

Illuminance Sensor

Instruction Manual

"Wang"-Shaped Shell (RS485)

Illuminance Sensor ('Wang'-Shaped Shell)

1. Product Introduction

1.1 Product Overview

This module is a product capable of measuring ambient temperature and air humidity. It acquires data quickly, in real time and with high accuracy, and transmits it.

The module contains a basic illuminance sensor and can be used in smart greenhouses, warehouse monitoring, indoor environment monitoring for breeding/livestock, etc. The module provides the acquired data to the user via the RS485 interface using the MODBUS protocol, and the data can be displayed on a host computer in a quick and convenient way. The serial baud rate defaults to 9600 and the device address defaults to 01.

1.2 Features

- Measures air temperature and air humidity;
- Serial baud rate defaults to 9600 and can be changed via 485 commands;
- Serial port supports full-duplex and half-duplex communication, with automatic RS485 transmit/receive switching;
- Device address defaults to 0x01 and can be changed via 485 commands.

1.3 Main Parameters

Parameter	Value
DC power supply	9–24 VDC
Average power consumption	0.12 W
Illuminance measurement range	0~200000/65535 lux
Output signal	RS485 (Modbus protocol)
Operating range	-40 °C ~ 80 °C, 0–80 %RH
Resolution	1 lux
Accuracy	±5%

2. Hardware Connection

2.1 Pre-Installation Check — Packing List

- Sensor × 1
- 12 V waterproof power supply × 1 (optional)
- USB-to-485 converter × 1 (optional)

2.2 Interface Description

Wide-range power input: any voltage from 9 to 24 V is acceptable. When wiring the 485 signal lines, make sure the A/B two wires are not reversed; device addresses on the same bus must not conflict with each other.

2.3 Wiring Description

Function	Wire Color	Description
Power	Red	Power positive (9–24 VDC)
	Black / Blue	Power negative
Communication	Yellow	485-A
	White	485-B

Note: Do not wire the terminals in the wrong order — incorrect wiring may burn out the device.

3. Communication Protocol

This module communicates with external devices using the standard ModBus communication protocol, compliant with the Chinese national standard GB/T 19582.1-2008 'Industrial automation networks based on Modbus — specifications'. It adopts the ModBus RTU protocol: it receives and parses frame data on the bus, and replies with data according to the parsed result.

The Modbus frame on a serial link is structured as follows:

Address	Function Code	Data	CRC Check
1 byte	1 byte	N bytes	2 bytes

This module supports register read and register write operations, using the following function codes: **0x03**: read holding registers; **0x06**: write a single register.

4. Protocol Details

4.1 Basic Communication Parameters

Item	Value
Encoding	8-bit binary
Data bits	8
Parity bit	None
Stop bit	1
Error check	CRC-16 (Modbus)
Baud rate	Default 9600 bps; configurable: 2400/4800/9600/19200/38400/57600/115200

4.2 Read Holding Registers

Function code 0x03 is used to read the values of holding registers. The command frame and response frame follow the formats below, where the CRC check value is sent with the low byte first and the high

byte last.

Command frame:

Address	Function Code	Starting Register Address	Number of Registers	CRC Check
1 byte 0x01–0xFE	1 byte 0x03	2 bytes	2 bytes	2 bytes CRC16

Response frame:

Address	Function Code	Data Length	Data	CRC Check
1 byte 0x01–0xFE	1 byte 0x03	1 byte	N bytes	2 bytes CRC16

The following are example MODBUS commands for this module. The examples use the default device address 0x01; after the user resets the device address, the command data must be re-packed using the new address.

4.2.1 Read the Device Address

Host sends: 41 54 (ASCII: AT)

Character sent by host	0x41 (A)	0x54 (T)
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Slave replies: 49 44 3D 30 30 31 (ASCII: ID=001, i.e. 0x01 is the device address)

Slave reply	0x49 (I)	0x44 (D)	0x3D (=)	0x30 (0)	0x30 (0)	0x31 (1)
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4.2.2 Illuminance Value

Command frame: 01 03 00 03 00 02 34 0B

Address	Function Code	Starting Register Address	Number of Registers	CRC Check
0x01	0x03	0x00 0x03	0x00 0x02	0x34 0x0B

Response frame: 01 03 04 00 00 03 12 7A CE

Address	Function Code	Number of Data Bytes	Data	CRC Check
0x01	0x03	0x04	0x00 0x00 0x03 0x12	0x7A 0xCE

Illuminance = 0x00000312 ⇒ 786 lux

4.3 Write Holding Registers

4.3.1 Modify the Device Address (change device address from 0x01 to 0x02)

Command frame: 01 06 00 0A 00 02 28 09

Address	Function Code	Starting Register Address	New Address	CRC Check
0x01	0x06	0x00 0x0A	0x00 0x02	0x28 0x09

Response frame: 01 06 00 0A 00 02 28 09

Address	Function Code	Starting Register Address	New Address	CRC Check
0x01	0x06	0x00 0x0A	0x00 0x02	0x28 0x09

4.3.2 Modify the Baud Rate (change 9600 to 115200; see the appendix for the decimal-to-hexadecimal baud rate table)

Command frame: 01 06 00 64 00 06 48 17

Address	Function Code	Starting Register Address	Baud Rate	CRC Check
0x01	0x06	0x00 0x64	0x00 0x06	0x48 0x17

Response frame: 01 06 00 64 00 06 48 17

Address	Function Code	Starting Register Address	Baud Rate	CRC Check
0x01	0x06	0x00 0x64	0x00 0x06	0x48 0x17

5. Common Problems and Solutions

Possible causes of a failed connection with the sensor assistant:

- 1) The computer has multiple COM ports and the wrong one was selected.
- 2) The device address is wrong, or there are devices with duplicate addresses (factory default for all devices is 1).
- 3) The baud rate, parity, data bits or stop bits are wrong.
- 4) The host polling interval and the response waiting time are too short — they should be set to 200 ms or more.
- 5) The 485 bus is broken, or the A and B wires are reversed.
- 6) Check whether the 12 V power supply is normal. If there are too many devices or the wiring is too long, power should be supplied nearby.
- 7) The USB-to-485 driver is not installed or is corrupted.
- 8) The device is damaged.

Appendix: Baud Rate Mapping Table

Decimal	Hexadecimal
2400	00 00
4800	00 01
9600	00 02

19200	00 03
38400	00 04
57600	00 05
115200	00 06