User Manual

WISE-S100

ADVANTECH

Enabling an Intelligent Planet

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Product Warranty (2 years)

Advantech warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which have been subject to misuse, abuse, accident or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages you get when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain an RMA (return merchandise authorization) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.
5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

Part No. 2003S10000 Edition 1

Printed in China September 2020

Declaration of Conformity

CE Declaration of Conformity

This product has passed the CE test for environmental specifications. Test conditions for passing included the equipment being operated within an industrial enclosure. In order to protect the product from being damaged by ESD (Electrostatic Discharge) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

Federal Communications Commission

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operate din a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Technical Support and Assistance

1. Visit the Advantech web site at www.advantech.com/support where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before you call:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! *Warnings indicate conditions, which if not observed, can cause personal injury!*

Caution! *Cautions are included to help you avoid damaging hardware or losing data. e.g.There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.*

Note! *Notes provide optional additional information.*

Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: support@advantech.com

Package List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- 1 x WISE-S100 Stack Light Monitoring Sensor
- 3 x Plastic Tie
- 1 x 2m Cable
- 1 x WISE-S100 Startup Manual
- 1 x China RoHS Declaration

Note! *The 2m cable is installed on WISE-S100 in default package.*

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
15. The power cord or plug is damaged.
16. Liquid has penetrated into the equipment.
17. The equipment has been exposed to moisture.
18. The equipment does not work well, or you cannot get it to work according to the user's manual.
19. The equipment has been dropped and damaged.
20. The equipment has obvious signs of breakage.
21. DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -40° C (-40° F) OR ABOVE 85° C (185° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.
22. CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.
23. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Contents

Chapter 1

Product Introduction

1.1 General Introduction

WISE-S100 is an easy to install intelligent stack light monitoring sensor to fit a variety of stack-type light towers. When WISE-4000 wireless modular I/O series is paired with WISE-S100 sensor, users get a remote and intelligent OEE solution that can be integrated without stopping machinery, or worrying about wiring. WISE-S100 enhances the productivity and overall equipment effectiveness. It supports WiFi 2.4G and various LPWAN wireless technologies such as LoRaWAN and proprietary LPWAN (SUB-G) which has higher penetration, lower interference, wider coverage and fits diverse production scenarios on the production line. WISE-4000 LPWAN series come with an optional battery power solution.

1.2 Features & Benefits

One Size Fits a Variety of Machine-Types

There are 8 light sensors inside WISE-S100 tower light. The idea of the design is for quick and easy installation without needing to stop a machine. All users need to do is to simply position a sensor indicator at the stack light and adjust WISE-S100 directly to match each light and mount them together.

No Need to Stop the Machinery While Installation

WISE-S100 is able to detect the light status by light colors, such as light on, light off, slow blink, and fast blink. It has 8 built-in light sensors for quick installation to fulfill most tower light applications in the market. Directly position WISE-S100 on the stack-type light tower to quickly get light status. You do not need to stop machines/equipment so you can quickly deploy your intelligent OEE solution.

Intelligent OEE Solution by Wireless Remote Management

By pairing WISE-4051 I/O module and WISE-S100, users can enjoy wireless remote management including up to 10, 000 data samples of local data storage with time stamps. WISE-S100 sends data to SCADA system, MES etc. via Modbus TCP, RESTful, HTTP and MQTT messaging protocols. The sensors support more than 20 Modbus addresses for intelligent OEE applications. WISE-4000 series also have WiFi, LoRaWAN and proprietary LPWAN wireless solution which support Modbus, and MQTT messaging protocols for remote management. With LPWAN wireless technologies, the whole solution can be battery powered with high penetration and wide coverage for complex production line environments.

1.3 Industrial Design

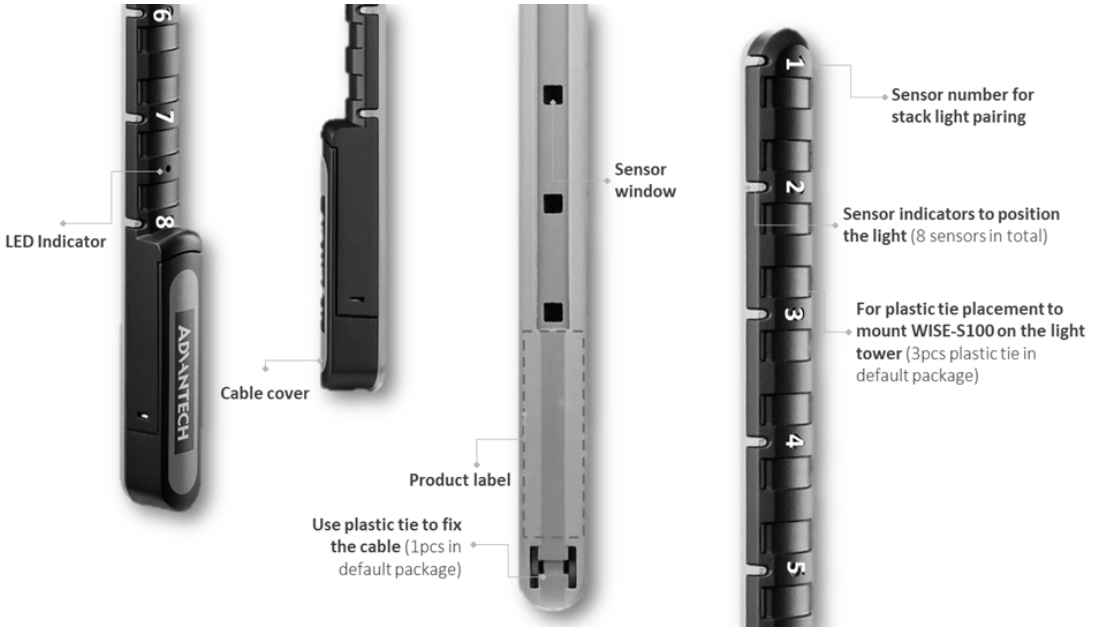


Figure 1.1 WISE-S100 Industrial Design

1.4 Dimension

Figure 1.2 WISE-S100 Dimension

1.5 LED Indication

LED	Color	Indication	Behavior
Status	Green	Steady On	Modbus/RTU Mode
		On for 5 secs	Serial Bus Mode (power saving)
		Blinking(2Hz)	Sensor Initial Error

1.6 Packing List

- 1 x WISE-S100 Stack Light Monitoring Sensor
- 3 x Plastic Tie
- 1 x 2m Cable
- 1 x WISE-S100 Startup Manual
- 1 x China RoHS Declaration

Note! *The 2m cable is installed on WISE-S100 in default package.*

Chapter 2

Hardware Installation

2.1 Hardware Installation

There are 8 light sensors inside WISE-S100 tower light. The idea of the design is for quick and easy installation without needing to stop the machine. All users need to do is to simply position a sensor indicator at the stack light and adjust WISE-S100 directly to match each light and mount them together.

Simply position WISE-S100 on the stack-type light tower to quickly get light status. You do not need to stop machine/equipment so you can quickly deploy your intelligent OEE solution.

There are only two steps to install the WISE-S100 when deployment.

Step 1. Position the light sensor by the indicator.

Step 2. Use the plastic tie to fix the WISE-S100 on the tower light.

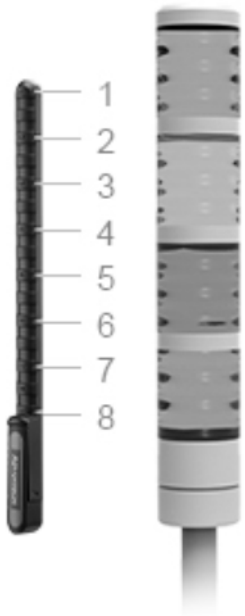


Figure 2.1 Position of WISE-S100

Figure 2.2 Installation of WISE-S100

Chapter 3

Hardware Specification

3.1 Power

Power Supply: 3.3~30 VDC
Power Consumption: 15 mA

3.2 Generic

Communication Interface: RS-485 (Modbus/RTU)
Baud Rate: 9600,N,8,1

3.3 Ambient Light Sensor

Number of Sensor: 8
Sensor Detection Rate: 3 Hz
Measuring Range: 20.48~83865.6 lux
Measuring Light Status: On, Off, Slow Blink, Fast Blink
Peak Irradiance: 550 nm (TYP.)
Spectral Responsivity:

- Resolution: 12 bits
- Accuracy*: 15%

*Accuracy of measurement of fluorescent light.
Linearity

- **Input illuminance:** > 40 lux, 2% (TYP.)
- **Input illuminance:** < 40 lux, 5% (TYP.)

Temperature Drift: 0.02%/°C

3.4 Mechanical

Dimension (L x W x H): 220 x 14 x 12.8 (mm)
Material: Polycarbonate (PC)

3.5 Environmental

Operating Temperature: -25~70 °C
Storage Temperature: -40~80 °C
Operating Humidity: 5~95% RH
Storage Humidity: 0~95% RH

3.6 Cable Wiring and Ping Assignment

The cable of the WISE-S100 stack light sensor is connected and installed in default package. The power input of the sensor is 3.3~30VDC.

Please refer to the pin assignment via below table.

Table 3.1: WISE-S100 Cable Definition

2M Cable with Wafer Box PN:1700031410-01		
1	Red	V+ In
2	Black	GND
3	Brown	DATA+
4	Yellow	MCU Interrupt
5	Orange	DATA-
6	Green	IO Interrupt

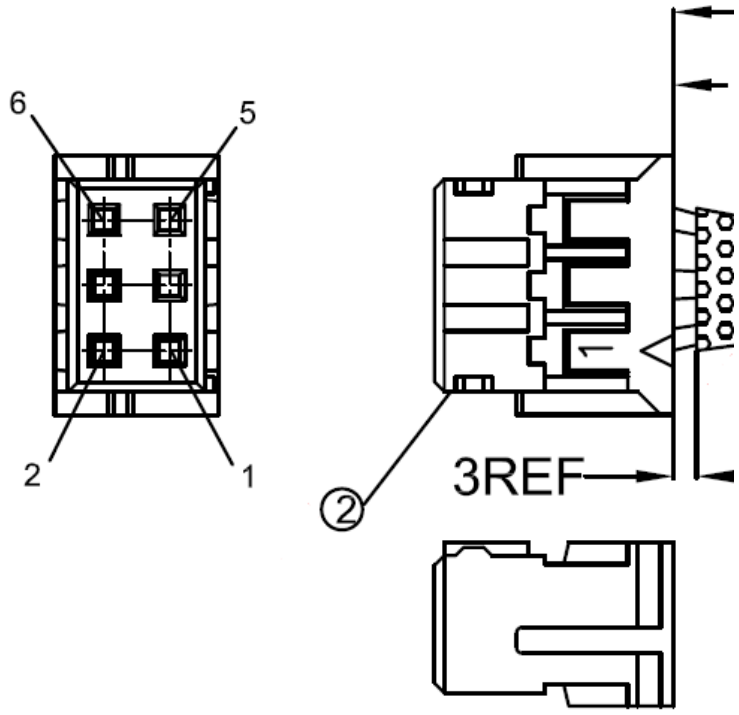


Figure 3.1 WISE-S100 Connector Pin Assignment

Chapter 4

Firmware Specification

4.1 Operation Mode

There two different operation modes of WISE-S100 to pair with different device. One is Modbus RTU mode and another one is serial bus mode. The default operation mode of WISE-S100 is **Serial Bus Mode** for pairing with WISE-4200/4400/4600 series, WiFi or LPWAN IoT Wireless Modular I/O.

Please follow below steps if you intend to use WISE-S100 to pair with WISE-4051, 2.4G WiFi IoT Wireless Modular I/O or any other Modbus master device.

Step 1.Download WISE Studio

Please change to Modbus mode via WISE Studio (WISE Studio version needs to be 1.01.01 (B05) or above).

Step 2.Operation Mode Change

The way to access WISE-S100 in Serial Bus Mode through WISE Studio when switching into Modbus Mode:

- PC < --- > ADAM-4561 or any other USB to RS-485 converter < --- > WISE-S100

Step 3.Check the LED Indicator

The LED indicator will be on when WISE-S100 is powered on.

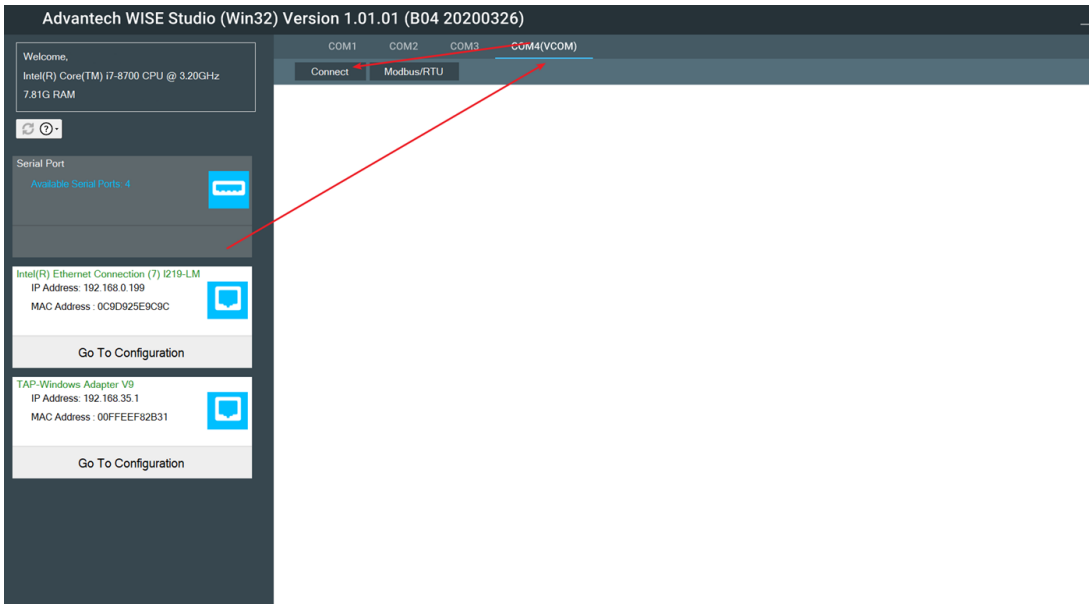
- Serial Bus Mode: LED indicator will be on for 5 secs the go off for power saving when pairing with WISE-4200/4400/4600 LPWAN IoT Wireless Modular I/O.

- Modbus Mode: LED indicator will be on constantly.

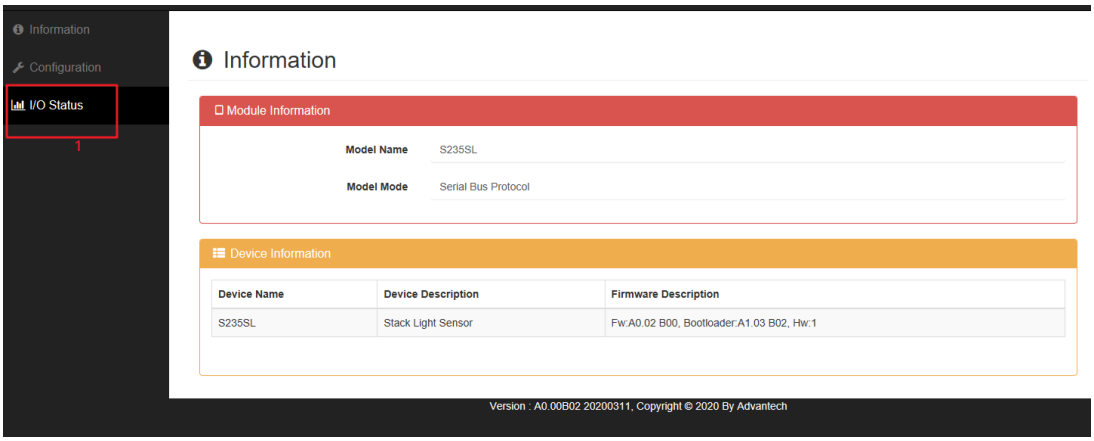
Step 4.Serial Bus Mode

Serial Bus Mode only used to pair with WISE-4200/4400/4600 series.

- Please enter into the main page of WISE-S100 via WISE Studio.



- For the device information, please click into I/O status for the device mode and further information.

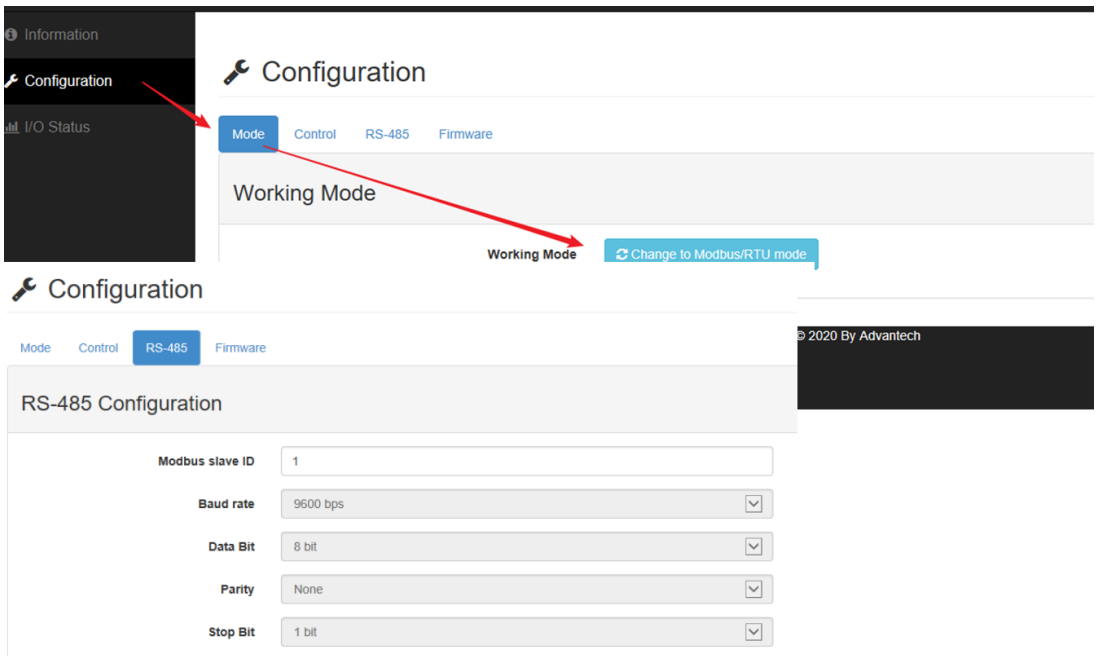


Step 5.Modbus Mode

Enter into **Configuration** page through WISE Studio.

Please take note of your RS-485 setting in case you could not search it.

Note! *Please refer to the Modbus Address table for more information.*



4.2 Configuration

In the configuration, users can get more information and setup of the sensor.

Mode: Enable this function to detect blinking frequency with maximum 3.3 Hz.

Delay Time: Only effective in on/off/blink mode.

5 Sec:

Light on or off > 5 sec = on or off.

Light on and off <5 sec = blinking.

*For example, when the delay time is setting to be 5 seconds, means the sensors determine the light should last for at least 5 seconds as **ON** or **OFF**. When the light is on or off in 5 seconds, it will be regarded as light **BLINKING**.*

Filter: Enable this function to filter the high frequency noise.

Reading Illumination option: Enable this function to get the Lux value of the sensor.

Normal Status: To support better power saving mode, please tick the normal status of the light tower. For example, the light is usually on, please tick normal on.

Low Illumination Limited Value: Lux<x means Dark

High Illumination Limited Value: Lux>x means Light

Fast Blink Frequency Threshold: Frequency≥x means Fast Blinking

Note: Tips for better accuracy

- **Please enable Lux reading at the first.**
- **Record the Lux value when the lights are on.**

Lux (on) / 2 +100: High Illumination Limit Value.

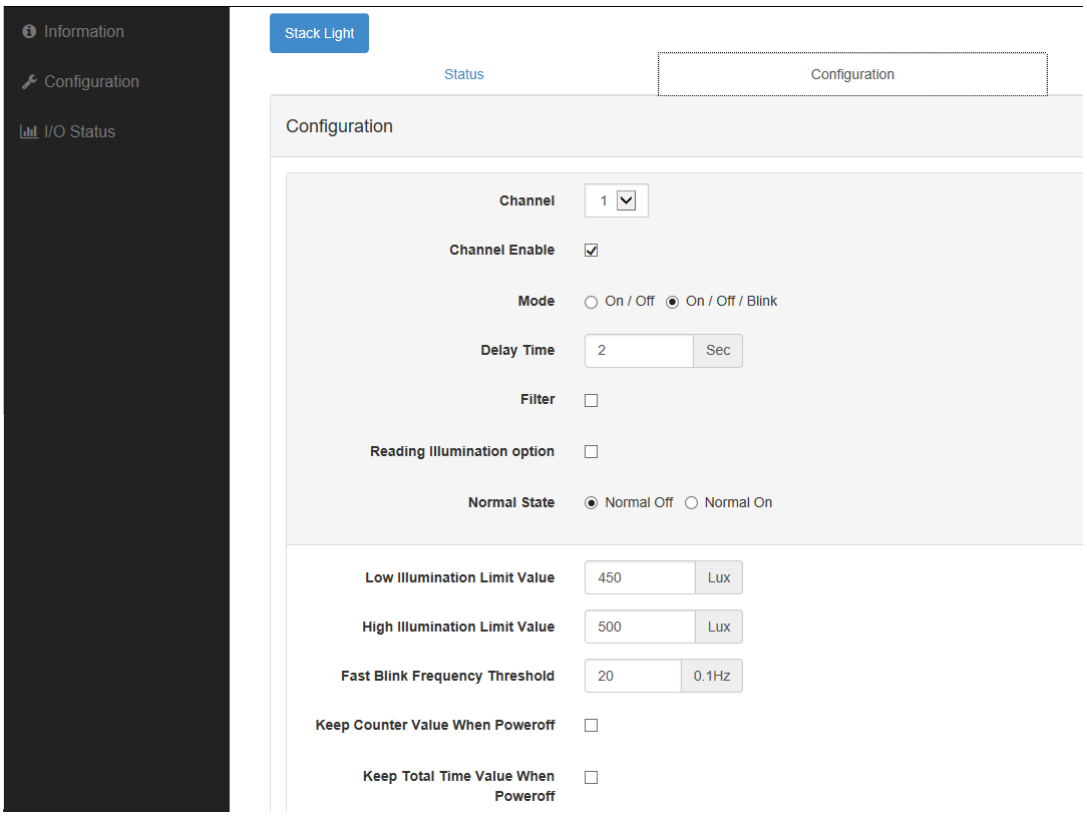
Lux (on) / 2 -100: Low Illumination Limit Value.

For example, when the lux is 1000, it is suggested to set the high illumination limit value at 600. (The suggestion is subject to change based on the real case)

Keep last value

There are two functions for keep the last value of light on, off, slow blinking and fast blinking, please tick the function.

- Keep Counter Value When Poweroff
- Keep Total Time Value When Poweroff



4.3 Light Sensor Channel Configuration

Parameter	Description	Values	Default
Channel switch	Enable/disable this channel	Enable/Disable	Enable
High limit	The state becomes high if illumination is over the high limit	0~83865, Unit: lux	550
Low limit	The state becomes low if illumination is below low limit	0~83865, Unit: lux	450
Fast Blink Frequency	Fast blink frequency threshold	0.2 ~ 2.55 Hz	2 Hz
mode	Light sensor state query mode	On/Off mode On/Off/Blink mode	On/Off/ Blink mode
Delay time	In On/Off/Blink mode, if within delay time the state keeps high/low, the state becomes high/low	1s ~ 5s Unit: second	2s
Filter	How many consecutive events are required to trigger the state (implement by sensor)	0: disable 1: 2 * conversion time	Disable
Illumination option	Whether to get illumination	0: disable 1: enable	disable
Normal state	Which state should save more power, off or on	Off/On	off

Note! *Because of the resolution of the sensor is not always less than 1 as following table, the user setting and actual light sensor setting might be inconsistent. For example, if a user sets 83850 on high limit, FW set 83845.12 on sensor but still show 83850 to user.*

4.4 Light Sensor Data

Values	Setting parameters
State (High/Low/Slow blink/Fast blink)	
Frequency	
State count	■ Keep last value
State duration (unit: 0.1s)	■ Keep last value
Illumination	■ Enable option if serial protocol mode

State count and State duration will clear to 0 after clear command from Modbus/RTU or serial protocol.

Frequency accuracy is: (x: actual frequency)

Faster blink: ±0.02*(x^2), x > 1

Slower blink: ±0.1*(x^2), x ≤ 1

4.5 LED Indicator

There is only one LED for module status indication.

LED	Color	Indication	Behavior
Status	Green	Steady On	Modbus/RTU Mode
		On for 5 secs	Serial Bus Mode (power saving)
		Blinking(2Hz)	Sensor Initial Error

4.6 RS-485 Modbus/RTU

■ Modbus/RTU communication configuration (only configurable in serial protocol mode)

Parameter	Description	Default
Baud Rate	The baud rate used	9600
Data Bits	The number of data bits used	8
Parity	The scheme of parity used	None
Stop Bits	The number of stop bits used	1

■ Modbus/RTU general Configuration (only configurable in serial protocol mode)

Parameter	Description	Values	Default
Modbus ID	The modbus ID used	1~255	1

■ Modbus/RTU Address (not modifiable)

See Appendix I

4.7 Serial Bus Interface

The serial bus interface is used to pair with WISE-4200/4400/4600 series. Communication between I/O module and RF module is via serial bus interface and serial bus protocol. The interface of the serial bus is UART and two GPIOs to control the communication in power saving mode. The serial protocol defines the commands for exchanging module information, I/O configuration and value and upgrading the firmware of I/O module.

Appendix A

Modbus Table

A.1 Modbus Table

WISE-S100							
Sensor MAX		**8**	**Total Enabled Sensor**		**8**		
Address 0X	**Ch**	**Description**	**Attribute**	**Address 4X**	**Ch**	**Description**	**Attribute**
				40001~ 40002	1	Sensor Value (Lux)	Read
				…	…		Read
				40015~ 40016	8		Read
				40017	1	Sensor Status (Low:0/ High:1/Slow Blink:2/ Fast Blink:3/ non-exist: 0xFE/ broken: 0xFF/dis-able:0xFD)	Read
				…	…		Read
				40024	8		Read
				40025	1	Frequency (hundredfold)	Read
				…	…		Read
				40032	8		Read
				40033~ 40034	1	Low state count	Read
				…	…		Read
				40047~ 40048	8		Read
00033	1	Clear low state count	Write	**40049~ 40050**	1	High state count	Read
…	…		Write	**…**	…		Read
00040	8		Write	**40063~ 40064**	8		Read
00041	1	Clear high state count	Write	**40065~ 40066**	1	Slow Blink state count	Read
…	…		Write	**…**	…		Read
00048	8		Write	**40079~ 40080**	8		Read
00049	1	Clear slow blink state count	Write	**40081~ 40082**	1	Fast Blink state count	Read
…	…		Write	**…**	…		Read
00056	8		Write	**40095~ 40096**	8		Read

00057	1	Clear fast blink state count	Write	**40097~ 40098**	1	Low state total time (100 ms)	Read
…	…		Write	**…**	…		Read
00064	8		Write	**40111~ 40112**	8		Read
00065	1	Clear low state total time	Write	**40113~ 40114**	1	High state total time (100 ms)	Read
…	…		Write	**…**	…		Read
00072	8		Write	**40127~ 40128**	8		Read
00073	1	Clear high state total time	Write	**40129~ 40130**	1	Slow Blink state total time (100 ms)	Read
…	…		Write	**…**	…		Read
00080	8		Write	**40143~ 40144**	8		Read
00081	1	Clear slow blink state total time	Write	**40145~ 40146**	1	Fast Blink state total time (100 ms)	Read
…	…		Write	**…**	…		Read
00088	8		Write	**40159~ 40160**	8		Read
00089	1	Clear fast blink state total time	Write	**40211**		Module Name 1	Read
…	…		Write	**40212**		Module Name 2	Read
00096	8		Write	**40213**		Module Name 3	Read
				40214		Reserved for Module Name	Read
				40221		Channel enable	Read/ Write
				40231~ 40232	1	Set Low limit (Lux)	Read/ Write
				…	…		Read/ Write
				40245~ 40246	8		Read/ Write
				40247~ 40248	1	Set High Limit (Lux)	Read/ Write
				…	…		Read/ Write
				40261~ 40262	8		Read/ Write

				41001~ 41002		Sensor Value (Lux) (only enabled channel)	Read
				…			Read
				41015~ 41016			Read
				41017		Sensor Status (only enabled channel)	Read
				…			Read
				41024			Read
				41025		Frequency (hundredfold) (only enabled channel)	Read
				…			Read
				41032			Read
				41033~ 41034		Low state count (only enabled channel)	Read
				…			Read
				41047~ 41048			Read
01033		Clear low state count (only enabled channel)	Write	**41049~ 41050**		High state count (only enabled channel)	Read
…			Write	**…**			Read
01040			Write	**41063~ 41064**			Read
01041		Clear high state count (only enabled channel)	Write	**41065~ 41066**		Slow Blink state count (only enabled channel)	Read
…			Write	**…**			Read
01048			Write	**41079~ 41080**			Read
01049		Clear slow blink state count (only enabled channel)	Write	**41081~ 41082**		Fast Blink state count (only enabled channel)	Read
…			Write	**…**			Read
01056			Write	**41095~ 41096**			Read
01057		Clear fast blink state count (only enabled channel)	Write	**41097~ 41098**		Low state total time (only enabled channel) (100 ms)	Read
…			Write	**…**			Read
01064			Write	**41111~ 41112**			Read
01065		Clear low state total time (only enabled channel)	Write	**41113~ 41114**		High state total time (only enabled channel) (100 ms)	Read
…			Write	**…**			Read
01072			Write	**41127~ 41128**			Read

01073		Clear high state total time (only enabled channel)	Write	**41129~ 41130**		Slow Blink state total time (only enabled channel) (100 ms)	Read
…			Write	**…**			Read
01080			Write	**41143~ 41144**			Read
01081		Clear slow blink state total time (only enabled channel)	Write	**41145~ 41146**		Fast Blink state total time (only enabled channel) (100 ms)	Read
…			Write	**…**			Read
01088			Write	**41159~ 41160**			Read
01089		Clear fast blink state total time (only enabled channel)	Write				
…			Write				
01096			Write				

Note: For those "only enabled channel" items, it helps the Modbus address configuration contiguously.

For example, if only channel 1 and channel 3 are enabled, the address of sensor value can be 41001~41002 for channel 1, 41003~41004 for channel3, and 41005 for channel 1 sensor status.

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Please verify specifications before quoting. This guide is intended for reference purposes only.

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