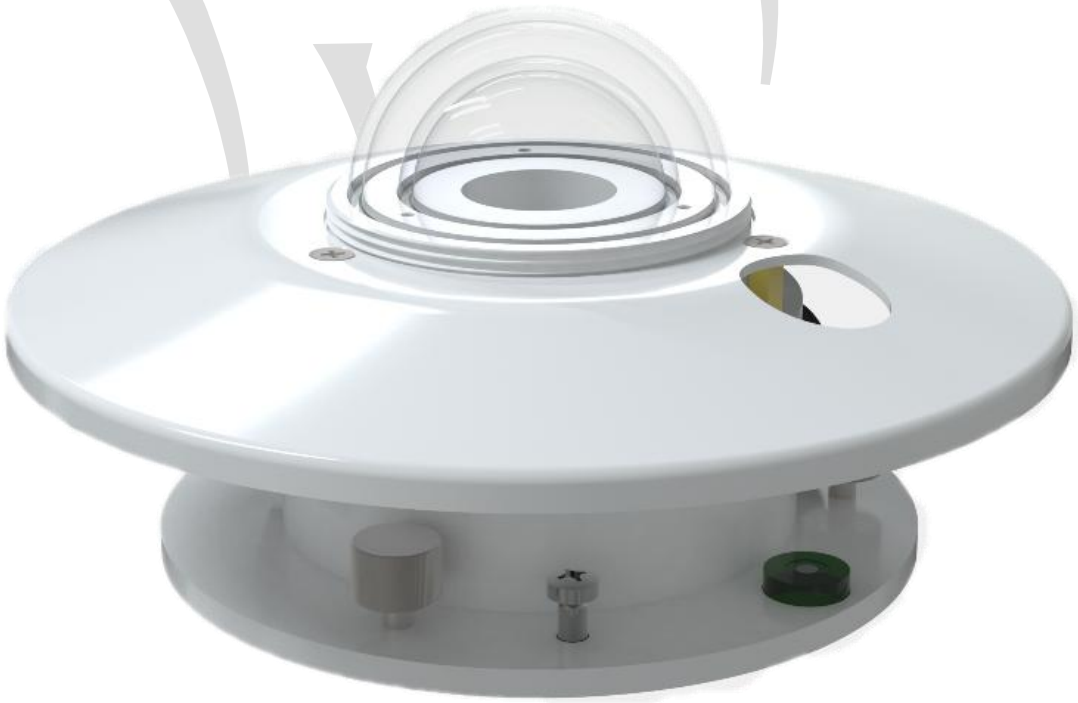
RS-TBQ-N01-AL

Total solar radiation transmitter User Manual Type 485

Document version: V1.0



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1. product description

The RS-TRA-N01-AL total solar radiation transmitter adopts the thermoelectric principle and can be used to measure solar radiation with a spectral range of 0.3~3 μm. The sensing element adopts a wire-wound electroplating thermopile, and the sensing surface is a black layer with high absorptivity. Using the thermal effect of radiation, it absorbs solar radiation and converts it into thermoelectromotive force. It also has a temperature compensation function, which can accurately measure solar radiation. The double-layer glass cover above the sensing surface can not only reduce the influence of air convection on the device, but also block the radiation of the cover itself. And add a radiation shield to measure scattered radiation.

The product adopts the standard Modbus-RTU 485 communication protocol, which can directly read the current total solar radiation value, and the wiring method is simple. The appearance is beautiful, and the installation space is small. Products are widely used in solar energy utilization, meteorology, agriculture, building materials aging and air pollution and other departments to measure solar radiation energy.

1.1Features

■Using pyroelectric sensor elements, high measurement accuracy.

■The light transmittance is as high as 95%, and the transparent double-layer glass cover has good sensitivity and special surface treatment to prevent dust adsorption

■The spectral range reaches 0.3~3 μm

■Short response time, small error and temperature compensation, more accurate measurement within the range

1.2Technical Parameters

Power supply range	10V～30V DC
output method	485 (standard Modbus-RTU protocol)
Power consumption	0.8W
Operating temperature	-40℃~60℃
Working humidity	0%~100%RH
Sensitivity	7～14 μV・W-1・m2
Internal resistance	About 300Ω
Response time (99%)	≤30s
Non-linear error	≤±3%

Directional Corresponding Error	≤±30W/m²
Temperature response error	≤±8% (-40℃～+40℃)
Spectral range	0.3~3μm
Measuring range	0-2000W/m²
Resolution	1W/m²
Precision	±3%
Yearly stability	≤±3%
Spectral selectivity	≤±10%
Cosine response error	≤±5%
Tilt response error	≤±2%

1.3product model

RS-				Company code
	TBQ-			Total solar radiation transmitter
		N01-		485 output (standard Modbus-RTU)
			AL	Aluminum shell

2.Product installation and wiring

2.1Check before installation

■One set of total solar radiation transmitter equipment

■A pack of mounting screws

■One signal line

■One verification certificate

■One certificate of conformity

■One warranty card

2.2Installation method and function indication

1. Make sure to install the bracket, and the radiation sensor is parallel to the ground (leveling can be done through the leveling knob)

2. Use screws to pass through the mounting holes on the sensor to fix the sensor on the mounting bracket

3. After installation, remove the protective cover

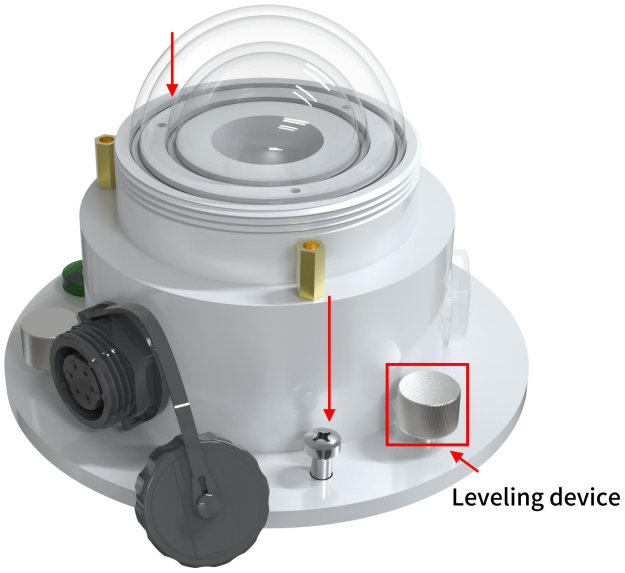
4. Please pay attention not to damage the glass cover during the installation process, so as not to affect the measurement accuracy

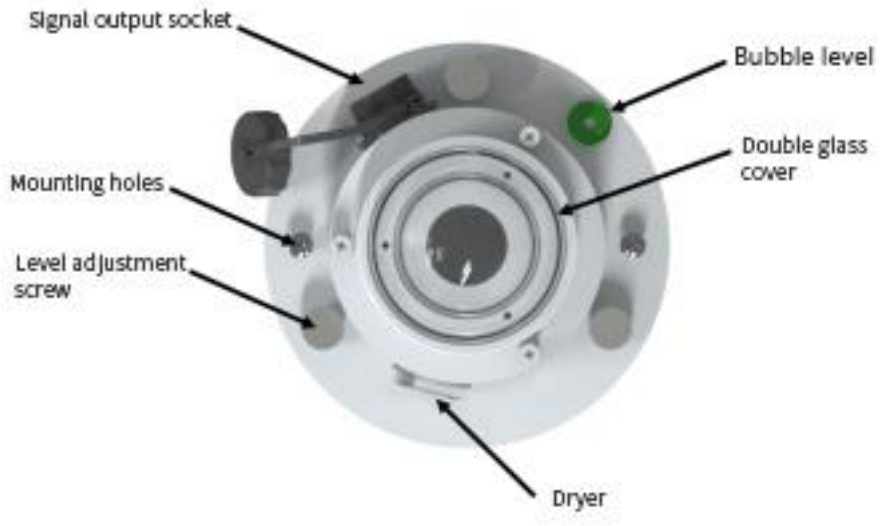
5. The installation location should be an open place all around and without any obstructions.

Note: The picture shows the installation method clearly, and the radiation shield is not

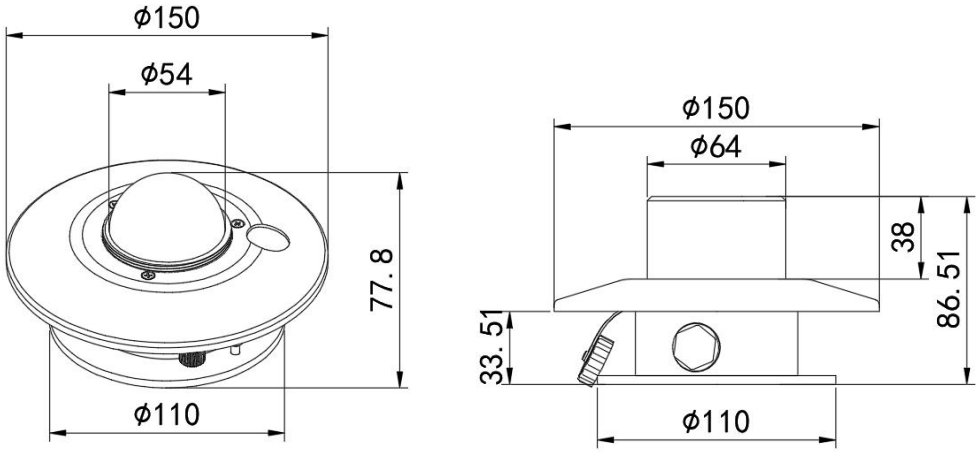
shown in the picture.

Please read the fifth and sixth parts for specific maintenance and precautions





2.3Equipment size



2.4Wiring

	Thread color	Description
Electricity source	brown	Positive power supply (10~30V DC)
	black	Power negative
through letter	yellow	485-A
	blue	485-B

3.Configuration software installation and use

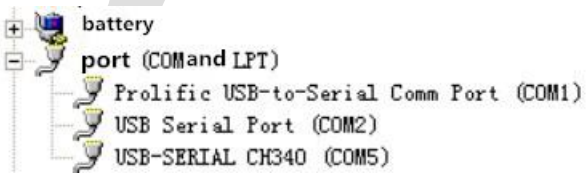
3.1 Software selection

Open the data package, select "Debugging Software" --- "485 Parameter Configuration Software", find 

and open it.

3.2 parameter settings

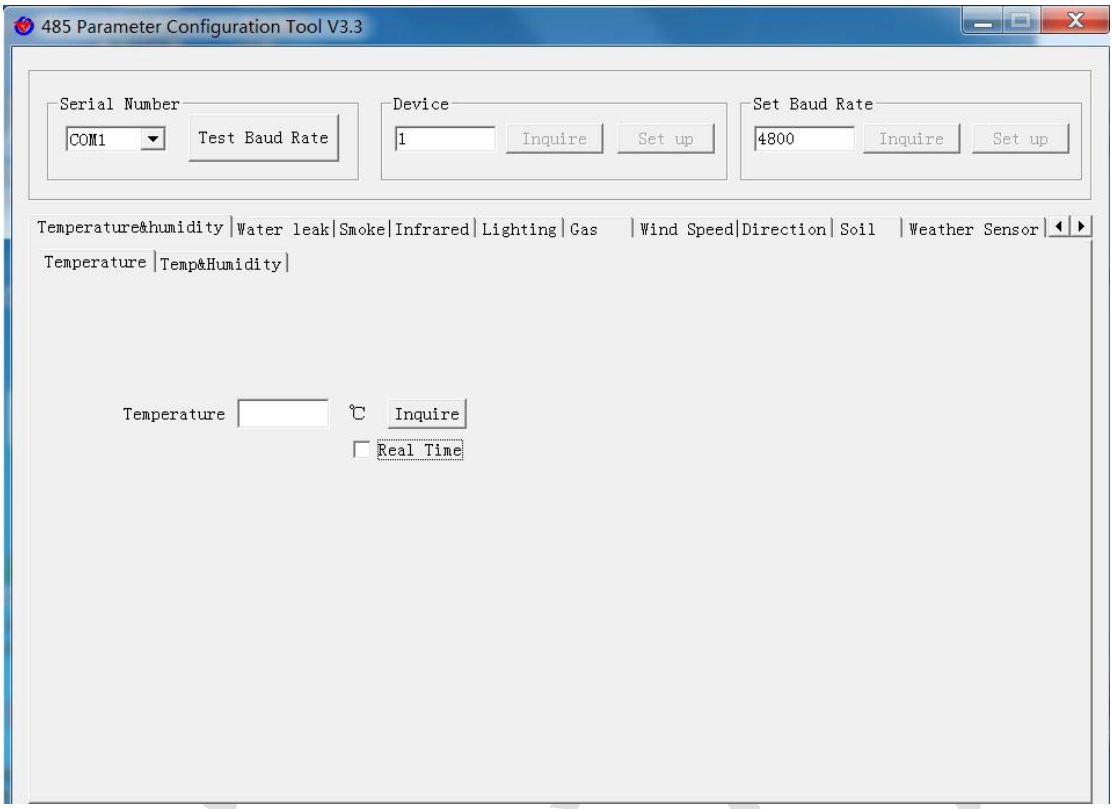
①. Select the correct COM port (check the COM port in "My Computer — Properties — Device Manager—Port"). The following figure lists the driver names of several different 485 converters.



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 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 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	Check code high bit
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave response frame structure:

address code	function code	Effective number of bytes	Data area	Second data area	Nth data area	Check code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

4.3Register address

Register address	content	Operation (hexadecimal)	Scope and definition
0000 H	Total solar radiation	03	actual value
0052H	Deviation	03/06	Total solar radiation deviation value (0~2000)
07D0 H	Device address	03/06	1~254 (factory default 1)
07D1H	Device baud rate	03/06	0 means 2400 1 is 4800 2 is 9600

4.4 Communication protocol example and explanation

4.4.1Read the current solar radiation value

Inquiry frame

address	function c	initial add	Data lengt	Check co	Check c

code	ode	ress	h	de low bit	ode high bit
0x01	0x03	0x00 0x00	0x00 0x01	0x84	0x0A

Response frame

Addres s code	Function co de	Returns the numb er of valid bytes	Solar radiatio n value	Check code l ow bit	Check code hi gh bit
0x01	0x03	0x02	0x00 0x64	0x9B	0xAF

Total solar radiation value:

0064 (hexadecimal) =100=> total solar radiation value=100W/㎡

4.4.2Write deviation value

Interrogation frame

Address cod e	Function code	Register addres s	Modified value	Check code lo w bit	Check code high bit
0x01	0x06	0x00 0x52	0x00 0x0A	0xA8	0x1C

Reply frame

Address cod e	Function code	Register addres s	Modified value	Check code lo w bit	Check code high bit
0x01	0x06	0x00 0x52	0x00 0x0A	0xA8	0x1C

Write the current total solar radiation deviation value

000A (hexadecimal) =10=> Total solar radiation deviation value = 10W/㎡ The deviation value is 10W/㎡

4.4.3Modify current address

Inquiry frame (modify the current address to 0x02)

Address cod e	Function code	Start address	Modified value	Check code lo w bit	Check code high bit
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

Reply frame

Address cod e	Function code	Start address	Modified value	Check code lo w bit	Check code high bit
0x01	0x06	0x07 0xD0	0x00 0x02	0x08	0x86

4.4.4Modify the current baud rate

Inquiry frame (assuming to modify the baud rate to 9600)v

Address cod e	Function code	Start address	Modified value	Check code lo w bit	Check code high bit
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

Reply frame

Address code	Function code	Start address	Modified value	Check code low bit	Check code high bit
0x01	0x06	0x07 0xD1	0x00 0x02	0x59	0x46

4.4.5Query current address

Interrogation frame:

Address code	Function code	Start address	Data length	Check code low bit	Check code high bit
0xFF	0x03	0x07 0xD0	0x00 0x01	0x91	0x59

Reply frame

Address code	Function code	Return valid number of bytes	Address	Check code low bit	Check code high bit
0xFF	0x03	0x02	0x00 0x01	0x50	0x50

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

5.Precautions and troubleshooting

Precautions:

1. When the customer receives the product, please confirm the product model, etc.

2. Do not wire with power on, and power on can only be done after the wiring is checked and correct

3. The sensor is a precision device, please do not disassemble the glass cover at will

Troubleshooting:

1. If the read value shows 0, check whether the protective cover of the product is removed and whether there is sunlight

2. Please check if the 485 wiring is correct

3. Check whether the power supply meets the markings

4. Equipment damage

6.Product Maintenance

1. The glass cover should be kept smooth and clean, often wipe it with a soft cloth or fur

2. There should be no water in the glass cover. If it encounters heavy rain, snow, ice and other long-term weather, it is recommended to cover it

3. It is recommended to check whether the desiccant in the dryer has become damp at regular intervals. The specific manifestation is that the orange turns into a dark color. If this happens, replace the desiccant in time, or remove the desiccant to dry and put it back in use

4. The equipment has been used for more than two years, and the sensitivity must be re-calibrated by the manufacturer or measurement department

7. contact details

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8. Document History

V1.0 document creation