User Manual

WISE-4220 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.

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 merchandize 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.

Declaration of Conformity

CE

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.

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. Please go to Section 1.6 for package list.

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.

- ■ To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- ■ 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 警語

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。

Federal Communication Commission Interference Statement

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.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- ■ Reorient or relocate the receiving antenna.
- ■ Increase the separation between the equipment and receiver.
- ■ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ■ Consult the dealer or an experienced radio/TV technician for help.

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

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

Radiation Exposure Statement:

This equipment complies with FCC 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.

FOR COUNTRY CODE SELECTION USAGE (WLAN DEVICES)

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all WiFi product marketed in US must fixed to US operation channels only.

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.

Contents

Chapter 1

Product Overview

1.1 Series Family and Specifications

Function	Model	Description
Wireless Sensor Node	WISE-4220-S231	IoT Wireless Sensor Node with Temperature/ Humidity Sensors

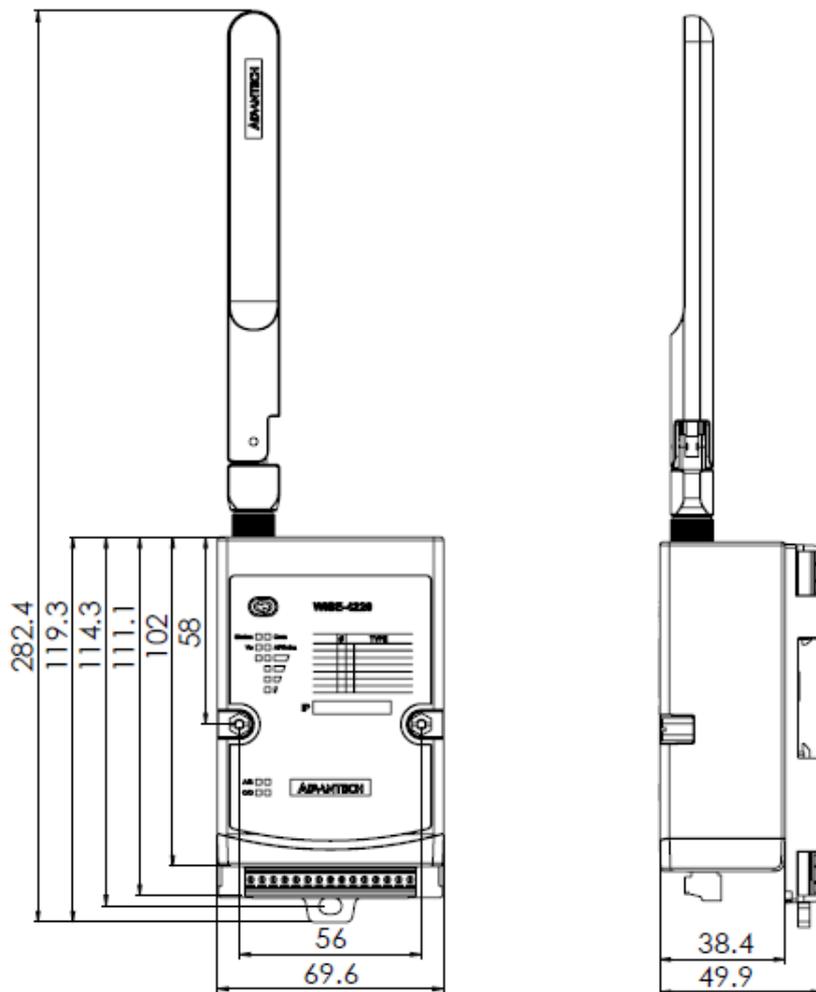## 1.2 Mechanical Design and Dimensions

1.2.1 WISE-4220 Series Dimension

Figure 1.1 ME Dimension Front & Side

1.3 Switch

Open the housing behide the WISE-4220 module, you can see a switch inside. The battery socket is no function for WISE-4220. It is reserved for WISE-4210 series.

Switch	Description	Position	ON (Default)	OFF
SW1	Operation Mode	P1	Normal Mode	Initial Mode
		P2	N/A	N/A

Note! *After the position 1 of SW1 been changed, users need to power on the module again to apply the operation mode.*

1.4 LED Definition
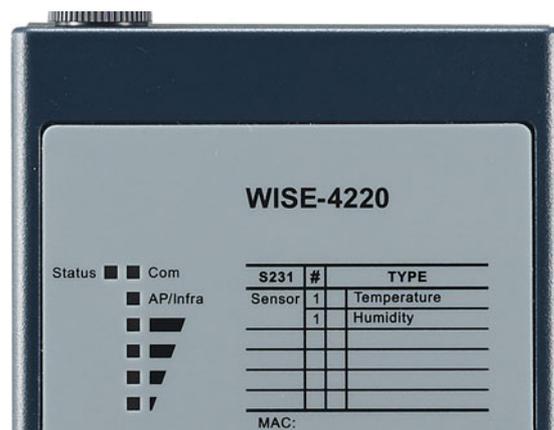
LED	Color	Indication	Behavior
Status	Green	Blink	2Hz: Wait for connection 0.5Hz: Network Connected
		ON 30 Sec	When enable LOCATE function
Com	Yellow	Blink	When TX/RX data in transmission
AP/Infra	Green	ON	Limited AP Mode
		OFF	Station Mode
Signal Strength	Yellow	ON *4	Full Signal
		ON *3	Good Signal
		ON *2	Okay Signal
		ON *1	Poor Signal
		All OFF	No Signal / AP Module

1.5 Certification and Safety Standard

Electromagnetic Compatibility (EMC)
- CE
  - EN 55011:2009 +A1:2010 (Group I, Class B)
  - EN 55024:2010 +A1:2015
  - EN 55032:2015 +AC:2016, Class B
  - EN 61000-4-2:2009
  - EN 61000-4-3:2006 +A1:2008 +A2:2010
  - EN 61000-4-4:2012
  - EN 61000-4-5:2014
  - EN 61000-4-6:2014
  - EN 61000-4-8:2010
  - EN 61000-6-1:2017
  - EN 61000-6-2:2017
  - EN 61000-6-3:2007 +A1:2011 +AC:2012
  - EN 61000-6-4:2007 +A1:2011
  - EN 301 489-1 V2.1.1 (2017-02)
  - EN 301 489-17 V3.1.1 (2017-02)

- FCC
  - 47 CFR FCC Part 15, Subpart B, Class B
  - ICES-003:2016 Issue 6, Class B
  - ANSI C63.4:2014
- CISPR
  - CISPR 32:2015 +COR1:2016, Class B
  - AS/NZS CISPR 32:2015, Class B
- VCCI
  - -VCCI-CISPR 32:2016, Class B

Wireless Certification

- FCC ID: M82-WISE4220
  - 47 CFR FCC Part 15, Subpart C (Section 15.247)
  - ANSI C63.10:2013
- IC: 9404A-WISE4220
  - Canada RSS-247 Issue 2 (2017-02)
  - Canada RSS-Gen Issue 4 (2014-11)
  - ANSI C63.10:2013
- NCC
  - LP0002
  - ANSIC63.10:2013
- TELEC: 001-A08148
- RED: Processing
  - EN 300 328 V2.2.2 (2016-11)
  - EN 63211:2008
- RCM:
  - AS/NZS 2772.2:2011
  - AS/NZS 4268:2017
- SRRC: Processing

1.6 Package Information

WISE-4220-S231

- WISE-4220 module with bundle antenna and terminal connector x1
- Mounting bracket x1
- Quick startup manual with China RoHS declare

Chapter 2

General Specification

2.1　General Specification

2.1.1　WLAN Interface

- Network Modes
  - Infrastructure/Station (Wireless Client)
  - Limited AP (Wireless Server)
- Standard Conformance
  - Infrastructure/Station
    802.11b
    802.11g
    802.11n (2.4GHz only)
  - Limited AP
    802.11b
    802.11g

2.1.2　General

- I/O Connector: 3.5mm spacing plug-in screw terminal block
- Power Connector: 3.5mm spacing plug-in screw terminal block
- Watchdog Timer
  - System: 1.6 second
  - Communication
  - Programmable (FSV)
- RTC Accuracy: ±1 min/month
- Enclosure: PC
- Mounting: DIN 35 rail, wall, and stack
- Dimensions (W x H x D): 69 x 38 x 102 mm
- Operation Temperature: -25~70°C (-13~158°F)
- Storage Temperature: -40~85°C (-40~185°F)
- Operating Humidity: 10~ 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: External Power: 10 ~ 50 V_{DC}
- Power Consumption
  - WISE-4220-S231: 1.2 W @ 24 V_{DC}

2.1.4 Software

- Configuration Interface: Web Interface, Windows Utility
- Utility: Adam/Apax .NET Utility
- Driver: ADAM .NET Class Library
- Industrial Protocol: Modbus/TCP
- Supported Protocols: TCP/IP, UDP, HTTP, HTTPS, DHCP, ARP, SNTP
- Supports RESTful Web API in JSON format
- Supports Web Server in HTML5 with JavaScript & CSS3

2.2 WISE-4220-S231

2.2.1 I/O Specification

2.2.1.1 Temperature Sensor Input

- Operating Range: -25°C ~ 70°C (-4°F ~ 157.9°F)
- Data Resolution: 0.1 (°C/°F/K)
- Accuracy: ±1.0°C (Vertical Installation)
- Update Rate: Minimum 1 seconds
- Response Time: 15 seconds (Achieving 63% of a step function)
- Long Term Drift: 0.05°C/Year (0.09°F/Year)

2.2.1.2 Humidity Sensor Input

- Operating Range: 10~90% RH
- Resolution: 0.1% RH
- Accuracy:
  ±4% for 0%~50% RH
  ±6% for 50%~60% RH
  ±10% for 60%~90% RH
- Update Rate: Minimum 1 seconds
- Response Time: 10 seconds (Achieving 63% of a step function)
- Long Term Drift: 0.5% RH/Year

2.2.2 Pin Assignment
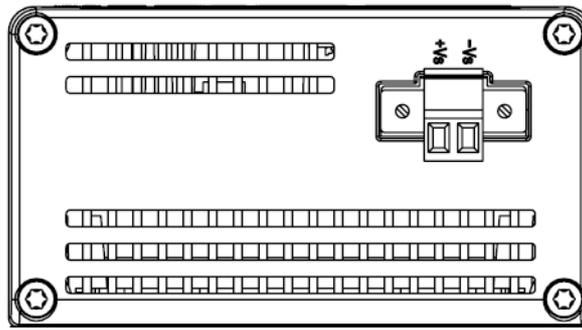
Figure 2.1 Pin Assignment

2.2.3 Block Diagram
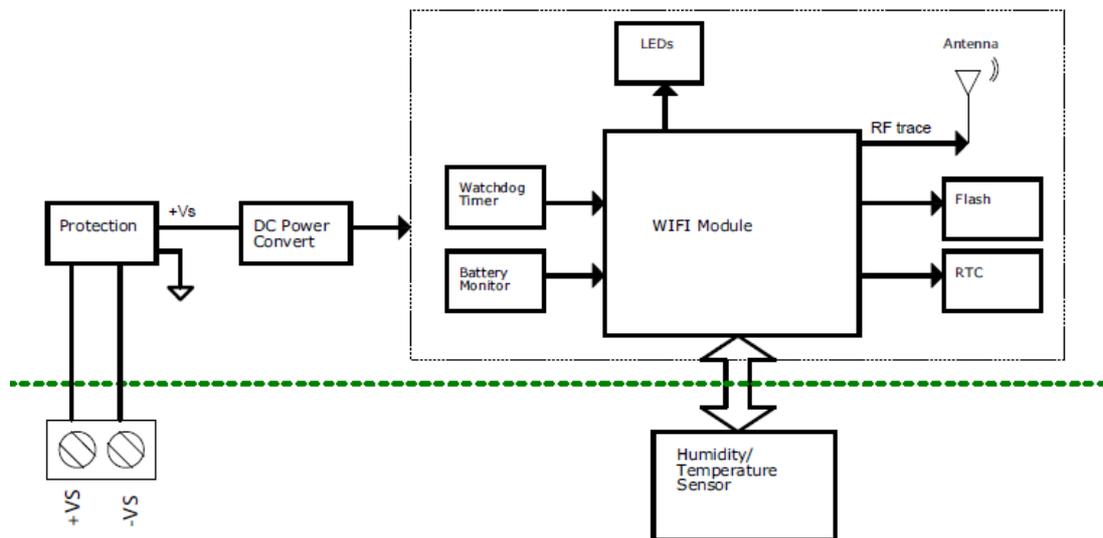
Figure 2.2 Block Diagram

Chapter 3

Hardware Installations

3.1 Interface Introduction

Detailed description of the WISE-4220 interface is shown below.
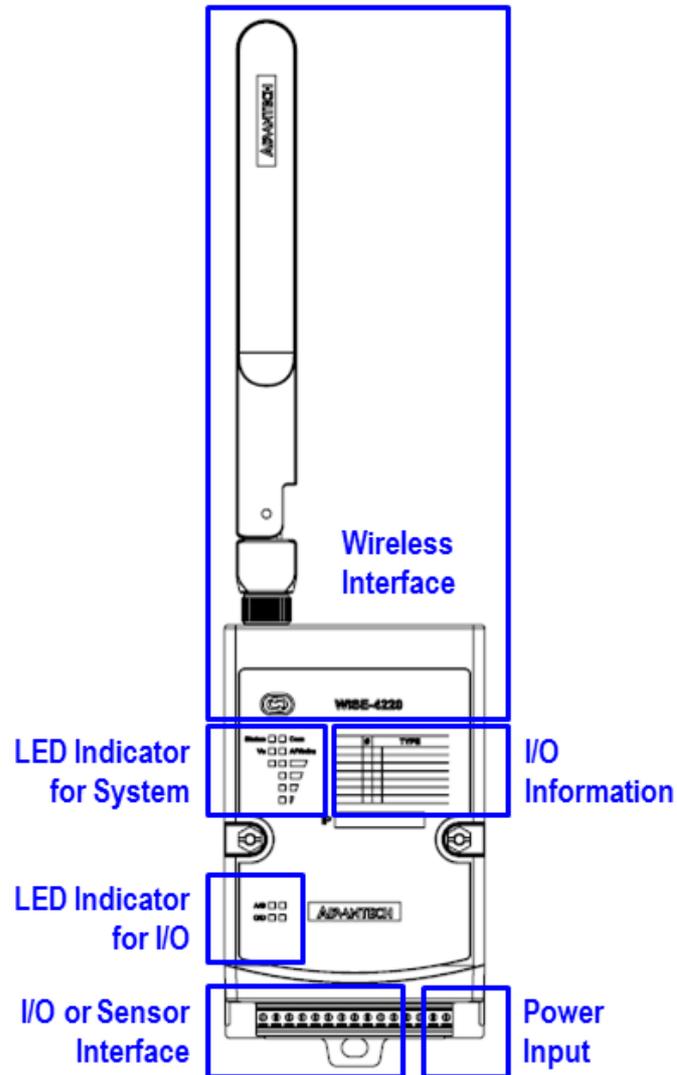
3.2 Mounting

WISE-4220 modules are designed as compact units and are allowed to be installed in the field site under the following methods.

3.2.1 DIN-Rail Mounting

The WISE-4220 module can also be fixed to the cabinet by using mounting rails. You need to assemble the DIN rail adapter to WISE-4220 module with flathead screw driver as below. When the module is mounted on a rail, you may also consider using end brackets at each end of the rail to keep the module from sliding horizontally along the rail.
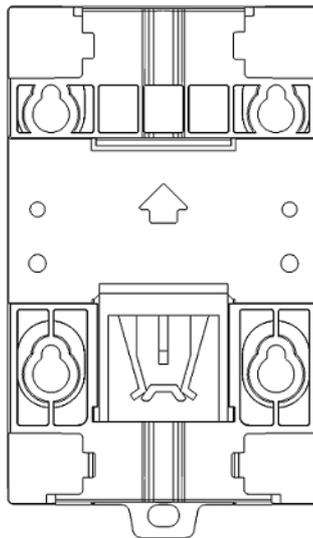
Figure 3.1 DIN Mounting Kit
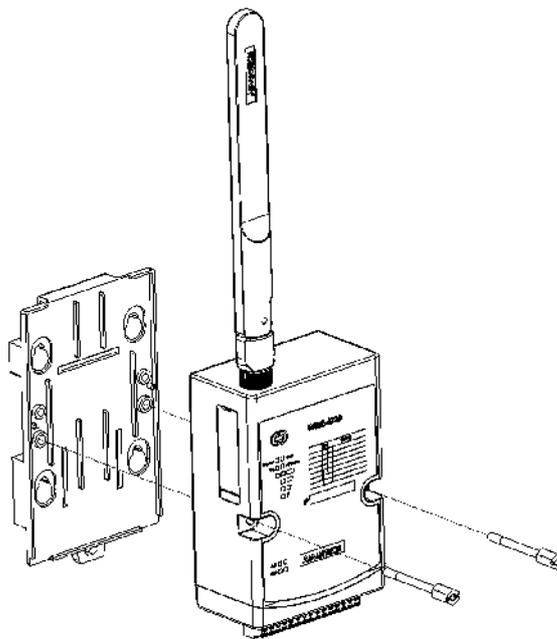
Figure 3.2 DIN Mounting Install

Figure 3.3 DIN Mounting Front

Figure 3.4 DIN Mounting Back

3.2.2 Wall Mounting

Each WISE-4220 module is packed with a plastic wall mounting bracket. Users can refer to the bracket dimensions and assembly steps to configure an optimal placement in a wall, panel, or cabinet.
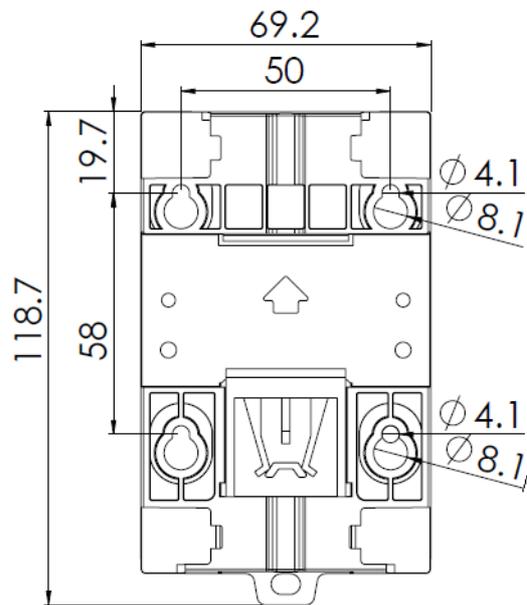
Figure 3.5 Wall Mounting Kit Dimension
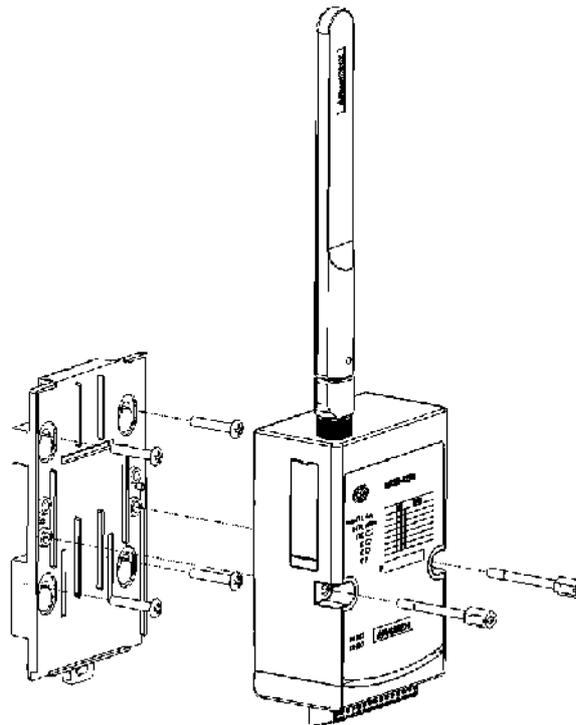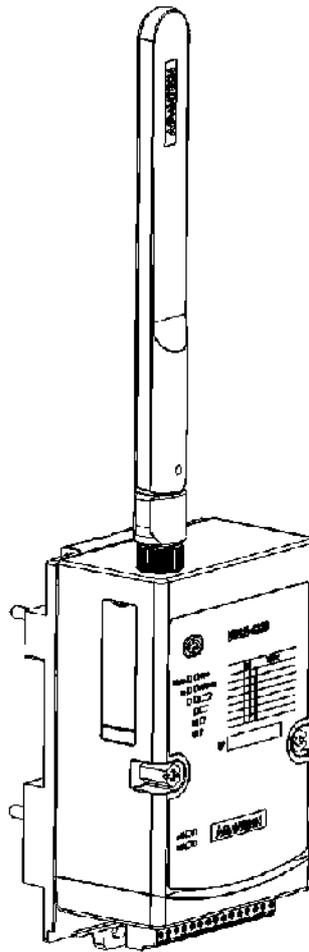

Figure 3.6 Wall Mounting Install 1

Figure 3.7 Wall Mounting Install 2

3.2.3 Pole Mounting

Put the pole mounting ring through the middle hole of it. Note that you should unlock the pole mounting ring with a screw driver before putting it through the device. Then mount the WISE-4220 module steadily to the pole by locking the pole mounting ring tightly.
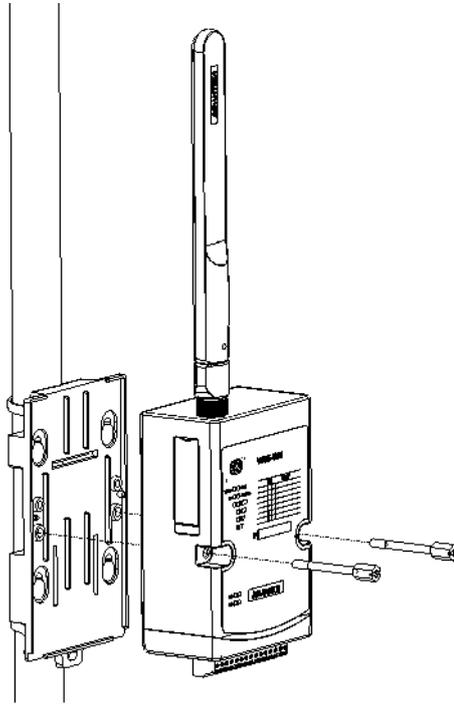
Figure 3.8 Polar Mounting Front
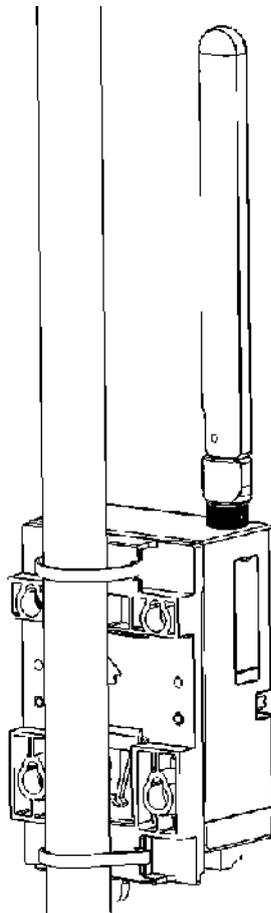
Figure 3.9 Polar Mounting Back

3.3 Wiring & Connections

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

3.3.1 Power Supply Wiring

The system of WISE-4220 is designed for a standard industrial unregulated 24 V_{DC} power supply. For further application, it can also accept +10 to +50 V_{DC} of power input, 200mV peak to peak of power ripple, and the immediate ripple voltage should be maintained between +10 and +50 V_{DC}. Screw terminals +Vs and -Vs are for power supply wiring.
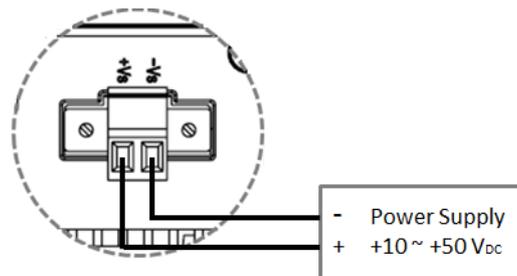

Figure 3.10 Power Wiring

3.3.2 I/O Units

The system uses a plug-in screw terminal block for the interface between I/O modules and field devices. The following information must be considered when connecting electrical devices to I/O modules.

- The terminal block accepts wires from 0.5 mm to 2.5 mm.
- Always use a continuous length of wire. Do not combine wires.
- Use the shortest possible wire length.
- Use wire trays for routing where possible.
- Avoid running wires near high-energy wiring.
- Avoid running input wiring in close proximity to output wiring.
- Avoid creating sharp bends in the wires.

Chapter 4

System Configuration

4.1 Connection

1. Plug a DC power source into the +Vs, -Vs pin of your module to turn on the power.

2. When users set the switch to "ON" as Section 1.3 shows, the module will be set to normal mode and the default setting for this operation mode is AP mode. If you want to set the module to Initial Mode (i.e. factory default mode), you can change position 1 of SW1 to "OFF". The module will only work in AP Mode when the module is in Initial Mode.
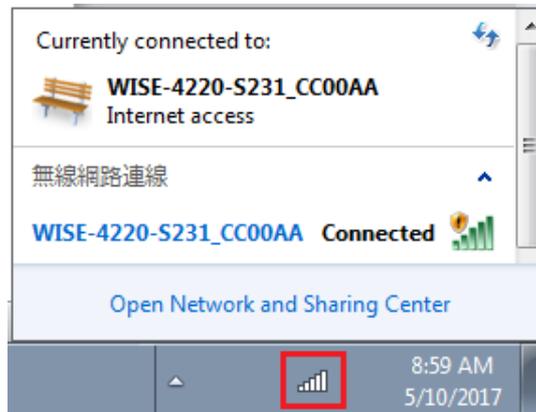
4.2 Configure WISE Using Web Interface

4.2.1 System Requirements

The web utility of WISE-4220 module is developed with public HTML 5, but for detailed indication and data transmission modes, the type of web utility will depend on 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

WISE-4220 Series

- Operation Mode: Normal Mode
- Wireless Mode: AP Mode
- IP Mode: Static IP Address
- Default IP: 192.168.1.1
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.1
- DHCP Server: Enabled
- Default Connection Timeout: 720 seconds
- 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

4.2.4 Operation Mode

The operation mode can be configured by switch SW1 on the back of module. Please refer to previous chapter for the detail of configuring SW1.

| Mode	WISE-4220 Series
Initial Mode	Fixed IP address: 192.168.1.1 Fixed Wi-Fi Mode: AP Mode
Normal Mode	Default IP address: 192.168.1.1 Default Wi-Fi Mode: AP Mode

4.2.5 Using Web Browser to Configure the Module

- Configure URL: http://IP_address/config
- Default URL: http://192.168.1.1/config
- Configuration Steps

4.2.5.1 Login Web Configuration Page
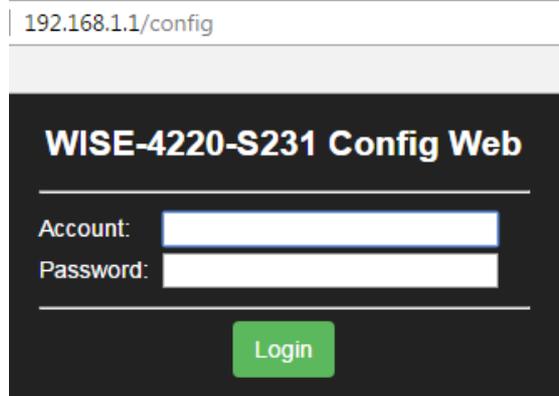
1. Connect your smartphone to your local Ethernet network and open the browser of your smartphone.
2. Enter IP address of module with "/config", for example, the default URL is http://192.168.1.1/config
3. Enter the account and password. Then click Login button.
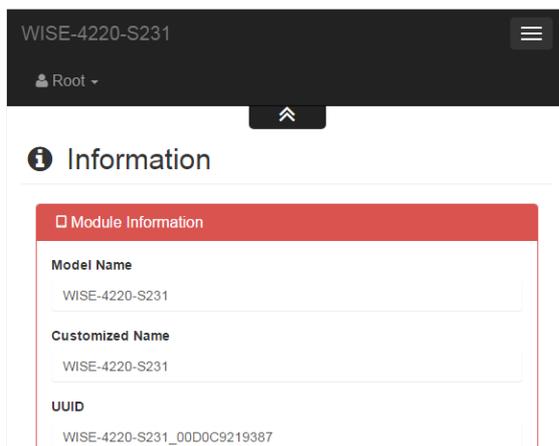
Login

4. After login, you will see the configuration web page.

Information

Change User

5. Scroll down the tab, and you can change the login user here.

Menu

6. Click the button on the top, and you can switch to other pages.

4.2.5.2 System Information

In the information page, you can see the dashboard: module detail, network setting, and module information, including the firmware version.

4.2.5.3 Module

You can see the naming of the module and related information. Click "Go to Configuration" to view or change the configurations:

- **Model Name:** Model name of the WISE module
- **Customized Name / UUID:** Refer to Model name and UUID of the module. The default UUID is the combination of model name and the MAC address. This can be modified.
- **Location Information:** The location of the module can be stated here.
- **Description:** Any comments about this module can be stated here.
- **Working Mode:** Refer to 4.2.4 for Operation Mode

Module Information

Model Name	WISE-4220-S231	**Customized Name**	WISE-4220-S231
UUID	WISE-4220-S231_00D0C9219387		
Description			

Location Information

Latitude		**Longitude**	
Altitude			
Location			

✔ Submit

4.2.5.4 Wireless Status

For WISE-4220 series, users can refer to the WLAN RSSI indicators for the signal quality in Wireless Status section. It also shows the MAC ID of the client device. If the module is in AP Mode, the WLAN RSSI Level and Refresh button will not be shown.

4.2.5.5 Network Information

For WISE-4220 series, WLAN Mode (AP Mode / Infrastructure) will be shown in Network Information section. Here is an overview of the entire network configuration. To configure the network configuration, click "Go to Configuration."

⊘ Network Information

WLAN Mode	Infrastructure Mode		
Mac	00-D0-C9-21-93-87		
IP	192.168.1.1	**Subnet**	255.0.0.0
Gateway	192.0.0.0	**IP Mode**	⦿ Static ◯ DHCP

Go to Configuration ➡

4.2.5.6 **Module Information**

Here you can check the model name and the module description. The firmware version will also been shown here. At the end of the configuration web page, you can see the version. For the normal release module, the version on the configuration web page will increase with the firmware version. These versions have to be updated simultaneously.

To update the firmware version, go the "Firmware Version" section.

Module Information

Module Name	Module Description	Firmware Description
WISE-4220-S231	WISE-4220 IoT Wifi with Temperature/Humidity Sensors	Fw:A0.91 B02, Bootloader:A1.11 B00

4.2.5.7 **Network Configuration**

■ AP Mode
When setting the module to AP mode, users can configure the SSID and also decide how the WISE module works, including security. The "AP Mode IP Settings" are fixed and do not allow users to make changes.

WLAN Settings

WLAN Mode	AP Mode
SSID of the AP Mode	WISE-4220-S231_219387
SSID Hidden	☐ Enabled/Disabled
Country Code	US (1~11)
Operational Channel	11
Security Type	Security Open

AP Mode IP Settings

Mac	00-D0-C9-21-93-87		
IP	192.168.1.1	Subnet Mask	255.255.255.0
Gateway	192.168.1.1	IP Mode	⦿ Static ○ DHCP

■ Infrastructure Mode
When using the module in "Infrastructure Mode", users need to enter the SSID of the Access Point (AP) that the WISE module is going to connect, and configure the security type here. WISE-4220 series modules provide a "Second AP Setting" section, an optional setting for the WISE module to connect to another AP automatically. If you do not have a second AP, just leave the SSID blank. After configuring the AP that the WISE module wants to access, the IP address also needs to be defined in the Infrastructure-Network.

4.2.5.8 IO Status

The IO family of WISE-4220 series is composed of various types of IO, including temperature and humidity sensors, DI, DO and AI. You can select the models which meet your requirements based on the applications.

- WISE-4220-S231:
  - Temperature and Humidity Sensors

WISE-4220-S231 is equipped with built-in temperature and humidity sensors. As you can see, the IO status section shows measured results. Channel 0 and 1 present the measured temperatures and humidity from the sensors, respectively.

📊 IO Status

Sensor

| Status | Configuration |

Status

| Current | Max | Min |

🎨 **Humidity**

61.3 %

Channel: 1 ▾
Range: Humidity
Value: 61.3
Low Alarm Status: ⬤ 🗑 Clear
High Alarm Status: ⬤ 🗑 Clear

Channel	Range	Unit	Status	Value
0	Temperature	°C	Normal	23.5
1	Humidity	%	Normal	61.3

You can also view the maximal and minimal measured results from the historical record by selecting "Max" and "Min" tabs. By clicking "Reset," you can reset the maximal and minimal records in the module.

| Status | Configuration |

Status

| Current | Max | Min |

🎨 **Temperature(°C)**

24.2 °C

Channel: 0 ▾
Range: Temperature(°C)
Value: 24.2
Reset Value: 🔄 Reset

Channel	Range	Unit	Status	Value
0	Temperature(°C)	°C	Normal	24.2
1	Humidity	%	Normal	62.9

| Status | Configuration |

Status

| Current | Max | Min |

🎨 **Humidity**

61.8 %

Channel: 1 ▾
Range: Humidity
Value: 61.8
Reset Value: 🔄 Reset

Channel	Range	Unit	Status	Value
0	Temperature(°C)	°C	Normal	23.5
1	Humidity	%	Normal	61.8

You can also change the settings of channel 0 and 1 in the "configuration" tab. The fields that can be changed are shown as follows:

- ■ **Tag Name:** The name of the node
- ■ **Range:** The unit used by each measured factor
- ■ **One Measurement Interval:** The time interval between two measurement events
- ■ **Enable Low Alarm:** If you enable this option, the module will send out an alarm signal when the measured results are below than the lower limit.
- ■ **Enable High Alarm:** If you enable this option, the module will send out alarm signal when the measured results are higher than the lower limit.
- ■ **Sensor Deviation Value:** The difference of measured results of two consecutive events. If the measured difference is higher than the deviation value you set, it will trigger an event.
- ■ **Sensor Offset Range:** The unit used to offset the measured number.
- ■ **Sensor Offset Value:** The delta value used to offset the measured number displayed in the "Status" section.

4.2.5.9 System Configuration

- ■ Network Application

You can configure the Web Server Port, Host Idle (timeout), and decide whether to enable Communication WDT or not in the section. The "Web Server Port" field determines which Ethernet port will be used for the web service, such as the web configuration and RESTful Web API. The default port is 80, but if you change the port number to 8080, you will have to access the module through http://192.168.1.1:8080/config in AP mode.

The **Host Idle (Timeout)** field dictates the availability of the TCP connection between the host controller and WISE. Each MCU-based WISE module supports four TCP connections from visitors simultaneously. In this case, if one of the hosts stops communicating with the WISE module for a time period longer than the configured host idle time (for example, the default 720 seconds), the WISE module will terminate the TCP connection with the host.

The Communication WDT has a Host Idle time, and will be triggered when all TCP connections are closed. This includes all hosts which visit WISE and the communication between remote servers like Dropbox or private servers. Once the **Communica-**

tion WDT mode is enabled, it will trigger system events, such as FSV of output channel and system log.

■   Time & Date / SNTP

You can see the current time, select the time zone you want to use, and calibrate the time by clicking "Click Me" to inquire time from host devices.

You can enable SNTP, so that the module can act as an SNTP client to perform time synchronization from an assigned SNTP server.

■ Modbus Address

In order to provide flexibility and scalability for module deployment, we release the Modbus address setting table, so that you can configure based on your needs. There are two Modbus address sections (0X and 4X).

Coils Status(0X)		Holding Registers(4X)	
Setting Address			
Item	**Base Address**	**Length**	
Reset Historical Maximum Sensor Value	101	2	
Reset Historical Minimum Sensor Value	111	2	
Sensor High Alarm Flag	131	2	
Sensor Low Alarm Flag	141	2	
Low Battery Status	5001	1	

Coils Status(0X)		Holding Registers(4X)	
Setting Address			
Item	**Base Address**	**Length**	
Sensor Value	1	2	
Historical Maximum Sensor Value	21	2	
Historical Minimum Sensor Value	41	2	
Sensor Status	101	4	
Sensor Range Code	201	2	
Module Name	211	4	
Data Log Status	5101	1	
Wi-Fi RSSI Status	5302	1	

■ General Configuration

"**Scan Interval**" determines the I/O polling interval in the "I/O Status" section. The changed values will not be saved into the module. The change is only valid until the module is powered off. The "**FSV by Communication WDT**" determines whether to enable the FSV function triggered by communication with WDT. You can enable the FSV function for all the output channels of the module here.

General Configuration

Scan Interval	1000	ms	💾
FSV by Communication WDT	☑	Enabled/Disabled	💾

■   Account Management
Change the password for each account here.

4.2.5.10 System Configuration File

This section demonstrates how to update or download the configuration file from WISE modules. The following items will be saved in the configuration file:

Configuration	Information, Wireless, Network App, Time & Data, SNTP, Modbus, General Cloud, and Account
I/O Status	I/O Configuration
Advanced	Access Control, Data Logger (Data log and Cloud upload)

■   Download Configuration File from Module
Go to the "Firmware" page in system configuration and click the "Download Configuration File" button. The configurations will be saved as a file.

■   Update Configuration File to Module
Go to the "Firmware" page in system configuration and click the icon to select the configuration file you want to upload from the local folder. Before uploading the configuration file to the module, select whether or not to apply the IP settings to the WISE module.

4.2.5.11 Firmware Version

■ Check Version

The firmware version is shown in the "System Information" page. At the end of the configuration web page, check the version. For normal release module, the version on the configuration web page will increase with the firmware version, as these have to been updated at the same time.

Here is the table list the versions in following figure:

Type	Version
Firmware	A1.00 B03
Bootloader	A1.00 B00
Web Page	A0.00 B06
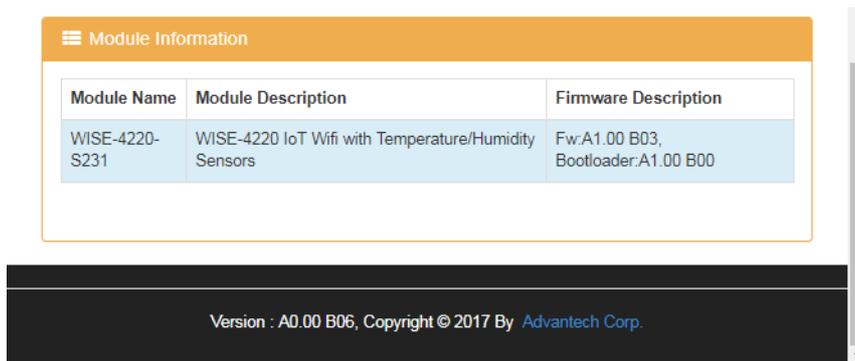
■ Update Firmware

Go to the "Firmware" page in system configuration and click the icon to select the configuration file you want to upload from the local folder. You can find the latest official release firmware file at the Advantech support site (http://support.advantech.com/support/).
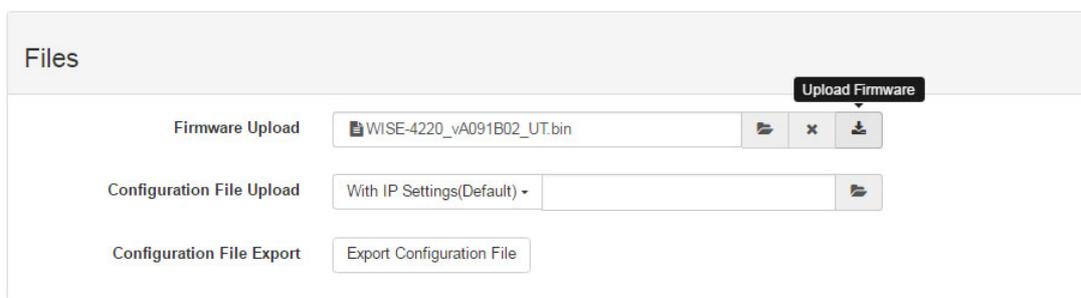
4.2.5.12 Access Control for Security

To avoid unauthorized access, you can manage the list of devices that can access the WISE-4220 module by using the "Access Control" section. Please enable one of the rows and enter the IP address or MAC address of the devices that are allowed to access the WISE-4220 module.

> **Note!** For WISE-4220 wireless modules, users can only configure access control by the IP address, not the MAC address.

4.2.5.13 Data Logger

The WISE-4220 series supports data log functions. I/O status can be logged in the module and queried from the module.

■ Time & Date / SNTP

Before you start the log function, please make sure that the RTC time inside the WISE module is correct. Standard WISE modules, excluding WISE-4012E, come with an RTC battery. Once the RTC time has been configured, you don't need to synchronize the time with SNTP server. The time will be kept in the RTC with a battery. For the WISE-4012E without an RTC battery, you need to synchronize the time with SNTP server.

■ Data Configuration
  – I/O Data

You can use the "Log Conditions" section in "Data Configuration" to choose the method that will be used to log data. If you check "By Period" box, it will enable periodic logging, and the log period can be assigned in the following field. Note that the unit of this field is 0.1 second, meaning that the status of I/O will be logged every minute if you enter "600" here. If you check the box "By Communication WDT", once the condition of the WDT is met, the status of the I/O will be logged.

For the analog input channel, data can be logged by the AI Deviation Rate (Dividing difference between present sample value and previous sample value by the total range value). Here you can enter the percentage of the deviation rate to be the criteria for triggering the logger.

All the data can be kept even if the module is powered off; however, you can clear all data in the logger when powering up WISE module by checking the "Clear Log when Power Up" box. When maximum memory capacity is achieved, the logger will stop logging by default. You can check the "Circular Log when Memory Full" box to overwrite the memory.

The "By Channel" tab is used to determine which kind of status will be logged and whether the change of the status will be logged or not. Note that the log memory will be cleared if any parameter is changed in the "By Channel" and "By Sensor."

For S231 sensor channel, check the "Log Enabled" box to log the status of checked channel periodically. After you check "Log Enabled" box, you can check the "Deviation Enabled" box if you want to log data when the deviation matches the criteria set in "Sensor Deviation Value" field of the "IO Status" section. You can also choose to log the events that trigger high and low alarms by checking "**High Alarm**" and "**Low Alarm**" boxes.

The "By Sensor" tab is used to decide what kinds of data will be logged. Note that the log memory will be cleared once any parameter changed in the "By Channel" and "By Sensor" tabs.

4.2.5.14 System Data

The WISE data logger function not only logs the I/O status, but also logs system events for module diagnostics or troubleshooting. You can choose what kind of system events you would like to log here.
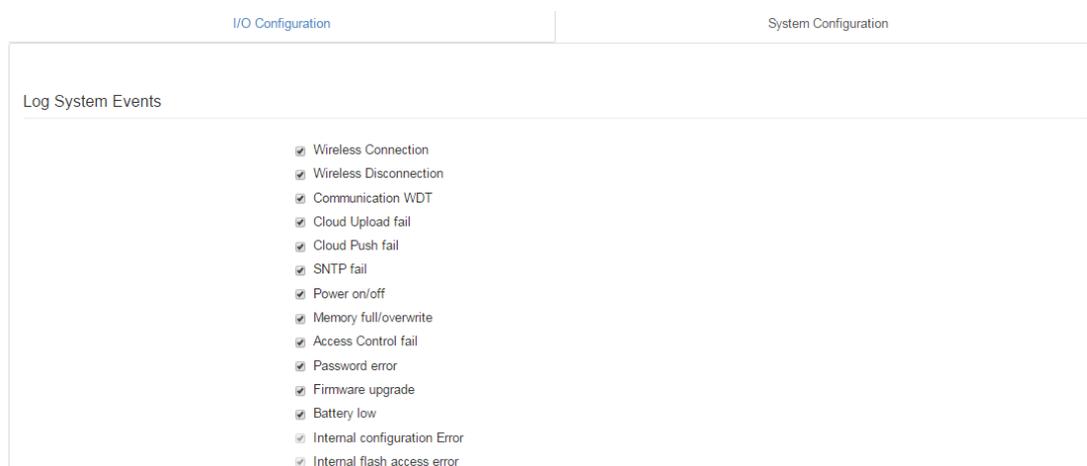
■ Logger Configuration

In the previous page, you can configure which data is logged. In this page you can enable the local memory storage function. There are separate switches to enable the function of logging I/O data and system data. You can turn ON the switches to enable the function.
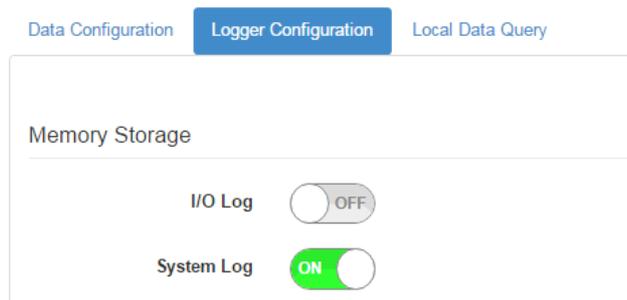
■ Local Data Query

The logged data can be queried from the WISE module. Due to the limitation of MCU-based WISE modules, the file will be saved in a *.json file. You can visit https://json-csv.com/ to convert the data from *.json to *.csv.

Before querying the logged data, you can configure the format of the file. You can determine whether the data comes with a UUID or MAC ID, and choose the type of time stamp. For the latest version of WISE module, which supports Local Date and

Time (GMT), the time stamp will be reported in the format like this: "2015-08-27T15:20:29+08:00", whereas the time stamp will look like: "1440660089," if it supports Coordinated Universal Time (UTC).

After selecting the data format, you can query the amount of data or data within a certain period by selecting "Amount of Latest Data" or "Time Filter" modes, respectively. However, if the amount of data is not too large, you can also choose "No Filter Enabled" to query all the data.

Now you can click Query to query the data from local memory. Then the data will be shown in a chart and table. Click "Save" to save data from the WISE module into a *.json file, or you can click "Clear" to clear all data in local memory.
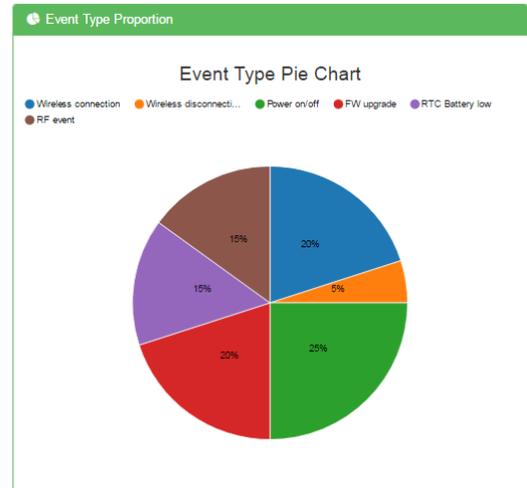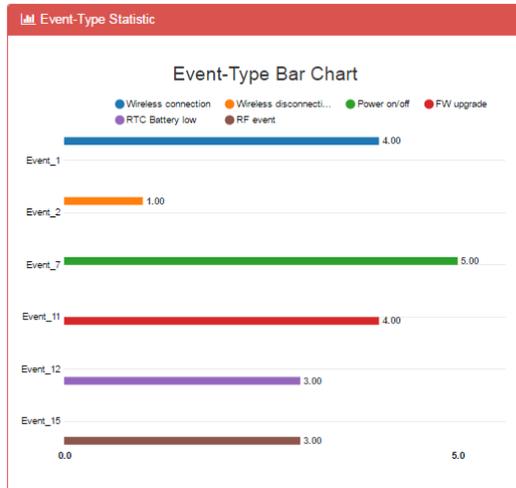
4.2.5.15 Cloud Logger

■   Dropbox

Refer to section **4.2.6 Configuring Cloud Server** for Dropbox cloud logger.

■   Private Server

If you don't want to push the data to a public file-based cloud like Dropbox, WISE also supports a "Private Server" function which pushes data to a private web server directly. You can setup your own web service to retrieve data from the WISE module, or use the example agent on your own server to retrieve the files pushed from the WISE module.

Go to "Cloud Configuration" page and select "Private Server." Then configure the Private Server Setting. If you would like to use the example agent provided by WISE, you need to confirm the Server IP and Server Port, and make sure the server port you configure is not occupied by another application on your private server. To setup your own application to retrieve files from WISE, you need to configure the URL. We also support SSL security with Dropbox, in order to provide you a safe private cloud solution. Once SSL security is enabled, you need to setup the SSL service on your private server.

If you are not able to setup the SSL service, there is another option for internet security. You can use "Authentication" section for the private server with a User Name and Password provided by our example agent.

After "**Cloud Configuration**" is configured as a private server, you can go back to the **Logger Configuration** page in **Data Logger.** Before switching Cloud Upload to ON,

you can configure the data upload criteria for I/O signal and system diagnosis individually.

You can choose to push a certain amount of data by using Item Periodic Interval mode, or push data within a certain period of time (Unit: 0.1 sec) by using Time Periodic Interval mode. If you don't want to upload I/O or system data, choose "Disable". After configuring the upload criteria, you can switch Cloud Upload ON and start uploading. The data will be pushed to the cloud in the format of *.csv.

■ Push Notification

For Cloud Logger functions including Dropbox Cloud Logger and other private servers, data comes from the local memory of WISE. You can pack data from the WISE data logger into a file, and then push it to the web server. Then you can push the latest data when the log condition is triggered with the events such as changes of DI status.

The WISE module will push a notification in JSON format to the private server. You can switch the I/O Log or System Log ON, and then the WISE module will start pushing the latest logged data to the private server.

4.2.6   Configuring Cloud Server

1.   Make sure the WISE-4220 module is able to access the Internet, and the device that's going to configure the WISE-4220 module is in the same IP domain as the WISE-4220 module

2.   Go to the Cloud tab of Configuration.

> **Note!**   *The following instructions use Dropbox. Make sure Dropbox provide their service in your region or find an alternative public cloud service.*

> **Note!**   *Before start to configure cloud sever, please make sure WISE module is working in "Infrastructure Mode", and the connected AP is able to access internet*

3.   Select Dropbox as the cloud server.

4.   The browser will open a new window for Dropbox. Enter your Dropbox account information including E-mail and Password, then click "Sign in."

5. After logging in, click "Allow" to allow WISE Cloud Logger Apps to access your Dropbox account to store the data log file.
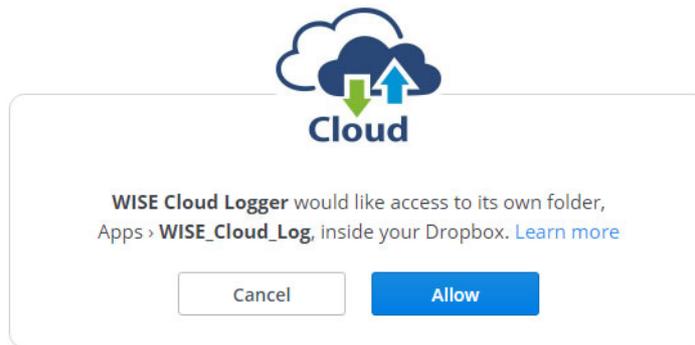
6. Dropbox will then provide a code. Copy this code and return to the configuration web page of the WISE module.
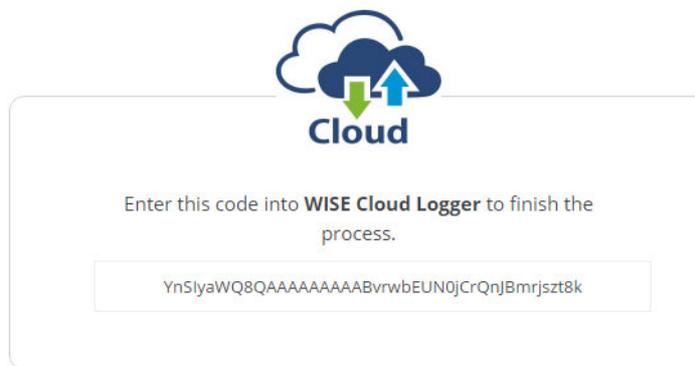
7. Click "Next" to enter the code.
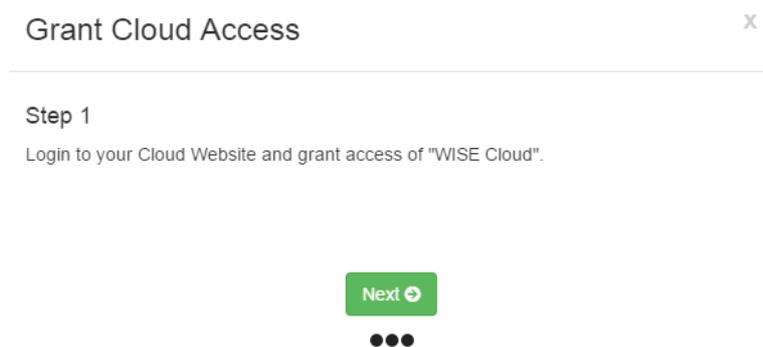
8. Paste the code provided by WISE Cloud Logger, then click "Submit."

9. If your WISE-4220 module is correctly connected to the Internet, you will be able to set the functions successfully. Click "Close" to return to Configuration.

10. You will then see the "Link Status" shows "Ready."

Appendix A

Modbus Mapping Table

A.1 Modbus Function Code Introduction

Code (Hex)	Name	Usage
01	Read Coil Status	Read Discrete Output Bit
02	Read Input Status	Read Discrete Input Bit
03	Read Holding Registers	Read 16-bit register. Used to read integer or floating point process data.
04	Read Input Registers	
05	Force Single Coil	Write data to force coil ON/OFF
06	Preset Single Register	Write data in 16-bit integer format
08	Loopback Diagnosis	Diagnostic testing of the communication port
0F	Force Multiple Coils	Write multiple data to force coil ON/OFF
10	Preset Multiple Registers	Write multiple data in 16-bit integer format

A.2 WISE-4220-S231 Modbus Mapping Table

Address (0X)	Channel	Description	Attribute
00101	Temperature	Reset Historical Max. Sensor Value	Write
00102	Humidity		Write
00111	Temperature	Reset Historical Min. Sensor Value	Write
00112	Humidity		Write
00131	Temperature	High Alarm Flag	Read
00132	Humidity		Read
00141	Temperature	Low Alarm Flag	Read
00142	Humidity		Read
05001		RTC Battery Low	Read

Address (4X)	Channel	Description	Attribute
40001	Temperature	Sensor Value	Read
40002	Humidity		Read
40101~40102	Temperature	Sensor Status*	Read
40103~40104	Humidity		Read
40021	Temperature	Historical Max. Sensor Value	Read
40022	Humidity		Read
40041	Temperature	Historical Min. Sensor Value	Read
40042	Humidity		Read
40201	Temperature	Type Code**	Read
40202	Humidity		Read

40211	Module Name 1	Read
40212	Module Name 2	Read
45101	Data Logger Status***	Read

* Sensor Status:

Bit Order	Description
0	Fail to provide sensor value (sensor not ready)
1~31	Reserved

** Type Code

Type Code	Sensor type	Sensor type and unit
4096 (0x1000)		Temperature (°C)
4097 (0x1001)	Temperature	Temperature (°F)
4098 (0x1002)		Temperature (K)
4128 (0x1020)	Humidity	Humidity (%)

*** Data Logger Status

Bit Order	Description
0	Built-in logging is out of memory for IO log. (No space left)
1	Built-in memory errors.
2	Built-in logging is out of memory for System log. (No space left)
3	Cloud upload fail
4	Cloud push fail
5-15	Reserved

Appendix B

REST for WISE-4220
Series

B.1 Introduction

Representational State Transfer (REST) is a software architecture for how web applications and services interact encompassing every thing or entity that can be identified, named, addressed or handled, in any way whatsoever, on the Web. It can be developed with compatible popular protocols or standards like HTTP, URI, JSON, HTML. With the advantage of scalability, simplicity and performance, it's already adopted by Amazon and Yahoo web services. The web service is developed based on HTML5 language, if a user need to integrate this into other web services, the following information/command list can be referenced.

B.2 REST Resources for WISE-4220 Series

B.2.1 Sensor Input

/sensor_value/slot_0/ch_num

Description	Retrieves information about the sensor input value resource on specific slot.
URL Structure	http://10.0.0.1/sensor_value/slot_0 http://10.0.0.1/sensor_value/slot_0/ch_num where num = 0 ~ : the channel number
HTTP Method	GET: Returns the representation of all of analog input value resource. PUT: None PATCH: Apply partial modifications to analog input value resource.

GET	Multi Channel Request:
	    GET /sensor_value/slot_0
	Single Channel Request:
	    GET /sensor_value/slot_0/ch_num
	
	[Example]
	■ **Request: GET /sensor_value/slot_0**
	
	Content-type: application/json
	Response: 200 OK
	{
	  "SVal": [
	   {
	    "Ch":0,
	    "Rng":4096,
	    "EgF":0.650,
	    "HEgF":1.250,
	    "LEgF":0.500,
	    "Evt":0,
	    "LoA": 0,
	    "HiA": 0
	    "ClrH": 0,
	    "ClrL": 0,
	   },
	   {
	    "Ch":1,
	    "Rng":4128,
	    "EgF":0.000,
	    "HEgF":0.000,
	    "LEgF":0.000,
	    "Evt":0,

```
        "LoA": 0,
        "HiA": 0
        "ClrH": 0,
        "ClrL": 0
      }
    ]
}
```
■   **Request: GET /sensor_value/slot_0/ch_1**
Content-type: application/json
Response: 200 OK
```
{
    "Ch":1,
    "Rng":4128,
    "Evt":0,
    "EgF":0.000,
    "HEgF":0.000,
    "LEgF":0.000,
    "LoA": 0,
    "HiA": 0
    "ClrH": 0,
    "ClrL": 0
}
```

PUT	None

	Single/Multi Channel Request:
	    PATCH /sensor_value/slot_0
	Single Channel Request:
	    PATCH /sensor_value/slot_0/ch_num
	
	[Example]
	■ **Request: PATCH /sensor_value/slot_0**
	
	Content-type: application/json
| PATCH | ```
{
" SVal": [
  {
    "Ch":0,
    "ClrH": 0
  },
  {
    "Ch":1,
    "ClrL":0
  }
 ]
}
```<br>Response: 200 OK<br><br>■   **Request: PATCH /sensor_value/slot_0/ch_1**<br>Content-type: application/json<br>```
{
    "ClrL":0
}
```<br>Response: 200 OK |

■ JSON array name definition:

Field	Abbreviation	Data Type
Array of Sensor value	SVal	Array

■ Resource value definitions (Total channels = AI channel number):

Field	Abbreviation	Data Type	Property	Description
Channel Number	Ch	Number	R	0, 1, …: Sensor input channel number.
Input Range	Rng	Number	R	Sensor input range. Refer to Sensor type code table*
Channel Event Status	Evt	Number	R	Sensor status | Bit Order	Description
---	---
0	Fail to provide Sensor value (UART timeout)
1~31	Reserved	
Clear Maximum Sensor Value	ClrH	Number	W	1 : Clear the Maximum Sensor value
Clear Minimum Sensor Value	ClrL	Number	W	1 : Clear the Minimum Sensor value
Channel Engineering data (floating type)	EgF	Number	R	Sensor engineering data, the value is floating type. Unit: According sensor type code For example, 999.120 → 999.12 °C -3.220 → -3.22 °C
Maximum Sensor Engineering data (floating type)	HEgF	Number	R	Sensor max. engineering data, the value is floating type. Unit: According sensor type code For example, 10.200 → 10.2 °C -5.120 → -5.12 °C
Minimum Sensor Engineering data (floating type)	LEgF	Number	R	Sensor min. engineering data, the value is floating type. Unit: According sensor type code For example, 250.350 → 250.35 °C -0.120 → -0.12 °C
Low Alarm Status	LoA	Number	RW	Low alarm status Read 1 : low alarm occurred. 0 : not occurred Write 0 : clear the low alarm status
High Alarm Status	HiA	Number	RW	High alarm status Read 1 : high alarm occurred. 0 : not occurred Write 0 : clear the high alarm status

* Sensor type code table

Type Code	Sensor type	Sensor type and unit
4096 (0x1000)		Temperature (°C)
4097 (0x1001)	Temperature	Temperature (°F)
4098 (0x1002)		Temperature (K)
4128 (0x1020)	Humidity	Humidity (%)

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