket is installed in the bearing through the tipping bucket shaft. The internal structure of the instrument is assembled when it leaves the factory, and there is no need to perform on-site installation of the internal structure. Installation has brought convenience.

The tipping bucket of this instrument is a three-dimensional streamlined design, and is designed with a drooping curved diversion tip, which has a beautiful and smooth appearance, better turning performance and easy cleaning and maintenance.

The tipping bucket of this instrument is equipped with constant magnetic steel, and the reed switch bracket is equipped with a reed switch. When the instrument leaves the factory, both the magnetic steel and the reed switch have been adjusted at an appropriate coupling distance, so that the output signal of the instrument and the number of flipping buckets have a definite ratio. relationship.

When the instrument leaves the factory, the tilt angle adjustment screw of the tipping bucket has been locked at the position of the best tilt angle base point and the tilt angle screw has been sealed with red paint. When installing the instrument on site, the user only needs to adjust the horizontal bubble according to the relevant requirements of this manual. It can be put into use when it is located in the center, and there is no need to adjust the tilt angle of the tipping bucket on the spot.



1.3Main Specifications

Rain-bearing caliber: φ200mm; sharp angle of cutting edge: 40°～45°

Resolution: 0.2mm/0.1mm

Measurement error: ≤±2%, reaching the national accuracy level I standard (customizable accuracy ≤±1%, better than the national accuracy level I standard)

Rain intensity range: 0mm～4mm/min (allowable maximum rain intensity 8mm/min)

Communication method: 485 communication (standard MODBUS-RTU protocol)

Power supply range: 4.5~30V Maximum power consumption: 0.24W

working environment:

Ambient temperature: 0～50℃ Relative humidity: <95%(40℃)

1.4product model

Note: Please purchase the supporting sheet separately

YL01-				Rain gauge
	N01-			485 signal output (standard MODBUS-RTU protocol)
		6S-		Double dump
		6SP		All stainless steel double tipping bucket
			02	0.2mm Resolution
			01	0.1mm Resolution

2. Equipment installation instructions

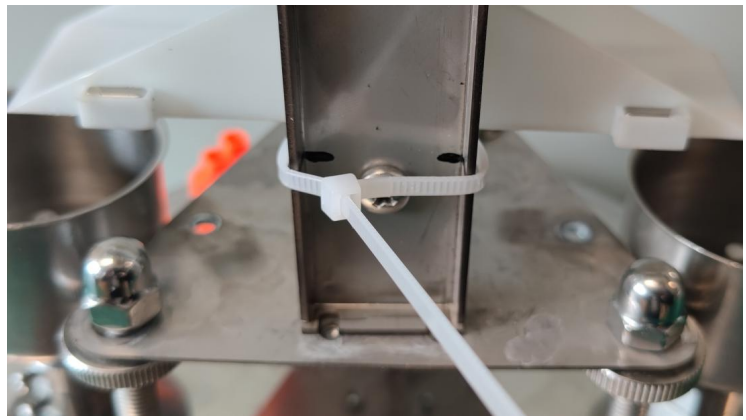
2.1 Inspection before equipment installation

(1) Take the instrument out of the packing box, check carefully against the packing list in the instruction manual, and check whether the equipment accessories are complete.

(2) Carefully read the product instruction manual and product qualification certificate.

(3) Check whether the appearance of the instrument is damaged, especially whether the tipping bucket is intact, and pay attention to properly placing the tipping bucket to prevent damage to the tip of the tipping bucket shaft and the arc-shaped tip of the tipping bucket at both ends, and do not touch the inner wall of the tipping bucket with your fingers. Avoid fouling the tipping bucket to damage the accuracy of the instrument.

(4) Unscrew the three screws at the bottom of the equipment, take the stainless steel outer tube, cut off the two cable ties that fix the tipping bucket, and then install the outer tube, and the preparation is complete.



2.2 Outdoor installation and debugging

2.2.1 Production and installation base

When installing the outdoor ground and roof, the cement installation foundation should be made according to the dimensions and requirements of Figure 2, and the plane of the cement foundation should be horizontal. The size of the cement installation foundation is generally a 40cm×40cm square base with a height of not less than 30cm or a circular base with a diameter of 40cm. It is required that the distance between the height of the rain-bearing mouth of the instrument and the ground level is 70cm, and it is ensured that no shelters higher than the rain-bearing mouth of the instrument are allowed within 3 to 5 meters around the mouth of the instrument.

2.2.2Install fixed instruments and adjust the level of the rain-bearing outlet

Drill three mounting holes with a depth of 8-10cm in diameter 10 on the cement foundation according to the dimensions in Figure 2, place the expansion bolts in the mounting holes, and lock them with lock nuts, and then install the instrument base on the three height-adjusting support nuts. Adjust the height of the support nut and measure whether the ring mouth is in a

horizontal state with a level, and finally fix the instrument with the upper lock.

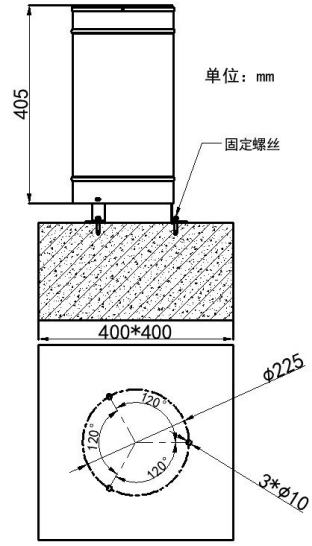


figure 2

2.2.3Adjust the rain gauge level

Remove the stainless steel outer cylinder, and keep the dome nut in the unlocked state as shown in Figure 3, just use two hands to adjust the height of the nut in the red circle, so that the bubble in the horizontal bubble is at the center. Then tighten the dome nut, check and adjust again whether the bubble of the horizontal bubble on the tipping bucket bracket is in the middle position.



image 3

2.4Wiring instructions

Thread color	Description	Thread color	Description
Brown wire	V+	Yellow line	485A
black line	V-	blue line	485B

3.Configuration software installation and use

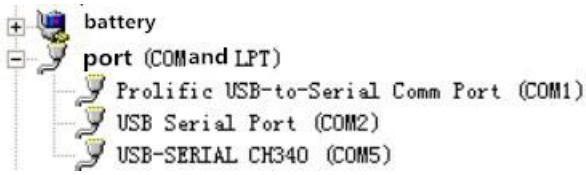
3.1Software selection

Open the data package, select "Debug software" --- "485 parameter configuration software", find 

Just open it.

3.2 parameter settings

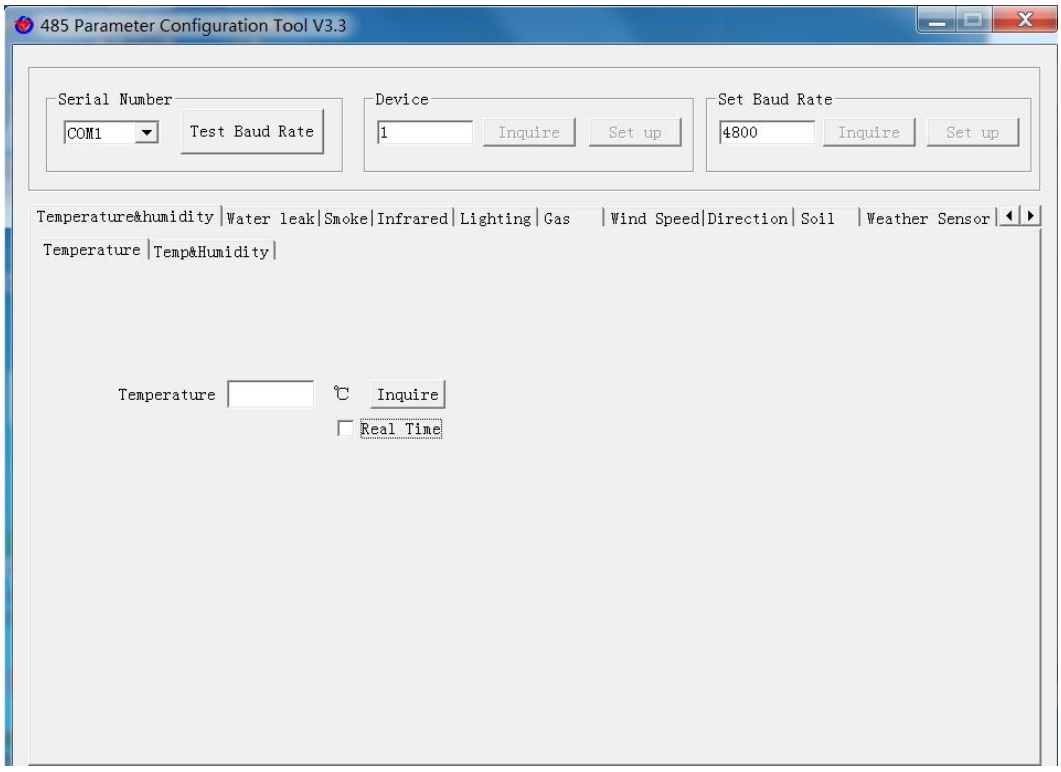
①. Select the correct COM port (check the COM port in "My Computer—Properties—Device Manager—Port"). The following figure lists the driver names of several different 485 converters.



② Connect only one device alone and power it on, click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

③. Modify the address and baud rate according to the needs of use, and at the same time, you can query the current function status of the device.

④. If the test is unsuccessful, please recheck the equipment wiring and 485 driver installation.



4.letter of agreement

4.1 Basic communication parameters

Code	8-bit binary
Data bit	8-bit
Parity bit	No
Stop bit	1 person
Error checking	CRC（Redundant cyclic code）
Baud rate	2400bit/s, 4800bit/s, 9600 bit/s can be set, the factory default is 4800bit/s

4.2 Data frame format definition

Using Modbus-RTU communication protocol, the format is as follows:

Initial structure ≥ 4 bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

Time to end structure ≥ 4 bytes

Address code: the address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: the command function instruction issued by the host, the transmitter can use the function code 0x03 (read register data) and 0x06 (write register data).

Data area: The data area is the specific communication data, pay attention to the high byte of the 16bits data first!

CRC code: two-byte check code.

Host query frame structure:

address code	function code	Register start address	Register length	Check code low bit	High bit of check code
1byte	1byte	2byte	2byte	1byte	1byte

Slave machine response frame structure:

address code	function code	Number of valid bytes	Data area	Second data area	Nth data area	Check code
1byte	1byte	1byte	2byte	2byte	2byte	2byte

4.3Register address

Register address	content	Operation (hexadecimal)	Scope content and definition
0000H	Rainfall value	03/06	The rainfall value is 10 times larger than the actual value
07D0H	Device address	03/06	1~254（Factory default 1）
07D1H	Device baud rate	03/06	0 means 2400 1 means 4800 2 means 9600

4.4Communication protocol example and explanation

4.4.1Query the current rainfall value

Interrogation frame:

address code	function code	Start register	Data length	Check code low bit	High bit of check code
0x01	0x03	0x00 0x00	0x00 0x01	0x84	0x0A

Reply frame:

address code	function code	Returns the number of valid bytes	Rainfall value	Check code low bit	High bit of check code
0x01	0x03	0x02	0x00 0x0A	0x38	0x43

Current rainfall value: (Uploaded value is expanded by 10 times)

000A (hexadecimal system) = 10 (decimal system) → rainfall value: 1.0mm

4.4.2Clear rainfall data

Interrogation frame:

address code	function code	Start register	Clear command	Check code low bit	High bit of check code
0x01	0x06	0x00 0x00	0x00 0x5A	0X09	0XF1

Reply frame:

address code	function code	Start register	Clear command	Check code low bit	High bit of check code
0x01	0x06	0x00 0x00	0x00 0x5A	0X09	0XF1

4.4.3Modify current address

Inquiry frame: (If the current address is 01, the address needs to be modified to 02)

address code	function code	starting address	Modify value	Check code low bit	High bit of check cod

					e
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

Reply frame:

address code	function code	starting address	Modify value	Check code low bit	High bit of check code
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

4.4.4Modify the current baud rate

Inquiry frame: (If the current baud rate is 4800, modify it to 9600)

address code	function code	starting address	Modify value	Check code low bit	High bit of check code
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

应答帧：

address code	function code	starting address	Modify value	Check code low bit	High bit of check code
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

4.4.5look for the address

When the user forgets the address, the following function codes can be used to query the address.Interrogation frame:

address code	function code	starting address	Data length	Check code low bit	High bit of check code
0xFF	0x03	0x07 0xD0	0x00 0x01	0x91	0x59

Reply frame

address code	function code	Returns the number of valid bytes	address	Check code low bit	High bit of check code
0xFF	0x03	0x02	0x00 0x01	0x50	0x50

The address code read is the real address of the device: 01

5. maintenance

5.1Daily maintenance

The instrument has been outdoors for a long time and the operating environment is very harsh. Therefore, the inner wall of the rain-bearing port of the instrument should be wiped with a

soft cloth frequently to keep the rain-bearing port clean. If there are foreign objects such as leaves in the rain-bearing port, it should be cleaned up in time to keep the waterway unblocked. When the instrument is not used for a long time, a cover should be placed on the ring mouth of the instrument to protect the rain-bearing mouth;

The instrument must be cleaned up once a month for long-term work, and must be cleaned up once every three months;

5.2Tipping bucket cleaning

The tipping bucket is a key component of the instrument, which directly affects the measurement accuracy of the instrument. Over time, a little dust or oil will be deposited on the inner wall of the tipping bucket. Therefore, the tipping bucket should be cleaned. When cleaning, the inner wall of the tipping bucket can be repeatedly rinsed with clean water or gently brushed with a degreasing brush. It is strictly forbidden to scrub the inner wall of the tipping bucket with hands or other objects.

6. Common problems and solutions

The table in this document lists the general failure phenomena, causes and troubleshooting methods that may occur in the instrument.

Central station manifestation	Rain sensor failure	Solution
Can't get the number when raining	It means that the rain sensor has no signal output or the transmission line is faulty Reed switch failure The distance between the magnet and the reed pipe is too far The welding wire falls off or the signal wire is broken or the signal wire is connected reversely Tipping bucket stuck Instrument blockage	Check the next station replace Adjustment repair exclude Clear
When it rains, the amount of rainfall received is much different from that of the measured rain gauge	Rainfall sensor tipping bucket flipping base point is out of adjustment, but this error generally does not exceed ±10% The position of the magnet and the reed pipe is not good, resulting in good times and bad times, so that some signals are missed	Re-titration adjustment base point Adjust the distance The objective situation is like this, the instrument is

		trouble-free
The central station keeps coming in the number of rainfall, but the actual situation did not rain	Check whether the socket is immersed in water, this phenomenon often occurs after heavy rain	Treat water ingress and reseal

Note: In the above table, the failure phenomena listed are not necessarily all the faults of the rain gauge itself. After checking the fault of the instrument itself and removing the fault, you should also check whether the transmission line of the instrument, the data acquisition device, and other equipment are faulty, and one by one. Be eliminated and resolved.