

**User Manual**

# **WISE-4210 Series**

**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.

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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.

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# Declaration of Conformity

## FCC Class A

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 operated in 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.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

## Technical Support and Assistance

1. Visit the Advantech web site at [www.advantech.com/support](http://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.*



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## 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@advan-tech.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.

### **WISE-4210-APNA/UA**

- 1 x WISE-4210-APNA/UA LPWAN IoT Wireless to Ethernet AP
- 1 x Mounting bracket
- 1x China RoHS (UA series only)
- 1x Antenna (UA series only)

### **WISE-4210-S231NA/UA**

- 1 x WISE-4210-S231NA/UA LPWAN IoT Wireless module with temperature and humidity sensor
- 1 x Mounting bracket
- 1x China RoHS (UA series only)
- 1x Antenna (UA series only)

### **WISE-4210 NA/UA**

- 1 x WISE-4210 NA/UA module
- 1 x Mounting bracket
- 1x China RoHS (UA series only)
- 1x Antenna (UA series only)

### **WISE-S214-A**

- 1x WISE-S214-A I/O Module
- 1x China RoHS
- 4x Screws
- 1x I/O sticker

### **WISE-S250-A**

- 1x WISE-S250-A I/O Module
- 1x China RoHS
- 4x Screws
- 1x I/O sticker

### **WISE-S251-A**

- 1x WISE-S251-A I/O Module
- 1x China RoHS
- 4x Screws
- 1x I/O sticker

**Note!** *Antenna for NA series should be ordered respectively based on the required frequency range.*



- 1750008836-01 863-870MHz Dipole Antenna for WISE-4210
- 1750008837-01 902-928MHz Dipole Antenna for WISE-4210

**Note!** *Battery needs to be ordered separately*



- 1760002647-01 3.6V/2500mAh AA Cylindrical Battery (non rechargeable)

## 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 -20° C (-4° F) OR ABOVE 60° C (140° 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.

## 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.

## NCC 警语

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

## Industry Canada statement:

This device complies with ISED's licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

### FOR MOBILE DEVICE USAGE (>20cm/low power)

Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

## DETACHABLE ANTENNA USAGE

This radio transmitter (IC: 9404A-WISE4210 / Model: WISE-4210-S231, WISE-4210-S251, WISE-4210-AP, WISE-4210) has been approved by ISED to operate with the antenna type listed below with maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: M82-WISE4210 / Model: WISE-4210-S231, WISE-4210-S251, WISE-4210-AP, WISE-4210) a été approuvé par ISED pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Approved antenna(s) list

Type	Gain	Brand	Manufacturer
Dipole	2.19 dBi	Advantech	1750008836-01
Dipole	1.33 dBi	Advantech	1750008837-01





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# Chapter 1

Product Overview

## 1.1 Series Family and Specifications

Function	Model	Description
Wireless Access Point	WISE-4210-AP	LPWAN IoT Wireless to Ethernet AP
Wireless Module	WISE-4210	LPWAN IoT Wireless Module
Wireless Sensor Node	WISE-4210-S231	LPWAN IoT Wireless Sensor Node with Temperature and Humidity Sensor
I/O Module	WISE-S214	4AI/4DI
I/O Module	WISE-S250	6DI, 2DO & 1RS-485
I/O Module	WISE-S251	6DI, 1RS-485& 1RS-485

## 1.2 Mechanical Design and Dimensions

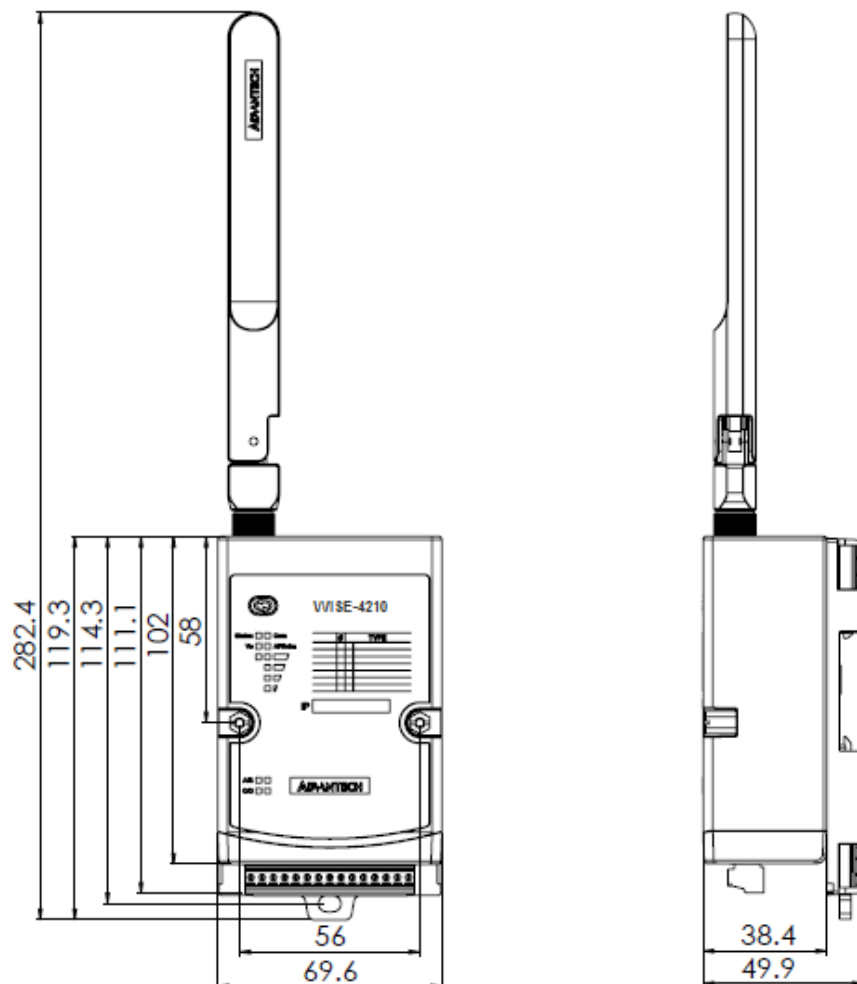


Figure 1.1 WISE-4210 Dimension Front & Side

### 1.3 System Diagram

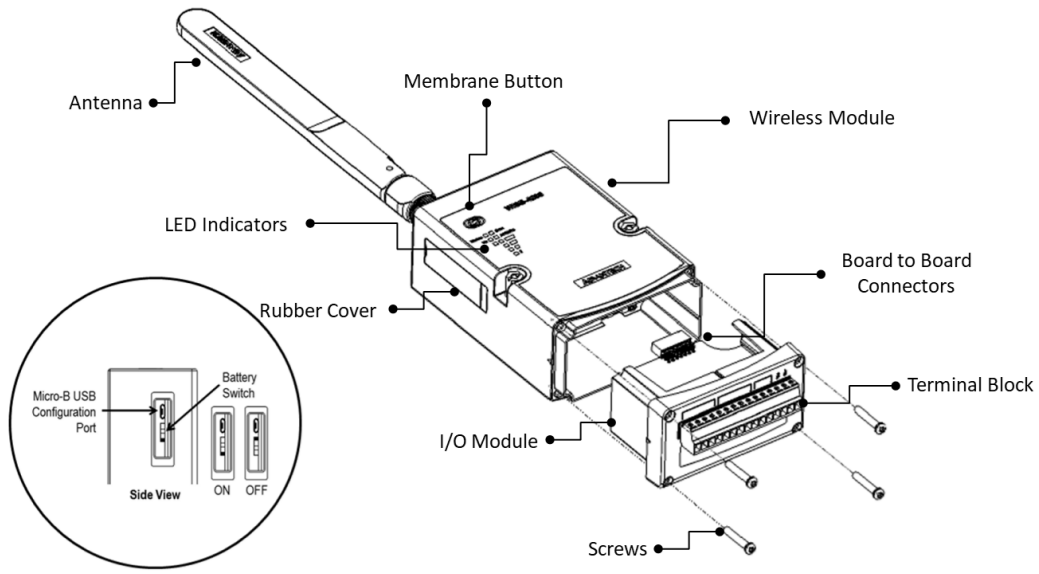


Figure 1.2 WISE-4210 System Diagram

## 1.4 LED Definition

### 1.4.1 WISE-4210-AP

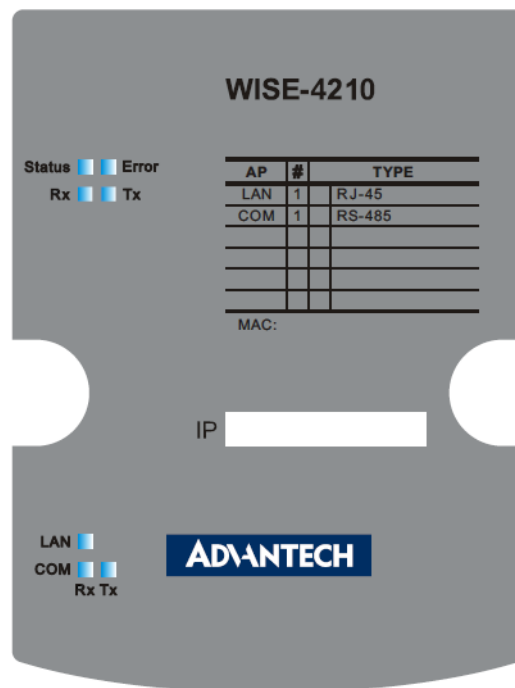


Figure 1.3 WISE-4210-AP LED Indicator

LED	Color	Indication	Behavior
Status	Green	Blinking	0.5Hz: Operating normally
Error	Red	Blinking	2Hz: I/O error or RF related error
Rx	Green	Blinking	Receiving data from LPWAN nodes
Tx	Green	Not Used	
LAN	Green	Blinking	1Hz: Gateway's IP is available and is normally at work
		On for 30 Sec	When enable LOCATE function
COM Rx	Green	Steady On	Receiving data from RS-485 Turn on at last 10ms
		Off	No data received from RS-485
COM Tx	Yellow	Steady On	Sending data to RS-485 Turn on at last 10ms
		Off	No data sent to RS-485

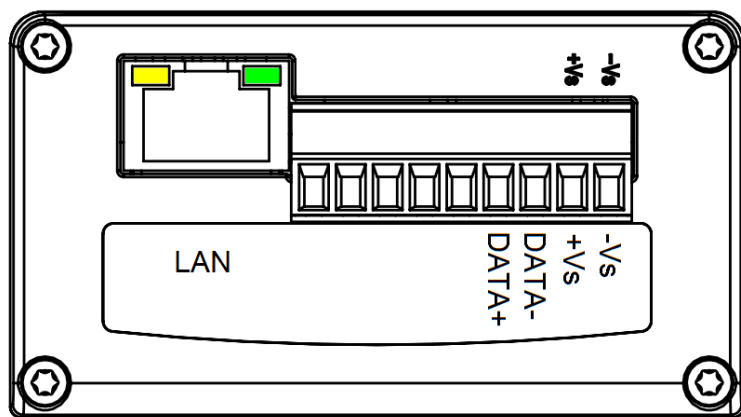


Figure 1.4 WISE-4210-AP LAN Port LED

LED	Color	Indication	Behavior
Link	Green	On	Both ends of devices are connected
		Off	Not connected yet
Speed	Yellow	On	100 Mbps
		Off	Less than 100 Mbps

### 1.4.2 WISE-4210-S231

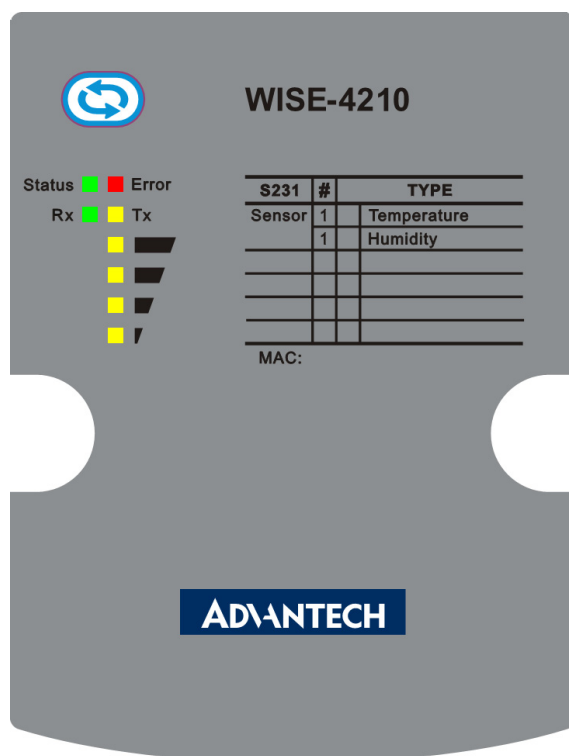


Figure 1.5 WISE-4210-S231 LED Indicator

LED	Color	Indication	Behavior
Status	Green	Blink	2 Hz: Initial Status 0.5 Hz: Node is connected and normally at work. (Automatically go OFF after 15 seconds when battery power is used.)
		On	Site Survey mode
		Off	OTA mode (RF RX or RF TX on)
RF RX	Green	On(at least 10 ms)	Receiving data from the Gateway
		On	Listen RF channel
		Off	Idle
Rx Tx	Yellow	On (at least 10 ms)	Sending data to the Gateway (Automatically be disabled after 15 seconds when battery power is used.)
		Off	Idle
Error	Red	Fast Blink	■ I/O Error ■ OTA Fail ■ TX/RX Firmware fail in OTA
		Slow Blink	■ Low battery voltage
		Off	No error
		Signal 4	Green
Signal 3	Green	Fast Blink	■ IO error
Signal Strength	Green	On * 4	■ Full signal (In site survey mode) ■ Battery level (100%) (Automatically go OFF after 15 seconds when battery power is used.)
		On * 3	■ Good signal ■ Battery level (100%~50%) (same as above)
		On * 2	■ Okay signal ■ Battery level (50%~30%) (same as above)
		On * 1	■ Poor signal ■ Battery level (30%~0%) (same as above)
		All Off	■ No signal Battery level (0%)

All of LEDs will automatically go OFF after 15 seconds when battery power is used.  
RF RX and Signal Strength LEDs are only available in WISE Link v2 mode.



### 1.4.3 WISE-4210

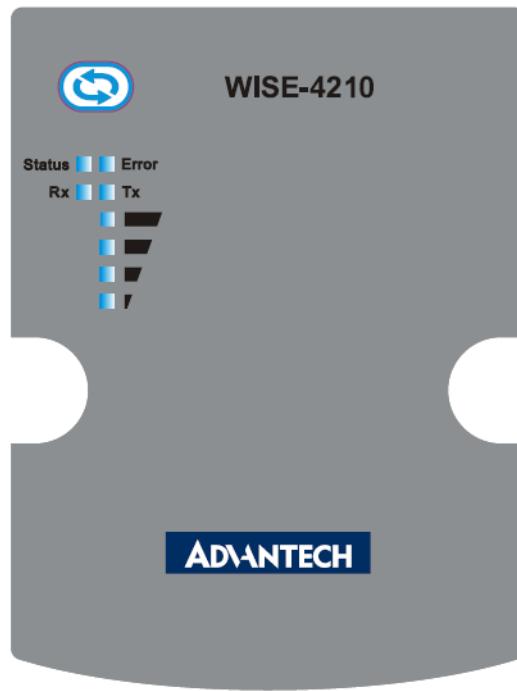


Figure 1.6 WISE-4210 LED Indicator

LED	Color	Indication	Behavior
Status	Green	Blink	2 Hz: Initial Status 0.5 Hz: Node is connected and normally at work. (Automatically go OFF after 15 seconds when battery power is used.)
		On	Site Survey mode
		Off	OTA mode (RF RX or RF TX on)
RF RX	Green	On(at least 10 ms)	Receiving data from the Gateway
		On	Listen RF channel
		Off	Idle
Rx Tx	Yellow	On (at least 10 ms)	Sending data to the Gateway (Automatically be disabled after 15 seconds when battery power is used.)
		Off	Idle
Error	Red	Fast Blink	■ I/O Error ■ OTA Fail ■ TX/RX Firmware fail in OTA
		Slow Blink	■ Low battery voltage
		Off	No error
		Signal 4	Green
Signal 3	Green	Fast Blink	■ IO error
Signal Strength	Green	On * 4	■ Full signal (In site survey mode) ■ Battery level (100%) (Automatically go OFF after 15 seconds when battery power is used.)
		On * 3	■ Good signal ■ Battery level (100%~50%) (same as above)
		On * 2	■ Okay signal ■ Battery level (50%~30%) (same as above)
		On * 1	■ Poor signal ■ Battery level (30%~0%) (same as above)
		All Off	■ No signal Battery level (0%)

All of LEDs will automatically go OFF after 15 seconds when battery power is used.  
RF RX and Signal Strength LEDs are only available in WISE Link v2 mode.

# 1.5 Membrane Button

WISE-4210-Sxxx end nodes have one membrane button on name plate. This button is design for switching different LED display mode or operation mode.

**Note!** WISE-4210-AP doesn't have membrane button, please use LAN port to do further configuration.

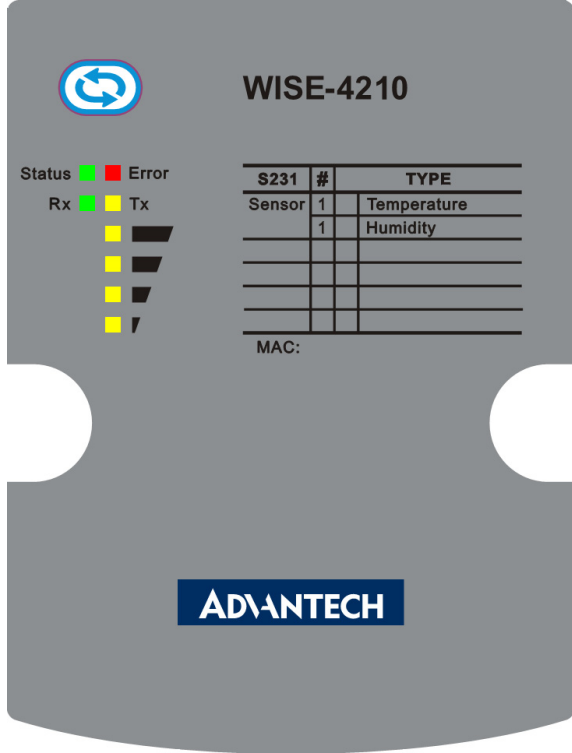
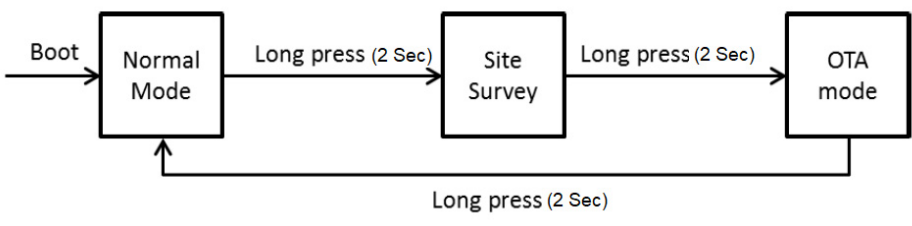


Figure 1.7 WISE-4210 Membrane Button



<b>Normal Mode</b>		
Mode	Power Saving Mode	Non-power saving Mode
Light Press (0.5 Sec)	LED turn on→Get battery level→LED turn off*	Get battery level→LED turn off*
Long Press (2 Sec)	Leave normal mode	Leave normal mode

<b>Site Survey Mode</b>	
Light Press (0.5 Sec)	Tx site survey packet
Long Press (2 Sec)	Leave site survey mode

<b>OTA Mode</b>				
Status	Rx Status	Tx Status (by USB port)	Low Battery	Update FW fail
Light Press (0.5 Sec)	Read battery level	Tx Configuration	NA	Reset OTA mode
Long Press (2 Sec)	Leave OTA mode	Tx Firmware	Leave OTA mode	NA

\*(LED indicator will go off automatically 15 secs later when using battery power.)

## 1.6 Battery Power Switch

Open the rubber cover on the side of WISE-4210-Sxxx nodes, there is a battery switch to turn on or turn off the battery power supply.

**Note!** This switch is only available for WISE-4210-Sxxx nodes, not for WISE-4210-AP.



This switch only controls the power supply from batteries. It did not control the power supply of line power from terminal block.

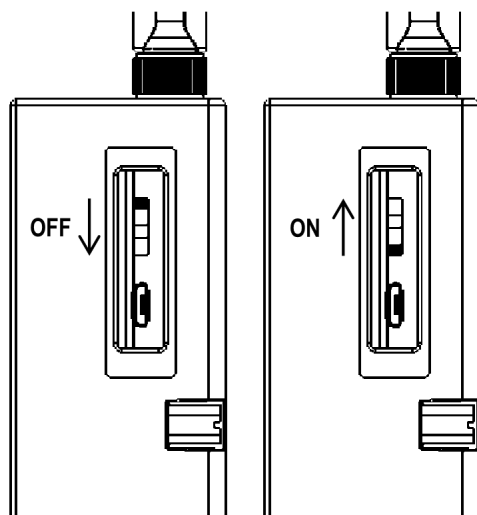


Figure 1.8 WISE-4210 Battery Switch

## 1.7 Package Information

### WISE-4210-APNA/UA

- 1 x WISE-4210-APNA/UA LPWAN IoT Wireless to Ethernet AP
- 1 x Mounting bracket
- 1x China RoHS (UA series only)
- 1x Antenna (UA series only)

### WISE-4210-S231NA/UA

- 1 x WISE-4210-S231NA/UA LPWAN IoT Wireless module with temperature and humidity sensor
- 1 x Mounting bracket
- 1x China RoHS (UA series only)
- 1x Antenna (UA series only)

### WISE-4210 NA/UA

- 1 x WISE-4210 NA/UA module
- 1 x Mounting bracket
- 1x China RoHS (UA series only)
- 1x Antenna (UA series only)

### WISE-S214-A

- 1x WISE-S214-A I/O Module
- 1x China RoHS
- 4x Screws
- 1x I/O sticker

### WISE-S250-A

- 1x WISE-S250-A I/O Module
- 1x China RoHS
- 4x Screws
- 1x I/O sticker

### WISE-S251-A

- 1x WISE-S251-A I/O Module
- 1x China RoHS
- 4x Screws
- 1x I/O sticker

**Note!** *Antenna for NA series should be ordered respectively based on the required frequency range.*



- **1750008836-01** 863-870MHz Dipole Antenna for WISE-4210
- **1750008837-01** 902-928MHz Dipole Antenna for WISE-4210

**Note!** *Battery needs to order separately.*



- **1760002647-01** 3.6V/2500mAh AA Cylindrical Battery (non-rechargeable)

**Note!** *Micro-B USB cable for configuring WISE-4210 nodes can be ordered optionally.*



- **1700023619-01** 1M micro USB type-B male to USB type-A male cable

# Chapter 2

General Specification

## 2.1 General Specification

### 2.1.1 Wireless Interface

- IEEE Standard
  - IEEE 802.15.4g
- Operating Frequency
  - NA923: 923MHz (920.8~924.4),BW:400KHz
  - EU868: 868MHz (865.2~868.8),BW:400KHz
- Data Rate:
  - WISE-4210-AP: 625 bps/ 2.5K bps / 5K bps / 50K bps
  - WISE-4210 Node: 625 bps, 50K bps
- Outdoor Range
  - 625bps: 5 km (Line of sight)
  - 50kbps: 2 km (Line of sight)
- Antenna Gain
  - 902~928MHz: 1.48 dBi
  - 863~870MHz: 2.02 dBi
- Transmit Power (CE): 14dBm±1dBm
- Receiver Sensitivity:
  - 115 dBm @ 625bps (Long-Rang Mode)
  - 100 dBm @50Kbps
- Topology: Star
- Network Capacity: Up to 64 end nodes
- Channel List:

EU868 BW: 400K Hz (Frequency: MHz)		NA915 BW: 400K Hz (Frequency: MHz)		UN433 BW: 300K Hz (Frequency: MHz)	
Chanel 1	865.2	Chanel 1	920.8	Chanel 1	433.2
Chanel 2	865.6	Chanel 2	921.2	Chanel 2	433.5
Chanel 3	866.0	Chanel 3	921.6	Chanel 3	433.8
Chanel 4	866.4	Chanel 4	922.0	Chanel 4	434.1
Chanel 5	868.8	Chanel 5	922.4	Chanel 5	434.4
Chanel 6	867.2	Chanel 6	922.8		
Chanel 7	867.6	Chanel 7	923.2		
Chanel 8	868.0	Chanel 8	923.6		
Chanel 9	868.4	Chanel 9	924.0		
Chanel 10	868.8	Chanel 10	924.4		

**Note!** *The transmitting distance is subject to the environment of application site. Please perform site survey to determine the set up range of the wireless network.*





## 2.1.2 General

- Configuration Interface: Micro-B USB
- Connector:  
WISE-S200: Plug-in screw terminal block (I/O and power)
- LED Indicator: Status, Error, Tx, Rx, Signal Level
- Mounting: DIN35 rail, wall, pole and stack
- Dimension (W x H x D): 70 x 112 x 38 mm
- Certification: CE(RED), NCC, FCC, IC
- I/O connector: 3.5-mm spacing plug-in screw terminal block
- Power connector: 3.5-mm spacing plug-in screw terminal block
- Real-time clock (RTC) accuracy:  $\pm 2$  s/day
- Enclosure: PC
- Operation temperature:  $-20\sim 70^{\circ}\text{C}$  ( $-4\sim 140^{\circ}\text{F}$ )
- Storage temperature:  $-40\sim 85^{\circ}\text{C}$  ( $-40\sim 185^{\circ}\text{F}$ )
- Operating humidity: 5~95% RH (non-condensing)
- Storage humidity: 0~95% RH (non-condensing)

**Note!** *Equipment will operate below 30% humidity. However, static electricity problems occur much more frequently at lower humidity levels. Make sure you take adequate precautions when you touch the equipment. Consider using ground straps, anti-static floor coverings, etc. if you use the equipment in low humidity environments.*



**Note!** *Measuring temperature and humidity will depend on sensor type. Whether the device is measuring temperature or humidity depends on the settings of the sensors.*



## 2.1.3 Power

- Power input voltage: 10 ~ 50 V<sub>DC</sub>
- Power consumption:
  - WISE-4210-AP: 0.8 W @ 24 V<sub>DC</sub>
  - WISE-4210 Nodes: 0.3 W @ 24 V<sub>DC</sub>
- Battery socket (WISE-4210 Nodes only, not for WISE-4210-AP)  
AA 3.6VDC battery x 3 (parallel connection)
- Battery life (2500mAh battery x3) @ 25°C:
  - 625bps: 5 years with 10 minute update rate
  - 50kbps: 5 years with 1 minute update rate

**Note!** *The battery life is estimated with 2500mAh battery, SB-AA11 by Vitzro-cell Co.,Ltd.*



*Testing condition:*

- WISE-4210-S231: Temperature/Humidity sensor
- WISE-4210-S251: Digital input only

**Note!** Power saving is not for downlink mode.



**Note!** The battery life is estimated in the environment at 25°C. If the battery operated in low temperature, the battery life would be lower. Here is the estimation for battery SB-AA11 at different temperature:



- SB-AA11 @ 0°C: Less than 30%
- SB-AA11 @ -10°C: Less than 18%
- SB-AA11 @ -25°C: Less than 13%

## 2.1.4 Software

- Utility: WISE Studio
- Driver: ADAM .NET Class Library
- WISE-4210-AP Protocols: TCP/IP, UDP, HTTP, HTTPS, DHCP, ARP, SNTP
- WISE-4210-AP supports RESTful Web API .JSON format

## 2.1.5 Configuration Interface

### WISE-4210-AP

- Interface: LAN port
- Connector: RJ-45

### WISE-4210 Nodes

- Interface: USB virtual COM port
- Connector: Micro-B USB
- USB chipset: Silicon Labs CP210x
- Driver: CP210x USB to UART Bridge VCP Drivers (<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>)

## 2.2 WISE-4210-AP

### 2.2.1 Uplink Communication Port

#### LAN port

- Ethernet: IEEE 802.3u 10/100Base-T(X)
- Connector: 1-port RJ-45
- Protocol: Modbus/TCP, RESTful web API

#### RS-485 port

- Signal: DATA+, DATA-
- Connector: 3.5-mm spacing plug-in screw terminal block
- Protocol: Modbus/RTU

## 2.2.2 Pin Assignment

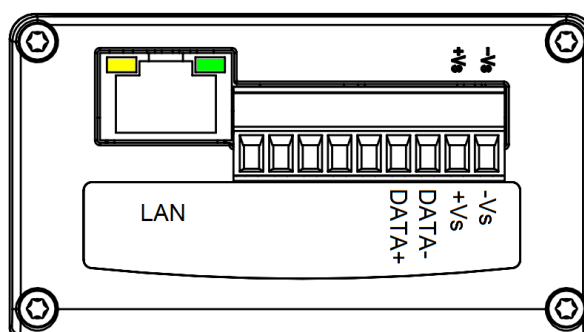


Figure 2.1 WISE-4210-AP Pin Assignment

## 2.2.3 Block Diagram

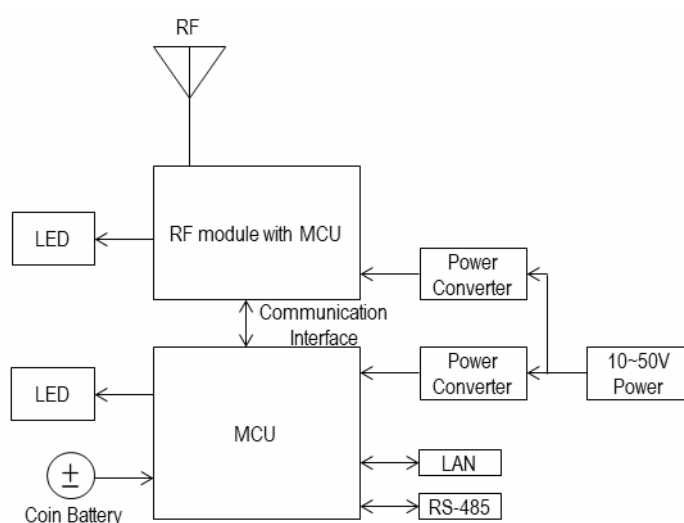


Figure 2.2 WISE-4210-AP Block Diagram

## 2.3 WISE-4210-S231

### 2.3.1 I/O Specifications

#### Temperature Sensor Input

- Operating Range:  $-25^{\circ}\text{C} \sim 70^{\circ}\text{C}$  ( $-4^{\circ}\text{F} \sim 157.9^{\circ}\text{F}$ )
- Data Resolution:  $0.1 (^{\circ}\text{C}/^{\circ}\text{F}/\text{K})$
- Accuracy:  $\pm 2.0^{\circ}\text{C}$  (Vertical Installation)
- Update Rate: Minimum 1 second
- Response Time: 15 seconds (Achieving 63% of a step function)
- Long Term Drift:  $0.05^{\circ}\text{C}/\text{Year}$  ( $0.09^{\circ}\text{F}/\text{Year}$ )

#### Humidity Sensor Input

- Operating Range: 10~90% RH
- Resolution: 0.1% RH
- Accuracy:
  - $\pm 4\%$  for 0%~50% RH
  - $\pm 6\%$  for 50%~60% RH

- $\pm 10\%$  for 60%~90% RH
- Update Rate: Minimum 1 second
- Response Time: 10 seconds (Achieving 63% of a step function)
- Long Term Drift: 0.5% RH/Year

### 2.3.2 Pin Assignment

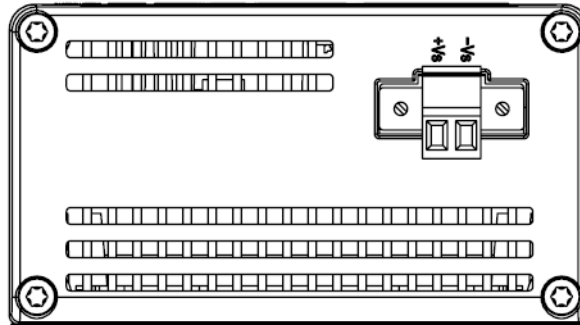


Figure 2.3 WISE-4210-S231 Pin Assignment

## 2.4 WISE-S214 (4AI/4DI)

### 2.4.1 I/O Specifications

#### Analog Input

- Channels: 4
- Resolution: 16bits Bipolar  
15bits Unipolar
- Sampling Rate:  
1Hz (per Channel) with 50/60Hz Rejection (Power Saving Mode)  
10Hz (Total) with 50/60Hz Rejection (Normal Mode)
- Accuracy:  
 $\pm 0.1\%$  for Voltage Input  
 $\pm 0.2\%$  for Current Input
- Input Range: 0~150mV, 0~500mV, 0~1V, 0~5V, 0~10V,  $\pm 150\text{mV}$ ,  $\pm 500\text{mV}$ ,  $\pm 1\text{V}$ ,  $\pm 5\text{V}$ ,  $\pm 10\text{V}$ , 0~20mA,  $\pm 20\text{mA}$ , 4-20mA
- Input Impedance:  $>1\text{M}\Omega$  (Voltage)
- Isolated voltage: 3kVrms
- Digital Input
  - Channels: 4
- Support Data Scaling and Averaging Digital Input Channels 4 (Dry Contact)
- Supports 32-bit counter input function (maximum signal frequency 200Hz)
- Supports keep/discard counter value on power-off
- Support inverted digital input status

## 2.4.2 Pin Assignment

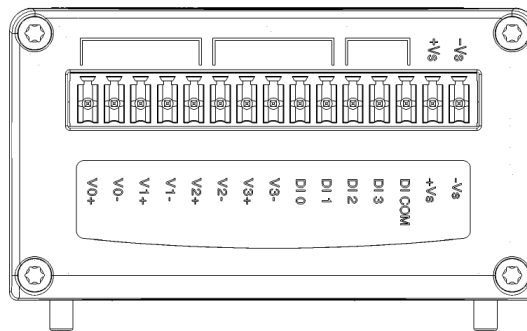


Figure 2.4 WISE-S214 Pin Assignment

## 2.5 WISE-S250 (6DI, 2DO& 1RS-485)

### 2.5.1 I/O Specifications

#### Digital Input

- Channels: 6 (Dry Contact)
- Supports 3kHz Frequency Input

#### Frequency mode

#### Counter mode

#### Digital Output (Sink Type)

- Channels: 2
- Output Current: 100 mA
  - At 0 -> 1: 100 us
  - At 1 -> 0: 100 us (for Resistive Load)
- Supports Pules Output 5 kHz
- Max. Load Voltage: 50V

#### Serial Port

- Port Number: 1
- Type: RS-485
- Data Bits: 7, 8
- Stop Bits: 1, 2
- Parity: None, Odd, Even
- Baud Rate (bps): 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
- Protocol: Modbus/RTU (Total 32 addresses by 8 max. instructions)

## 2.5.2 Pin Assignment

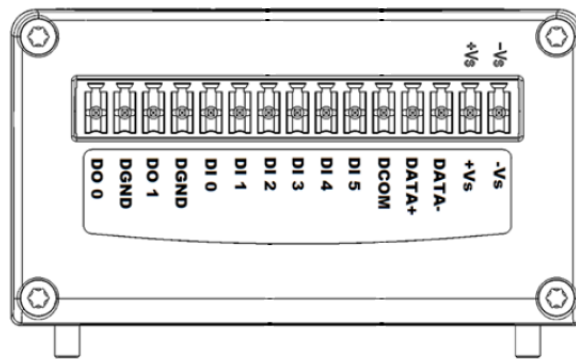


Figure 2.5 WISE-S250 Pin Assignment

## 2.6 WISE-S251 (6DI/1RS-485)

### 2.6.1 I/O Specifications

#### 2.6.1.1 Digital Input

- Channels: 6
- Logic level (dry contact)
  - 0: Open
  - 1: Close DI COM
- Supports 32-bit counter input function (maximum signal frequency, 200Hz)
- Supports keep/discard counter value on power-off
- Supports inverted digital input status

#### 2.6.1.2 RS-485 Port

- Port Number: 1
- Type: RS-485
- Data Bits: 7, 8
- Stop Bits: 1, 2
- Parity None, Odd, Even
- Baud Rate (bps): 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
- Protocol: Modbus/RTU (Total 32 address by max. 8 instructions)

### 2.6.2 Pin Assignment

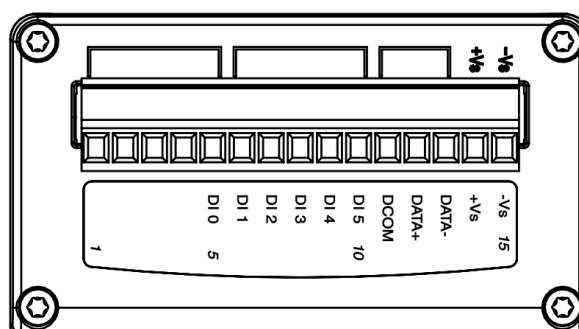


Figure 2.6 WISE-S251 Pin Assignment

### 2.6.3 Application Wiring

#### WISE-S214

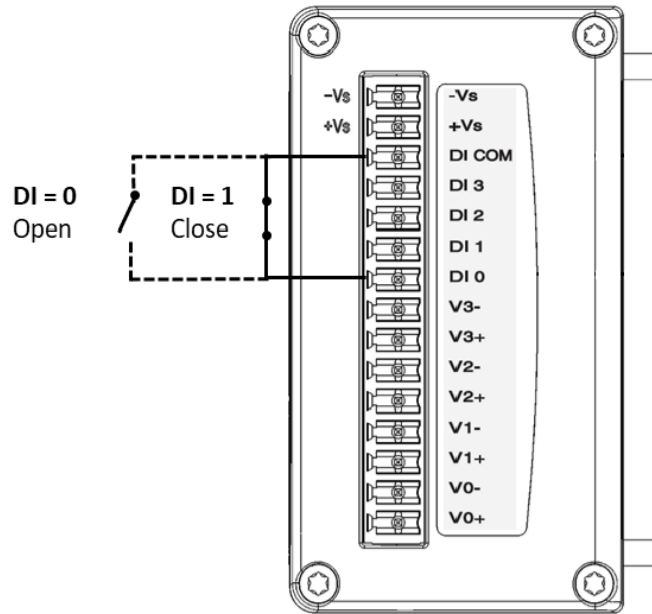


Figure 2.7 WISE-S214 Digital Input Wiring Diagram

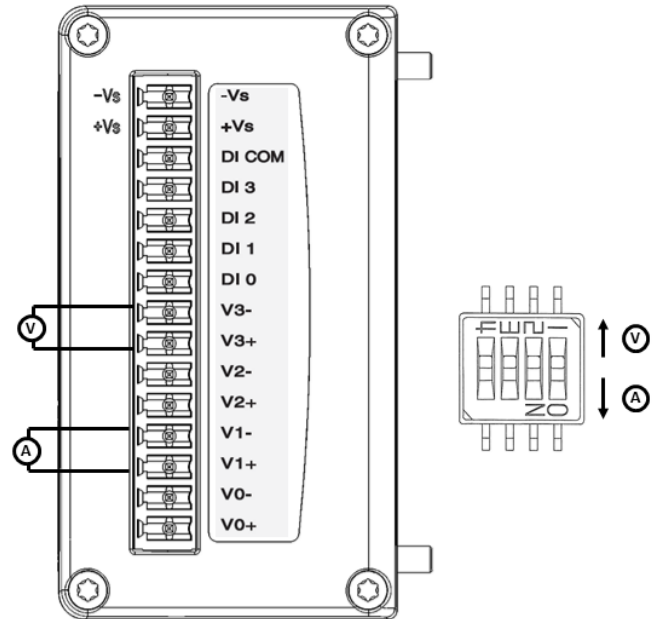


Figure 2.8 WISE-S214 Analog Input Wiring Diagram

# WISE-S250

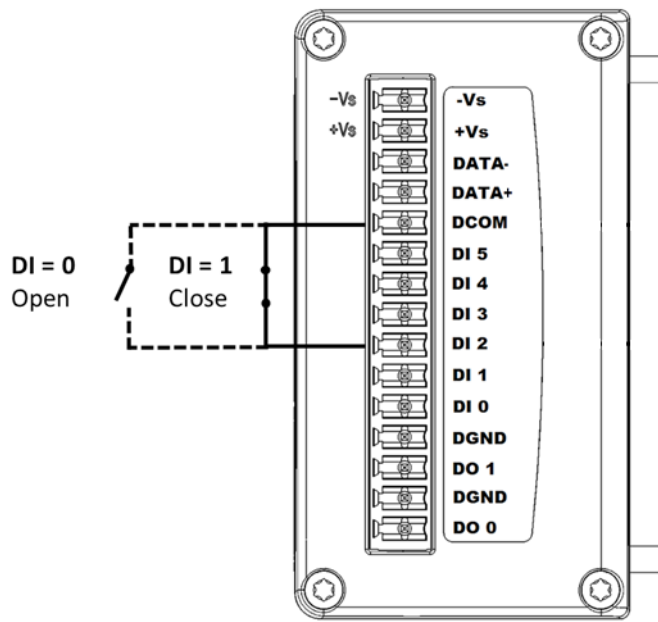


Figure 2.9 WISE-S250 Digital Input Wiring Diagram

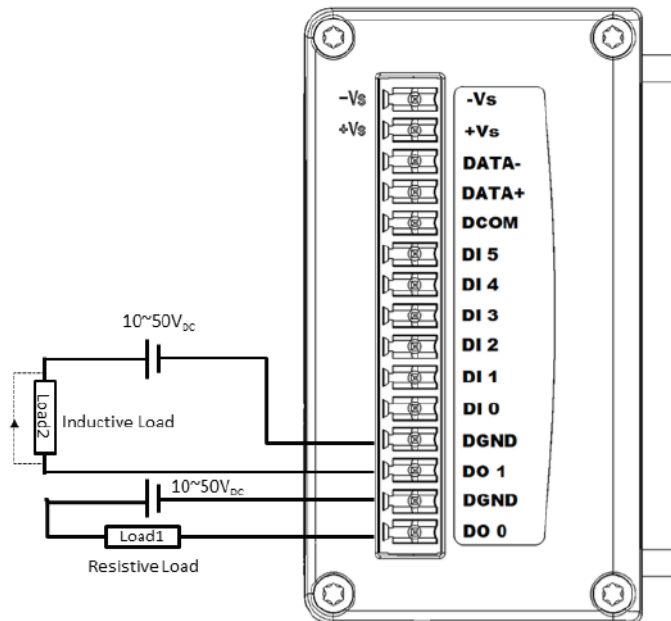


Figure 2.10 WISE-S250 Digital Output Wiring Diagram



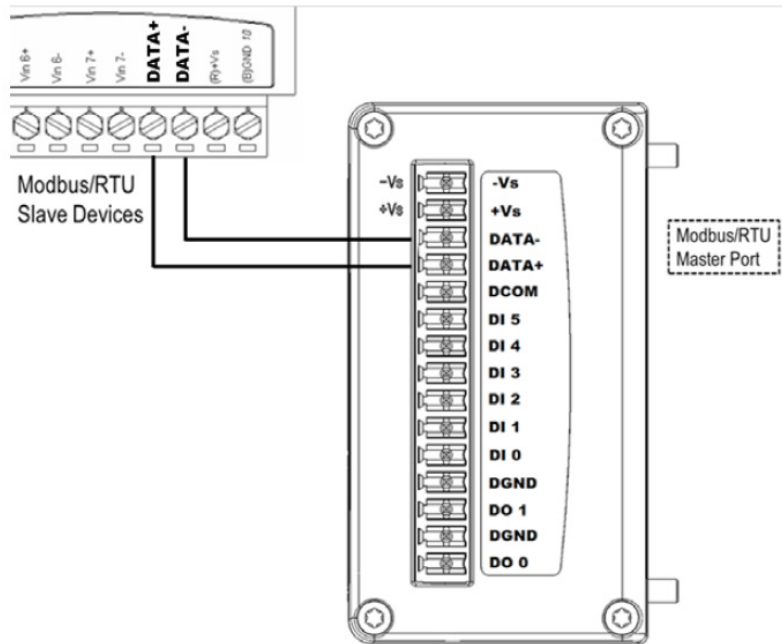


Figure 2.11 WISE-S250 RS-485 Wiring Diagram

# WISE-S251

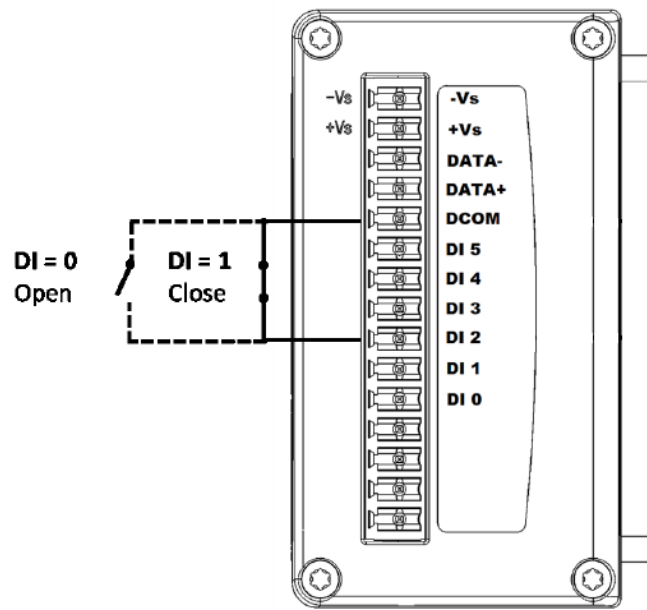


Figure 2.12 WISE-S251 Digital Input Wiring Diagram

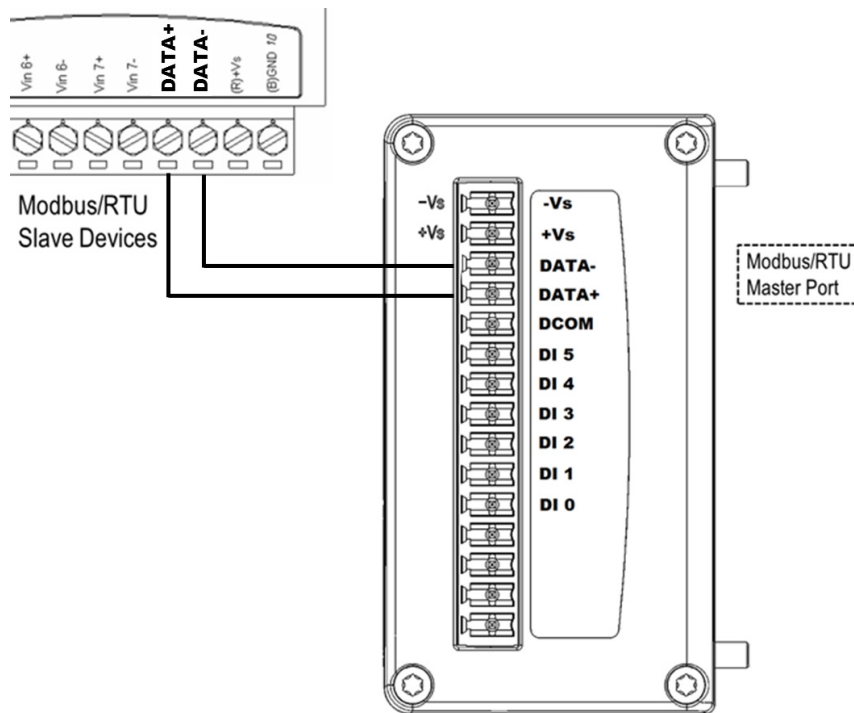


Figure 2.13 WISE-S251 RS-485 Wiring Diagram

## 2.7 WISE-4210 Node Block Diagram

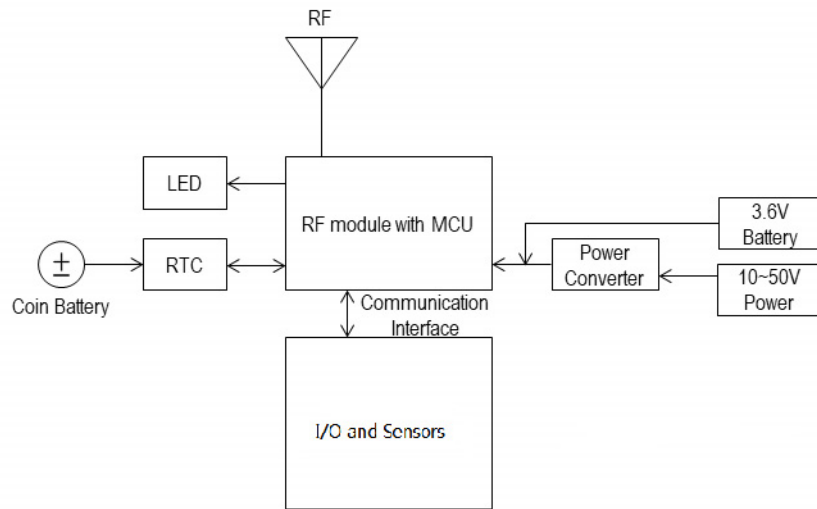


Figure 2.14 WISE-4210 Node Block Diagram



# Chapter 3

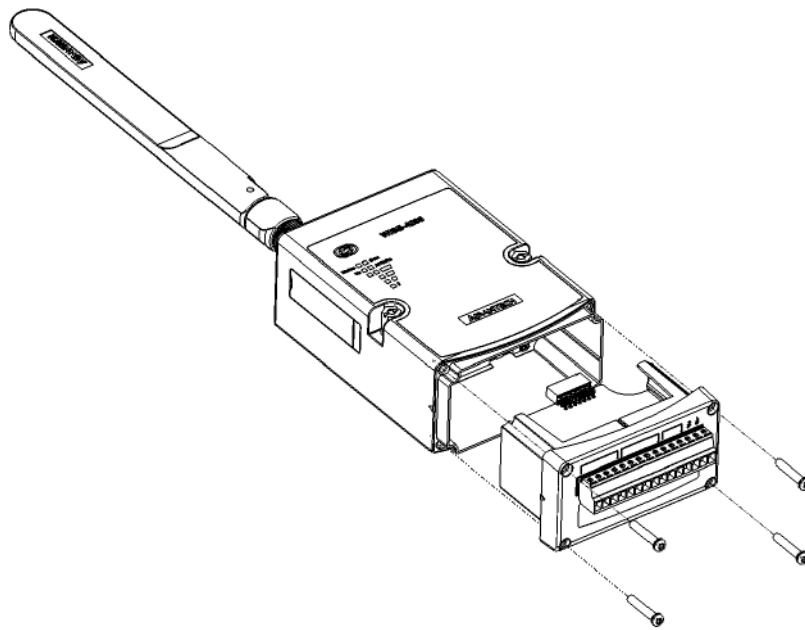
## Hardware Installations

The wireless sensor nodes for WISE-4210, like those for all WISE-4000 series modules, are designed as separate units. The procedure for installing these nodes in the module is explained in the following sections.

### 3.1 Modular Design

WISE-4210 features a modular design that supports various I/O configurations.

The benefit of a modular design is that the same wireless board can be leveraged by different I/O modules via a board-to-board connector. This allows users to install two I/O modules according to their specific usage requirements. Moreover, the modules can be affixed to WISE-4210 using the six screws provided (as shown in Figure 3.1).



**Figure 3.1 I/O Module Installation**

## 3.2 Interface Introduction

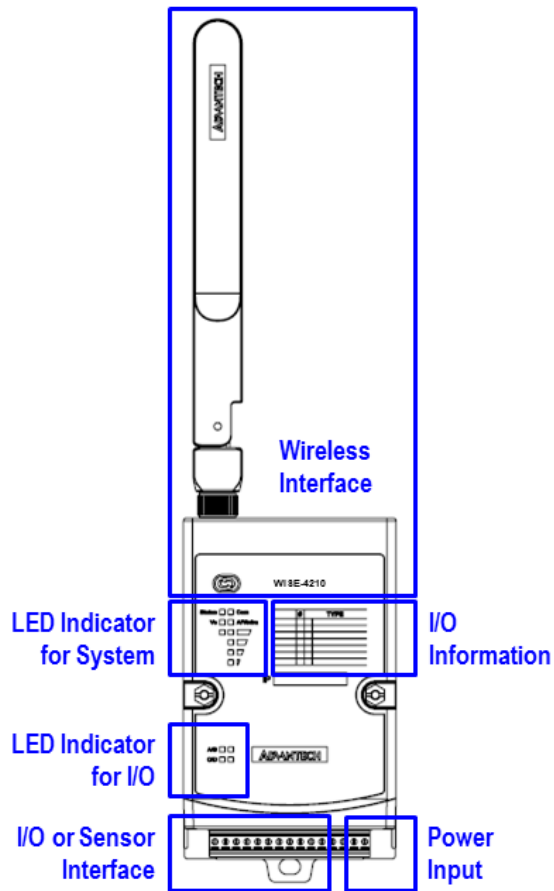


Figure 3.2 WISE-4210 Interface Introduction

### 3.3 Mounting

Like all WISE-4000 series modules, the WISE-4210 series of wireless sensor nodes are designed as compact units. Applicable installation methods are briefly described in the following sections.

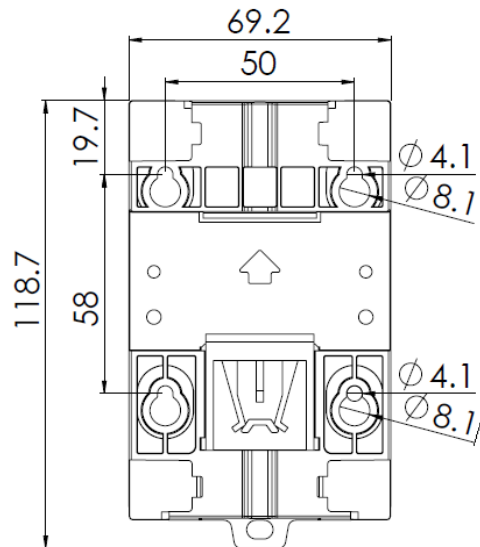


Figure 3.3 WISE-4000 Series Mounting Kit Dimensions

#### 3.3.1 DIN-Rail Mounting

WISE-4210 modules can be fixed to a cabinet with mounting rails. Use a flathead screwdriver to fasten the DIN rail adapter to your module. You can then use the end brackets included in the package in order to keep it from sliding.

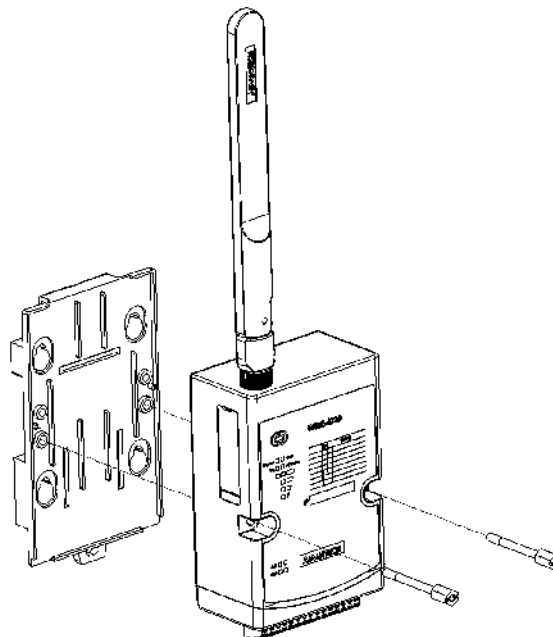
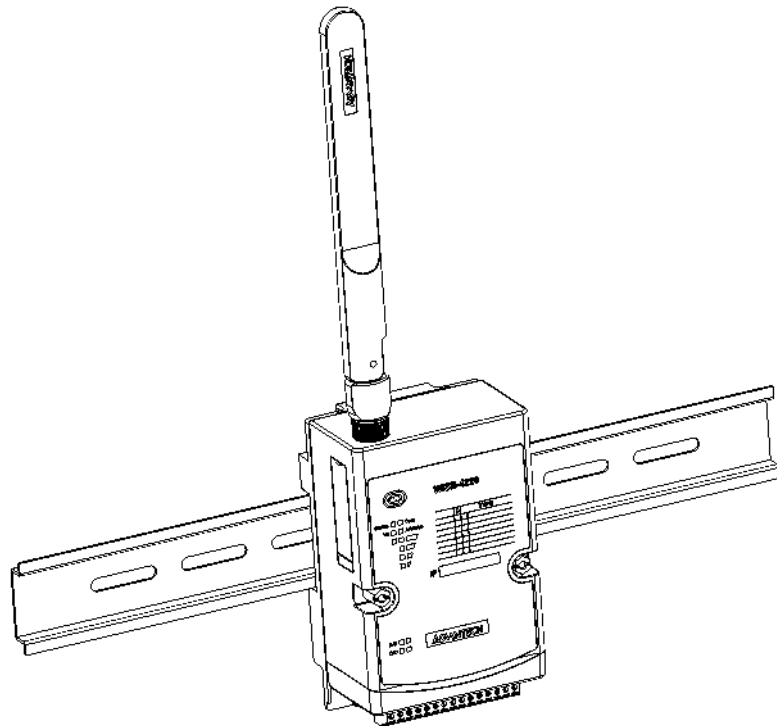
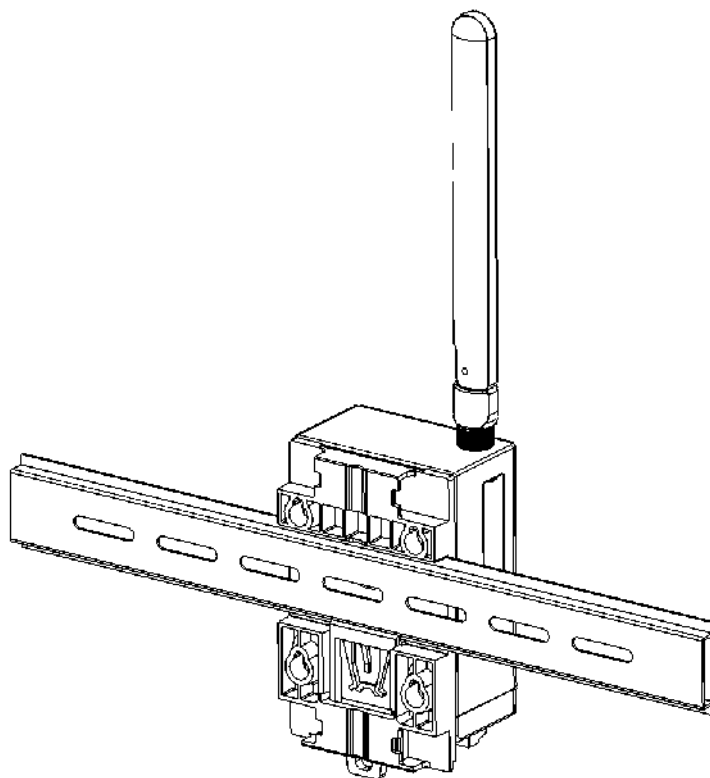


Figure 3.4 DIN-rail Mounting Installation





**Figure 3.5 DIN-rail Mounting (front)**



**Figure 3.6 DIN-rail Mounting (back)**

### 3.3.2 Wall Mounting

The plastic wall-mounting bracket that comes with the module can be used to mount it on a wall, panel, or cabinet.

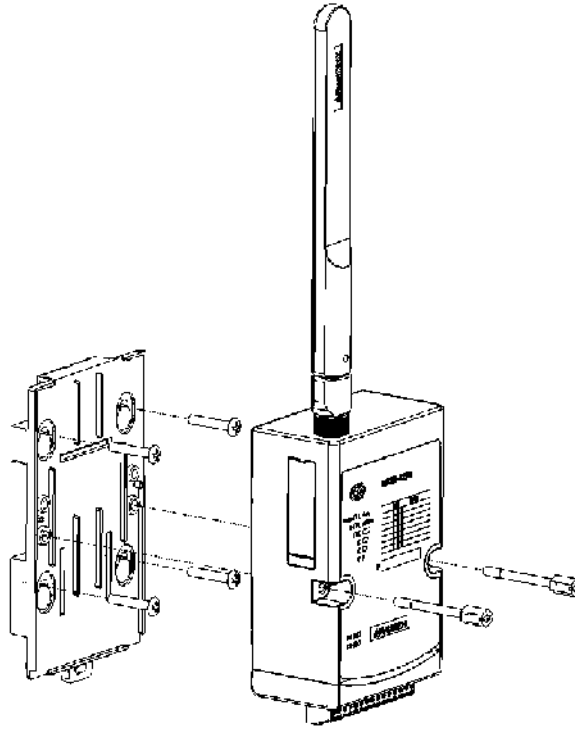
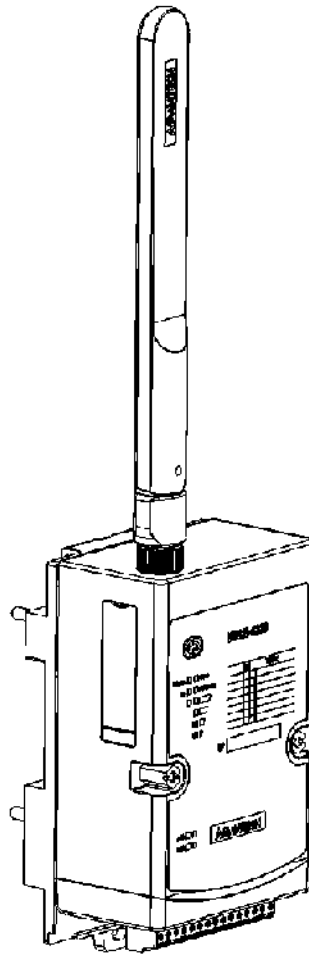


Figure 3.7 Wall Mounting Installation



**Figure 3.8 Wall Mounting Installation**

### 3.3.3 Pole Mounting

Put the pole mounting ring through the middle hole. Note that you should unlock the pole mounting ring with a screw driver before mounting. Mount the WISE-4200 module steadily onto the pole by locking the pole mounting ring tightly.

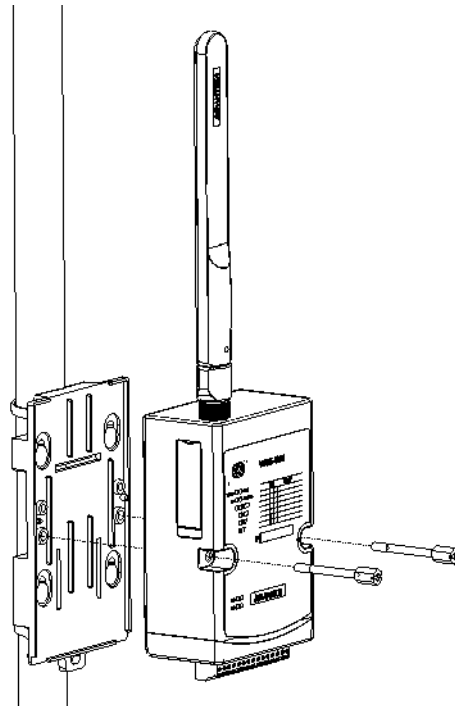


Figure 3.9 Pole Mounting (front)

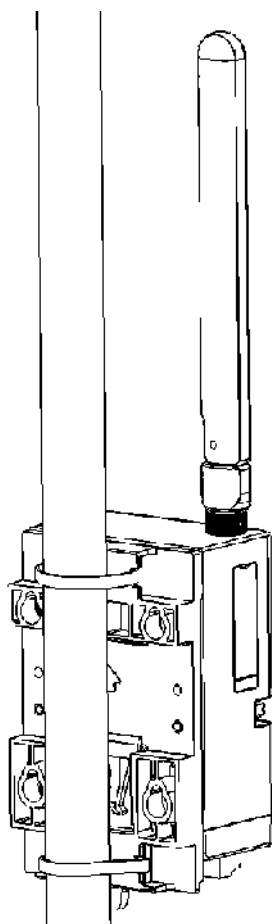


Figure 3.10 Pole Mounting (back)

## 3.4 Wiring and Connections

This section provides basic information on wiring the power supply and I/O units.

### 3.4.1 Power Supply Wiring

WISE-4210 modules are designed to support a standard industrial unregulated 24- $V_{DC}$  power supply. For other applications, they can also accept +10 to +50  $V_{DC}$  input with 200 mV of peak-to-peak power ripple. The immediate ripple voltage should be maintained between +10 and +50  $V_{DC}$ . The screw terminals labeled "+Vs" and "-Vs" are for the power supply wiring.

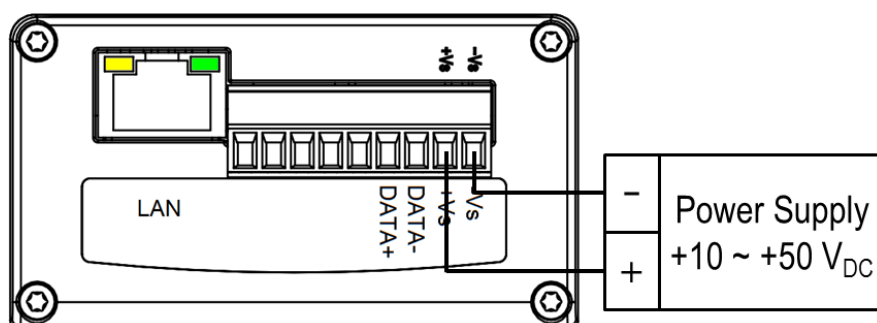


Figure 3.11 WISE-4210-AP Power Wiring

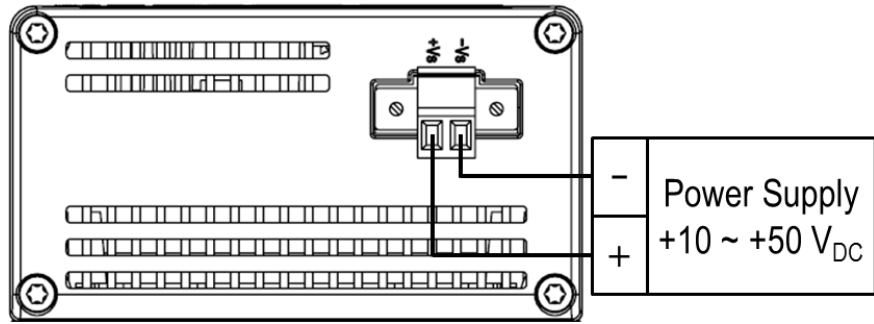


Figure 3.12 WISE-4210-S231 Power Wiring

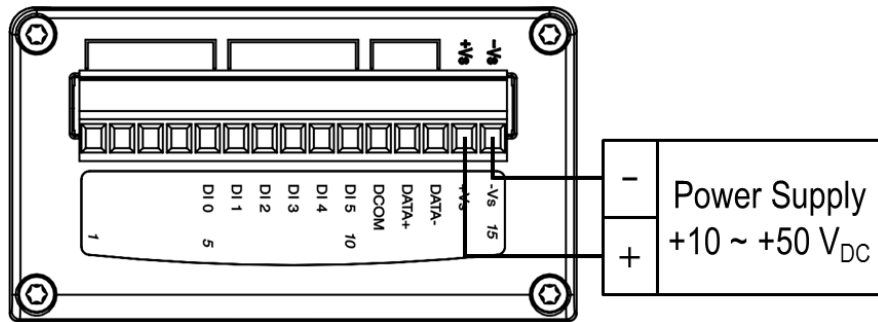


Figure 3.13 WISE-S200 Power Wiring

### 3.4.2 Battery Installation

Open the battery cover on the back of module. There are 3 battery sockets for 3.6 VDC AA batteries. Since the batteries are parallel connection, batteries are installed in same direction, positive pole (+) on left and negative pole (-) on right.



Figure 3.14 WISE-4210 Battery Socket

Open the rubber cover on the side of WISE module, there is a battery switch to turn on or turn off the battery power supply.

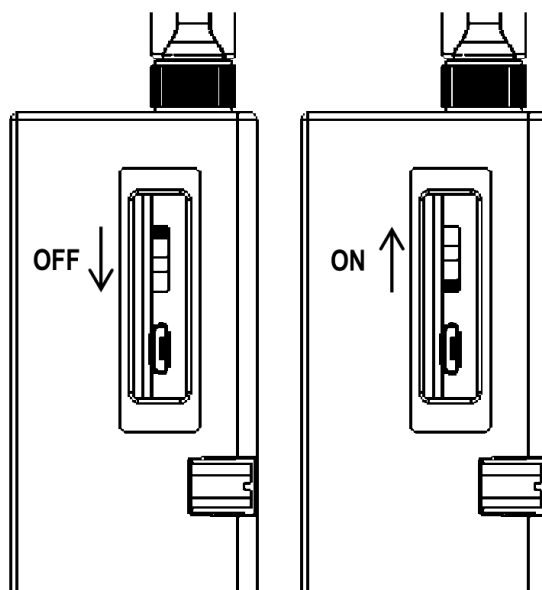


Figure 3.15 WISE-4210 Battery Switch

**Note!** This switch is only available for WISE-4210 nodes, not for WISE-4210-AP.



**Note!** Battery needs to order separately



- **1760002647-01** 3.6V/2500mAh AA Cylindrical Battery (non-rechargeable)

### 3.4.3 I/O Units

WISE-4210 uses a plug-in screw terminal block for the interface between WISE-4210 and field devices. The following information is critical when connecting electrical devices to I/O modules.

- Use the correct wire gauge (note that the terminal block accepts wires from 0.5 to 2.5 mm)
- Use a continuous length of wire (do not join separate wires to form a continuous length)
- Use the shortest wire length possible
- Use wire trays for routing wherever possible
- Avoid running wires near to high-energy wiring
- Avoid running input wiring near output wiring
- Avoid creating sharp bends or kinks in the wires





# Chapter 4

## System Configuration

## 4.1 Connection

### 4.1.1 WISE-4210-AP Connection

WISE-4210 uses the RJ-45 LAN port for configuration. Connect your computer to Ethernet port of the WISE module with RJ-45 cross-over Ethernet cable, and configure the IP address of your computer as same IP domain as default IP address of module: 10.0.0.1

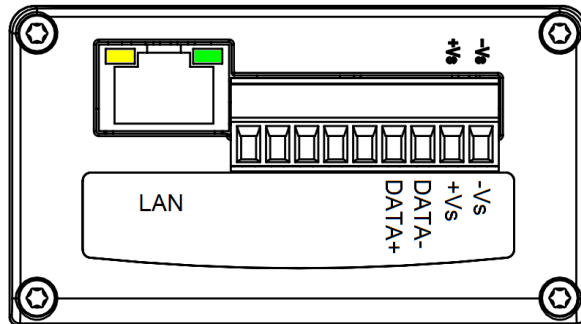


Figure 4.1 WISE-4210-AP LAN port

### 4.1.2 WISE-4210-Sxxx Node Connection

WISE-4210-Sxxx node uses the micro-B USB port for configuration. After removing the rubber cover on the side of the WISE module, there is a micro-B connector. Connect this port to the computer's USB port for configuration. The USB driver would be needed for creating a virtual COM port on the computer. Please refer to the following link to get the latest USB driver: CP210x USB to UART Bridge VCP Drivers (<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>)

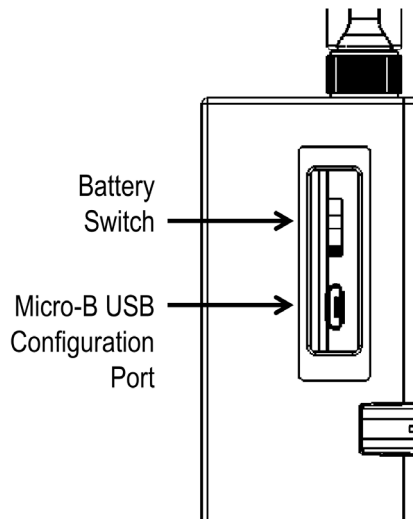


Figure 4.2 USB configuration port of WISE-4210 node

**Note!** Micro-B USB cable for configuring WISE-4210 nodes is available for ordered:



- **1700023619-01** 1M micro USB type-B male to USB type-A male cable

## 4.2 Configuring WISE-4210-AP with Browser

### 4.2.1 System Requirements

The web utility of WISE-4210-AP is developed with public HTML 5, but for detailed information and data transmission mode, the type of web utility will depend on the web page of the operating system.

For mobile devices, the minimum system requirements of web browsers are as below:

- Safari 6 in Apple iOS
- Web Browser in Google Android 4.0 (Ice Cream Sandwich)
- Chrome in Google Android 4.0 (Ice Cream Sandwich)

Mobile Browser	Chrome	Android	Safari
Configuration	Y	Y	Y
File Upload	N	N	N
Data Log Chart	Y	Y	Y
Data Log Export	N	N	N

For PC platforms, the minimum requirements of web browsers are as below:

- Internet Explorer (version 11)
- Google Chrome (version 30)
- Mozilla Firefox (version 25)

Mobile Browser	Chrome	Firefox	Safari	IE11	IE10
Configuration	Y	Y	Y	Y	Y
File Upload	Y	Y	N	Y	N
Data Log Chart	Y	Y	Y	Y	Y
Data Log Export	Y	Y	N	N	N

### 4.2.2 Factory Default Settings

- IP Mode: Static IP Address
- Default IP: 10.0.0.1
- Subnet Mask: 255.0.0.0
- Default Gateway: 0.0.0.0
- IP Mode: Static
- HTTP Port: 80

### 4.2.3 Module Authorization

Account	Default Password	Access Ability
root	00000000	All privileges
admin	00000000	All privileges except access control configuration
user	00000000	View module status only. Not allow to change configurations

Functions	Account		
	root	admin	user
Device information	View	View	View
Device setting	Edit	Edit	Deny
System Restart	Edit	Edit	Edit
Module Locate	Edit	Edit	Edit
Change passwords	Edit	Deny	Deny
Reset Password	Edit	Deny	Deny
Reset to default	Edit	Deny	Deny
Access control configurations	Edit	Edit	Deny
Group configurations	Edit	Edit	Deny
Download/upload processes	Edit	Edit	Deny
Network configurations	Edit	Edit	View
I/O configurations	Edit	Edit	View
I/O statuses monitor	View	View	View
Reset AI calibration to default	Edit	Deny	Deny
MODBUS addresses	Edit	Edit	View
Data log configuration and query	Edit	Edit	View
Clear data log	Edit	Edit	Deny

## 4.3 Install WISE Studio and Configure End Devices

**Step 1.** Download and install WISE Studio through:

[https://support.advantech.com/support/new\\_default.aspx](https://support.advantech.com/support/new_default.aspx)

**Step 2.** Execute WISE Studio

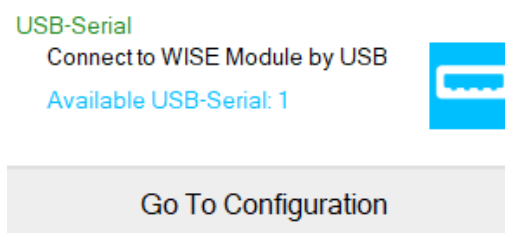
**Step 3.** Power up WISE-4210 using batteries or line power.

**Step 4.** Use a USB cable to communicate between WISE-4210 and the computer.

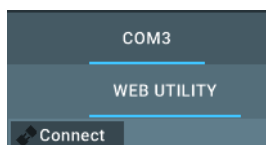
(Please take note the USB cable is not able to power up the device.)

**Step 5.** Click "Go to Configuration" where it shows "available USB-Serial" in USB-Serial box. (If the device cannot be connected through USB, please install *CP210x USB to UART Bridge VCP Drivers* from the following website:

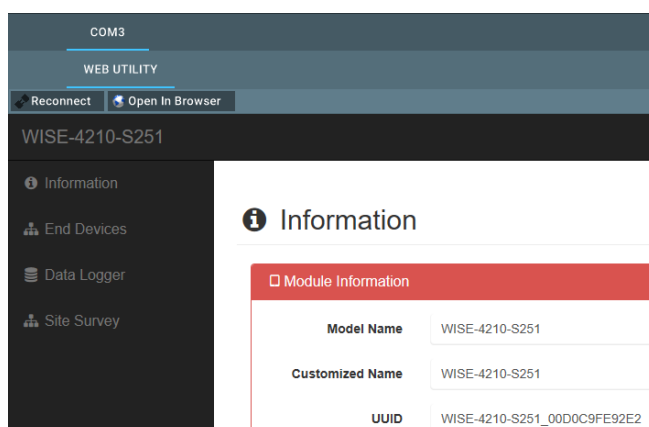
<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>)



**Step 6.** Click "Connect" to access the end device.



**Step 7.** Once everything is all set, you should be successfully into the configuration page.



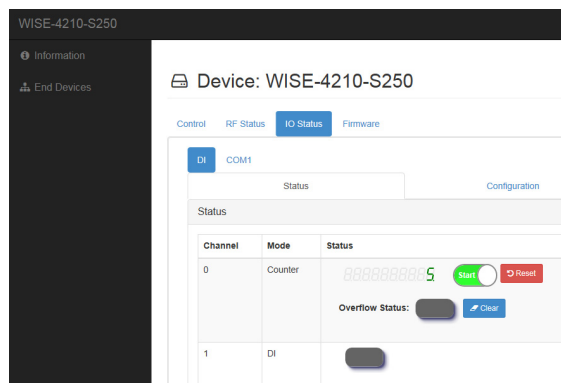
## 4.4 Connection between AP and Nodes

The first step of the connection between WISE-4210 end node devices and WISE-4210-AP is to configure the units in the same network with the same frequency range. Please go to "**End Devices \ RF Status \ Configuration**" to configure the RF module by following the instructions below.

- **RF Operation Mode:** WISE-4210 end node devices support "Push Mode", communication from the end node device to AP is uplink only, no downlink.
- **Data Rate (bps):** Lower data rate is helpful of extending communication range, while higher data rates can reduce the communication time which allows more data to be uploaded to AP in the same period of time.
- **Tx Power (dBm):** Lower Tx power helps to reduce the power consumption and extend longer battery life; higher Tx power enhances the communication distance.
- **Baseband (kHz):** If several WISE-4210-AP or sub-GHz networks are in the same area, users can select different base bands to reduce the interference of each network. Note that each WISE-4210 end node devices in the same network should use the same baseband as WISE-4210-AP.



Once the network configuration is finished, go to "**End Devices \ IO Status**" for I/O function configuration.



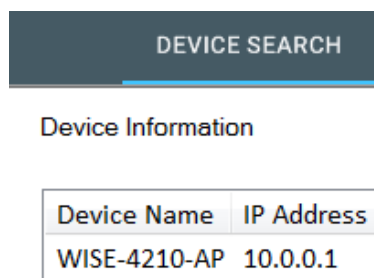
## 4.5 WISE-4210-AP Configuration

**Step 1.** The default IP address of WISE-4210-AP is 10.0.0.1, if you are not able to access WISE-4210-AP, please follow the steps below to search the IP address of WISE-4210-AP.

**Step 2.** Configure the Ethernet adapter to 10.0.0.1 IP address. In the following figure, the IP address is configured as 10.0.0.100. Find the Ethernet box in WISE Studio, and click "**Go to Configuration**"

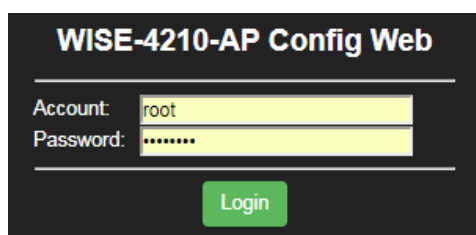


**Step 3.** After the above steps, WISE Studio will search WISE-4210-AP, and you will see the IP address on the **Device Information** screen.

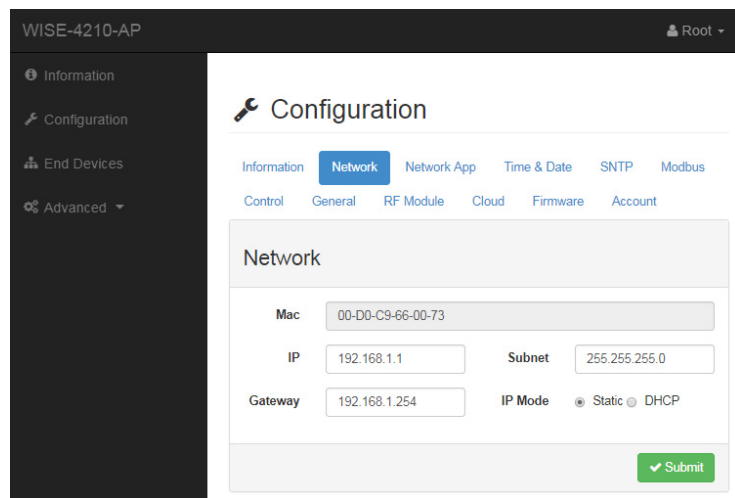


**Step 4.** Enter the IP address of WISE-4210-AP in the browser, or you can keep using WISE Studio to make further configurations.

The default account and password of WISE-4210-AP to log into the web page is **root** and **00000000**. Click "Login".



**Step 5.** Go to "**Configuration \ Network**" to configure LAN port parameters of WISE-4210-AP.



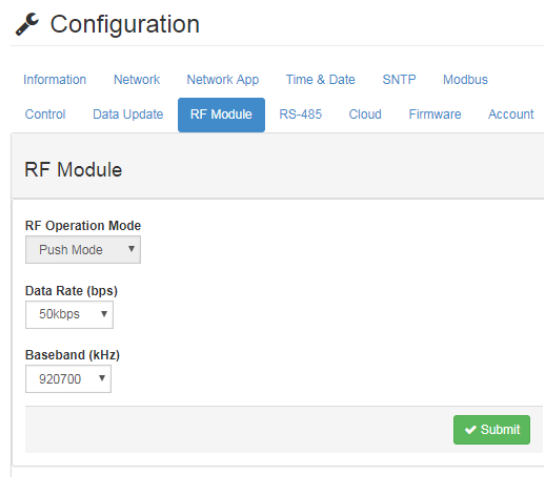
The screenshot shows the WISE-4210-AP web interface. The top navigation bar includes "Information", "Network" (selected), "Network App", "Time & Date", "SNTP", and "Modbus". Below this, there are sub-tabs: "Control", "General", "RF Module", "Cloud", "Firmware", and "Account". The main content area is titled "Network" and contains the following fields:

- Mac: 00-D0-C9-66-00-73
- IP: 192.168.1.1
- Subnet: 255.255.255.0
- Gateway: 192.168.1.254
- IP Mode:  Static  DHCP

A green "Submit" button is located at the bottom right of the form.

**Step 6.** Go to "**Configuration \ RF Module**" to configure the RF module.

- **RF Operation Mode:** WISE-4210 end node devices support "Push Mode", communication from the end node device to AP is uplink only, no downlink.
- **Data Rate (bps):** Lower data rates are helpful for extending communication ranges, while higher data rates can reduce the communication time which allows more data to be uploaded to AP in the same period of time.
- **Baseband (kHz):** If several WISE-4210-AP or sub-GHz networks are in the same area, users can select different base bands to reduce the interference of each network. Note that each WISE-4210 end node device in the same network should use the same baseband as WISE-4210-AP.



The screenshot shows the WISE-4210-AP web interface. The top navigation bar includes "Information", "Network", "Network App", "Time & Date", "SNTP", and "Modbus". Below this, there are sub-tabs: "Control", "Data Update", "RF Module" (selected), "RS-485", "Cloud", "Firmware", and "Account". The main content area is titled "RF Module" and contains the following fields:

- RF Operation Mode: Push Mode
- Data Rate (bps): 50kbps
- Baseband (kHz): 920700

A green "Submit" button is located at the bottom right of the form.



## 4.6 Setup WISE-4210 Network

After configuring all end devices into the network with WISE-4210-AP, users can go to **"End Devices"** tab to see **"End Device List"**.

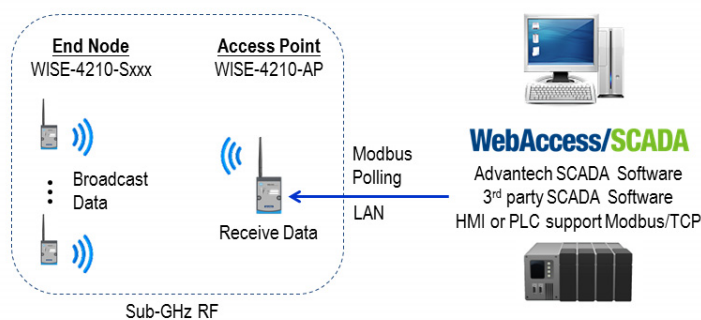
- **MAC Address:** The unique identifier of each end device.
- **Modbus ID:** Modbus ID is automatically assigned by WISE-4210-AP. User can configure Modbus ID manually in **"Configuration \ Modbus \ Modbus ID"**.
- **RSSI (dBm):** Signal strength when data updated from end device to AP. RSSI will be updated when WISE-4210-AP is receiving data from end node devices. It is suggested RSSI is higher than -100dBm.
- **Inactive Time:** Elapsed time since WISE-4210-AP received data from the end node devices. If end node devices update data every 5 seconds and they have good wireless signal quality, **Inactive Time** will go back to 0 or 1 every 5 seconds.

### End Device List

List 16 entries

MAC Address	Modbus ID	RSSI	Inactive Time	Battery Status	Battery Level	RTC Battery Status	Power Source	Device Status
4B0012CD11AC	1	-71	2	No Error	100 %	No Error	Line power, Device battery	Active
4B0012CC4166	2	-72	4	No Error	100 %	No Error	Line power, Device battery	Active
4B0012CD140B	3	-62	2	No Error	100 %	No Error	Line power, Device battery	Active

## 4.7 Access WISE-4210 I/O Data by Modbus/TCP Protocol



Go to **"Configuration \ Modbus \ Modbus ID"** to check MAC address of AP and each end node device, and to configure the Modbus ID. Use Modbus/TCP protocol to access each end device by WISE-4210-AP, polling different Modbus ID for different end node devices, or AP.

# Configuration

Information   Network   Network App   Time & Date   SNTP   **Modbus**   Control

Data Update   RF Module   RS-485   Cloud   Firmware   Account

Modbus Address








Modbus ID

## Modbus ID


### AP

Modbus ID

### End Devices

End Device MAC	Modbus ID	
4B0012CC4166	<input type="text" value="2"/>	 Delete
4B0012CD140B	<input type="text" value="3"/>	 Delete
4B0012CC414D	<input type="text" value="4"/>	 Delete
4B0012CD11EB	<input type="text" value="5"/>	 Delete
4B0012CD11AC	<input type="text" value="1"/>	 Delete
4B0012CD1427	<input type="text" value="6"/>	 Delete
4B0008FB79A1	<input type="text" value="7"/>	 Delete

 Submit

 Delete All End Devices

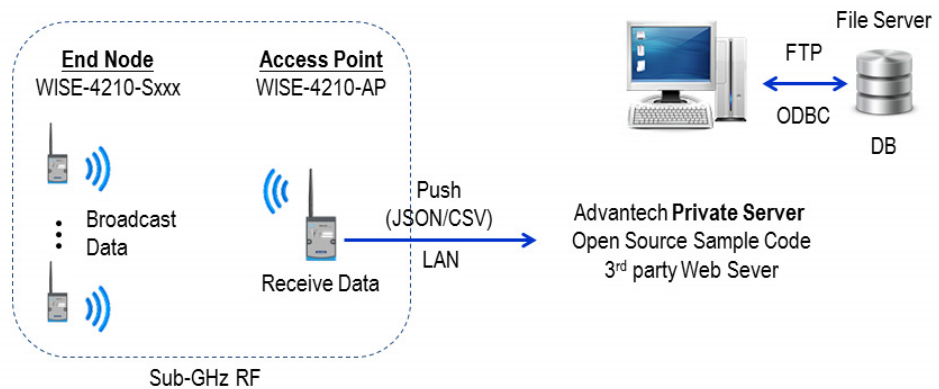
## 1. Modbus Address Table for WISE-4210-S231

Modbus Address	Sensor Input
40501	Temperature
40502	Humidity
45302	RSSI (-dBm)

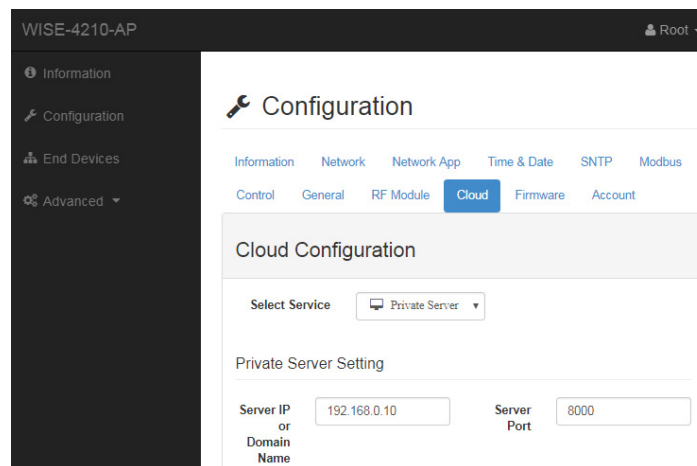
## 2. Modbus Address Table for WISE-4210-S250

Modbus Address	I/O
00001	DI0
00002	DI1
00003	DI2
00004	DI3
00005	DI4
00006	DI5
01001~01032	RS-458 Coils
41001~41032	RS-458 Registers
45302	RSSI (-dBm)

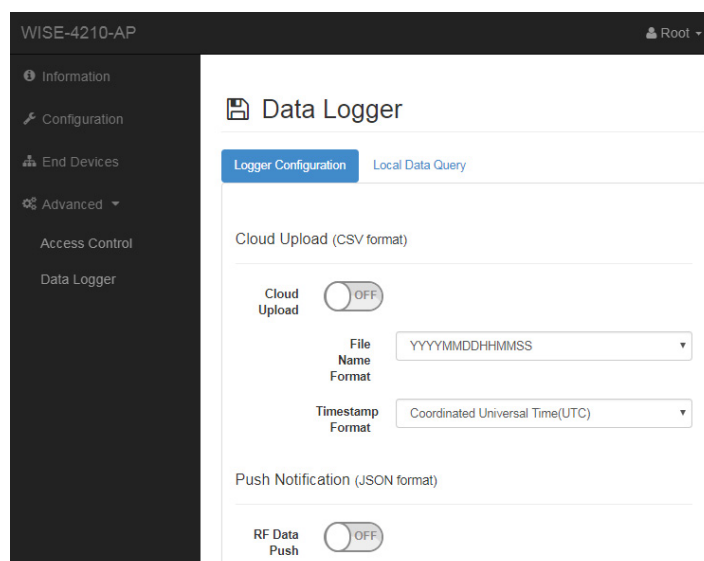
## 4.8 Push WISE-4210 data by RESTful Web Service



**Step 1. Configure the Private Server in "Configuration \ Cloud"**



**Step 2. Enable the Data Logger function in "Advanced \ Data Logger \ Logger Configuration"**



## 4.9 Access WISE-4210 I/O Data by RESTful API

### /lpwan\_message/slot\_macID

Description	Retrieves the log data in system memory.				
URL Structure	<b>http://10.0.0.1/lpwan_message/slot_macID</b>				
HTTP Method	GET: According to the setting of filtering, server returns the all/partial of push data.				
	Request: <b>GET / lpwan_message/slot_macID</b>				
	[Example]: <ul style="list-style-type: none"> <li>Request : <b>GET /lpwan_message/slot_AD4210112233 for WISE-4210 module</b></li> </ul>				
	Content-type: application/json Response: 200 OK				
GET	<pre>{   "TIM": "2014-11-11T15:48:32+08:00",   "UID": "WISE-4210-AP_00D0C90E8738",   "MAC": "00-D0-C9-FE-16-01",   "Rssi": -33,   "Record" :   [     [0, 0, 1, 0],     [0, 0, 2, 50],     [0, 0, 3, 10],     [0, 1, 4, 0],     [0, 1, 5, 456],     [0, 1, 6, 0],     [0, 0, 30, 0],     [0, 0, 31, 16],     [0, 0, 32, 32767]   ] }</pre>				
	<ul style="list-style-type: none"> <li>JSON array name definition:</li> </ul>				
	Field	Abbreviation	Data Type		
	Array of I/O records	Record	Array		
	<ul style="list-style-type: none"> <li>Resource value definitions:</li> </ul>				
	Field	Abbreviation	Data Type	Property	Description

				<p>Timestamp of the storage</p> <ul style="list-style-type: none"> <li>– Coordinated Universal Time (UTC)</li> </ul> <p><b>Ex.</b> "1415757750" corresponds to November 12, 2014, 2:02:30 am, Standard Time. (meanwhile, 2014, 10:02:30 am, Taipei Time.)</p> <ul style="list-style-type: none"> <li>– Local Date/Time according GMT time zone (ISO 8601)</li> </ul> <p><b>Ex.</b> "1994-11-05T08:15:30-05:00" corresponds to November 5, 1994, 8:15:30 am, US Eastern Standard Time.</p>
Timestamp	TIM	String	R	
UUID	UID	String	R	Universally Unique Identifier (UUID) Max. 32 characters
MAC ID	MAC	String	R	MAC address, ex, "00-D0-C9-F0-63-F7"
RSSI	Rssi	Number	R	The RSSI value
Recording message	Record	Array	R	<ul style="list-style-type: none"> <li>* The data type in array is as follows. [Number, Number, Number, Number]</li> <li>* The information in array is as follows. [Slot-index, Channel-index, I/O-type-index, I/O-value]</li> <li>* See I/O Type Index Table for I/O type-index</li> </ul>

[I/O Type Index Table]

<b>Index</b>	<b>Recording I/O-type of the storage</b>
0	Invalid
1	DI Logic Status
2	DI Counter value
3	DI Frequency value
4	DO Logic Status
5	DO Absolute Pulse Output value
6	DO Incremental Pulse Output Value
7	AI value
8	Historical Maximum AI value
9	Historical Minimum AI value
10	AI value after scaling
11	AI status flags
12	AI engineering value
13	Historical Maximum AI engineering value
14	Historical Minimum AI engineering value
24	DI period (counter mode)
25	DI low-to-high trigger tick
30	Expansion bit data
31	Expansion bit error code
32	Expansion word data
33	Expansion word error code
40	Sensor engineering value
41	Sensor maximum engineering value
42	Sensor minimum engineering value
43	Sensor status
44	Sensor alarm status

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