

User Manual

WISE-4610

LoRa Wireless I/O Module

ADVANTECH

Enabling an Intelligent Planet

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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 displayed 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 a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and proof of the purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package 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 damage due to electrostatic discharge (ESD) and electromagnetic interference (EMI) leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

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 this event, users are required to correct the interference at their own expense.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
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 calling:
 - 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

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Warnings, Cautions, and Notes

Warning! Warnings indicate conditions that if not observed may cause personal injury!



Caution! Cautions are included to help prevent hardware damage or data losses. For example, “Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer’s instructions.”



Note! Notes provide additional optional information.



Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all feedback in writing to support@advantech.com.

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item is missing or damaged, contact your dealer immediately.

- 1 x WISE-4610 module
- 1 x Antenna
- 1 x Mount bracket
- 1 x WISE-4610 startup manual

Note! I/O boards for pairing with WISE-4610 are available for order



- WISE-S614 4AI and 4DI
- WISE-S672 6DI, 1RS-485 * 1RS-485/232

Note! A micro-B USB cable for configuring WISE-4610 nodes is available for order:



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

Note! An M12 connector and cable for I/O or power wiring is available for order:



- **1654011516-01** M12 connector, 8 pin, male
- **1655005903-01** M12 connector, 4 pin, male
- **1700028162-01** M12 code-A, 4-pin, 2 M, female cable for power wiring
- **1700028163-01** M12 code-D, 8-pin, 2 M, male cable for I/O wiring

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all AC outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
6. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
7. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
8. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
9. All cautions and warnings on the equipment should be noted.
10. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
11. Never pour liquid into an opening. This may cause fire or electrical shock.
12. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
13. If one of the following occurs, have the equipment checked by qualified service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated the equipment.
 - The equipment has been exposed to moisture.
 - The equipment is malfunctioning, or does not operate according to the user manual.
 - The equipment has been dropped and damaged.
 - The equipment shows obvious signs of breakage.
14. Do not leave the equipment in an environment with a storage temperature of below -20 °C (-4 °F) or above 60 °C (140 °F) as this may cause damage. The equipment should be kept in a controlled environment.
15. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
16. According to IEC 704-1:1982 standards, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided in accordance with IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precautions - Static Electricity

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

- Disconnect the power supply before making any configuration changes. The sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.

NCC 警语

根據低功率電波輻射性電機管理辦法

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) the device may not cause harmful interference, and (2) the device must accept any interference received, including interference that may cause undesired operation.

COUNTRY CODE SELECTION (WLAN DEVICES)

The country code selection option is available for the non-U.S. model only, and is not available for any U.S. models. According to the FCC regulations, all Wi-Fi products marketed in the U.S. must be fixed to U.S. operation channels only.

Industry Canada statement:

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions: (1) the device may not cause harmful interference, and (2) the 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.

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Chapter 1

Product Introduction

1.1 LoRa and LoRaWAN

A low-power, wide-area network (LPWAN) is a type of wireless telecommunication wide-area network designed to allow long-range communications at a low bit rate between IoT devices, such as battery-operated sensors.

LPWAN offers multi-year battery lifetime and is designed for sensors and applications that need to send small amounts of data over long distances a few times per hour from varying environments.

LoRa and LoRaWAN belong to the category of non-cellular LPWAN wireless communication network protocols that enable long-range data transmissions with low power consumption, and operate in the license-free spectrum.

LoRa is a patented digital wireless data communication IoT technology. The technology is presented in two parts — LoRa, the physical layer (PHY), and the communication protocol built upon the underlying LoRa physical layer. The communication layer may be LoRaWAN, an open-source communication protocol defined by the LoRa Alliance consortium.

The difference between LoRa and LoRaWAN is that LoRaWAN defines the communication protocol and system architecture for the network, while the LoRa physical layer enables the long-range communication link.

1.2 WISE-4610 Feature Highlights

Advantech's WISE-4610 LoRa wireless I/O module can be configured to support either a public or private LoRa using the WISE Studio utility via a USB port.

For outdoor applications, WISE-4610 can be equipped with optional GPS, a solar rechargeable battery, and an IP65-rated enclosure to protect from water and dust ingress.

The WISE-4610 wireless I/O module features an intelligent modular design that supports various I/O configurations according to usage requirements. This allows users to easily integrate their desired I/O module (WISE-S672/S614) with the WISE-4610 module.

1.3 WISE Series Family

Function	Model	Description
LoRa Wireless I/O Module	WISE-4610	Outdoor LoRa wireless I/O module
I/O Module	WISE-S672	I/O module with 6 x digital inputs, 1 x RS-485 port, and 1 x RS-232/485 port
	WISE-S614	I/O module with 4 x digital inputs and 4 x analog inputs
LoRa Gateway	WISE-3610	LoRa network gateway

1.4 System Diagram

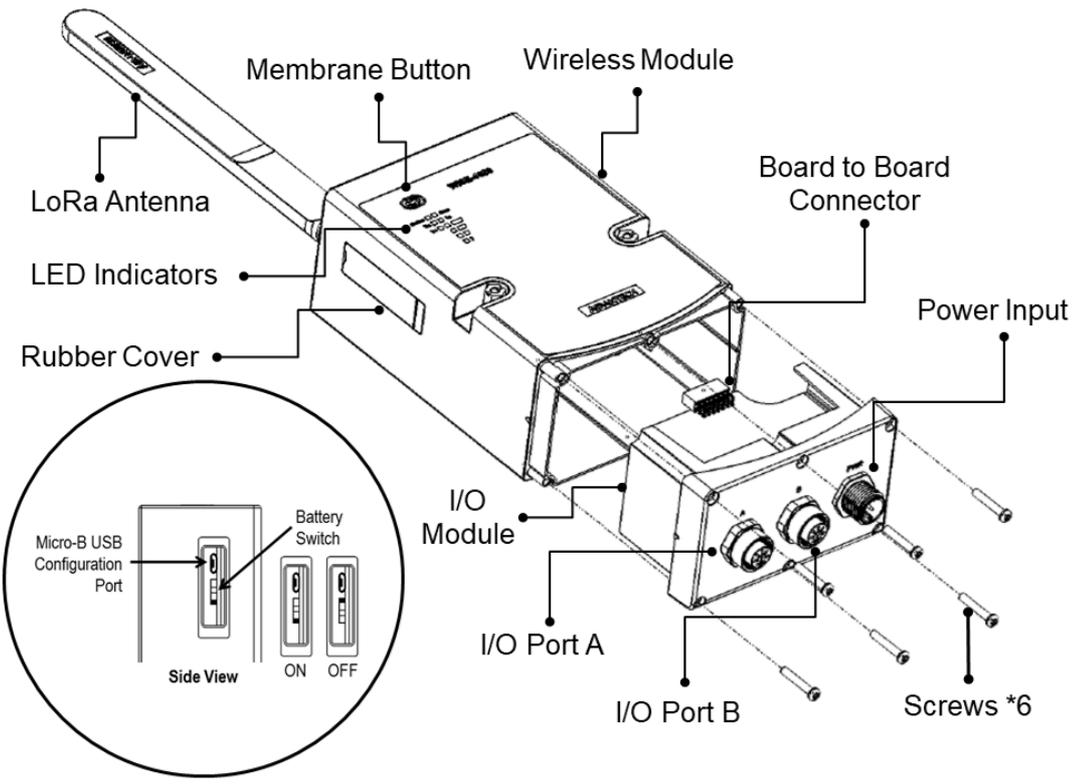


Figure 1.1 WISE-4610 System Diagram

1.5 Battery Switch

The WISE-4610 module is equipped with a switch to turn the battery ON/OFF. This switch is located at the side of the WISE-4610 module. Simply open the rubber cover and flick the switch to turn ON/OFF the battery power.

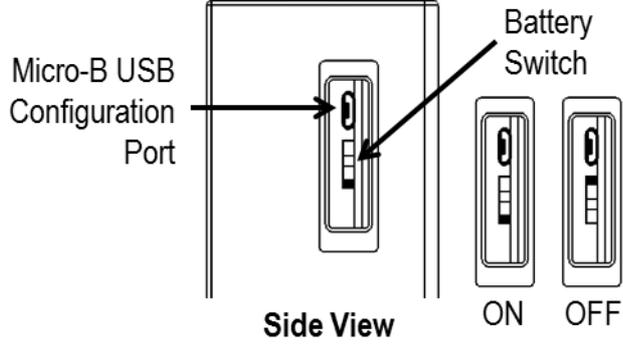


Figure 1.2 WISE-4610 Battery Switch

1.6 LED Indicators

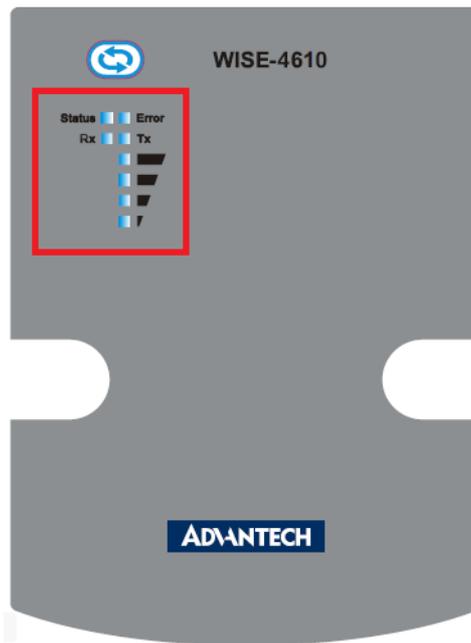


Figure 1.3 WISE-4610 LED Indicators

LED	Color	State	Description
Status	Green	Fast blink (0.2 sec ON, 0.3 sec OFF)	Waiting for connection or connecting
		Slow blink (0.2 sec ON, 1.8 sec OFF)	Connecting and operating normally
Error	Red	Fast blink (0.2 sec ON, 0.8 sec OFF)	Application errors. <ul style="list-style-type: none"> ■ Network registration timeout ■ I/O error
		Slow blink (0.2 sec ON, 2.8 sec OFF)	<ul style="list-style-type: none"> ■ Low battery voltage ($v \leq 20\%$) ■ Low RTC battery voltage
		Off	No error
RF RX	Green	On	Receiving data from gateway
		Off	NA
RF TX	Yellow	On	Sending data to gateway
		Off	NA
Signal Strength	4 Green	On (if pressing the membrane button)	Main battery capacity
			<ul style="list-style-type: none"> ■ All OFF - $V \leq 20\%$ ■ 1 ON - $20\% < V < 40\%$ ■ 2 ON - $40\% \leq V < 60\%$ ■ 3 ON - $60\% \leq V < 80\%$ ■ 4 ON - $V \geq 80\%$

Note! If WISE-4610 is powered by the battery, the LED indicators will turn off after 15 seconds to save power.



1.7 Membrane Button

Located at the front of the WISE-4610 module is a membrane button that can be used to switch between operating modes and to light up the LED indicators (refer to Section 4.2.9 “LoRaWAN Functions” for more information about the membrane button functions).

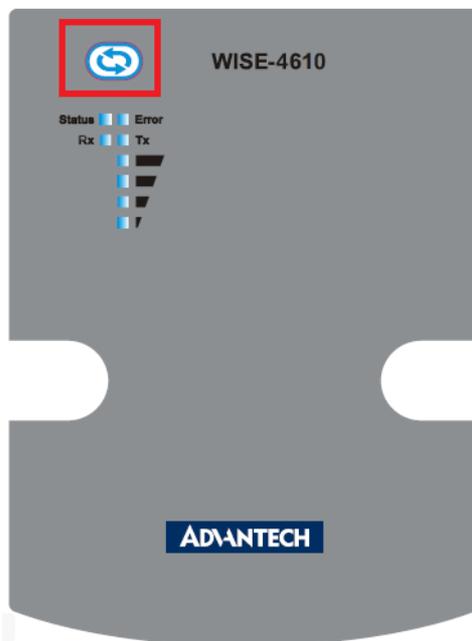


Figure 1.4 WISE-4610 Membrane Button

1.8 Packing List

WISE-4610 LoRa Wireless I/O Module

- 1 x WISE-4610 module
- 1 x Antenna
- 1 x Mount bracket
- 1 x WISE-4610 startup manual

WISE-S614 4AI/4DI I/O Module

- 1 x WISE-S614 module
- 1 x I/O information label

WISE-S672 6DI/1RS-485/1RS-485 or RS-232 Module

- 1 x WISE-S672 module
- 1 x I/O information label

Note! Refer to the WISE-3610 user manual for information on how to configure a LoRa gateway.



Note! Refer to the WISE-6610 user manual for information on how to configure a LoRaWAN gateway.



Note! A micro-B USB cable for configuring WISE-4610 is available for order:



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

Note! An M12 connector and cable for I/O or power wiring is available for order:



- **1654011516-01** M12 connector, 8 pin, male
- **1655005903-01** M12 connector, 4 pin, male
- **1700028162-01** M12 code-A, 4 pin, female cable for power wiring, 2 M
- **1700028163-01** M12 code-D, 8 pin, male cable for I/O wiring, 2 M

Chapter 2

Hardware Installation

The wireless sensor nodes for WISE-4610, 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.

2.1 Modular Design

WISE-4610 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-4610 using the six screws provided (as shown in Figure 2.1).

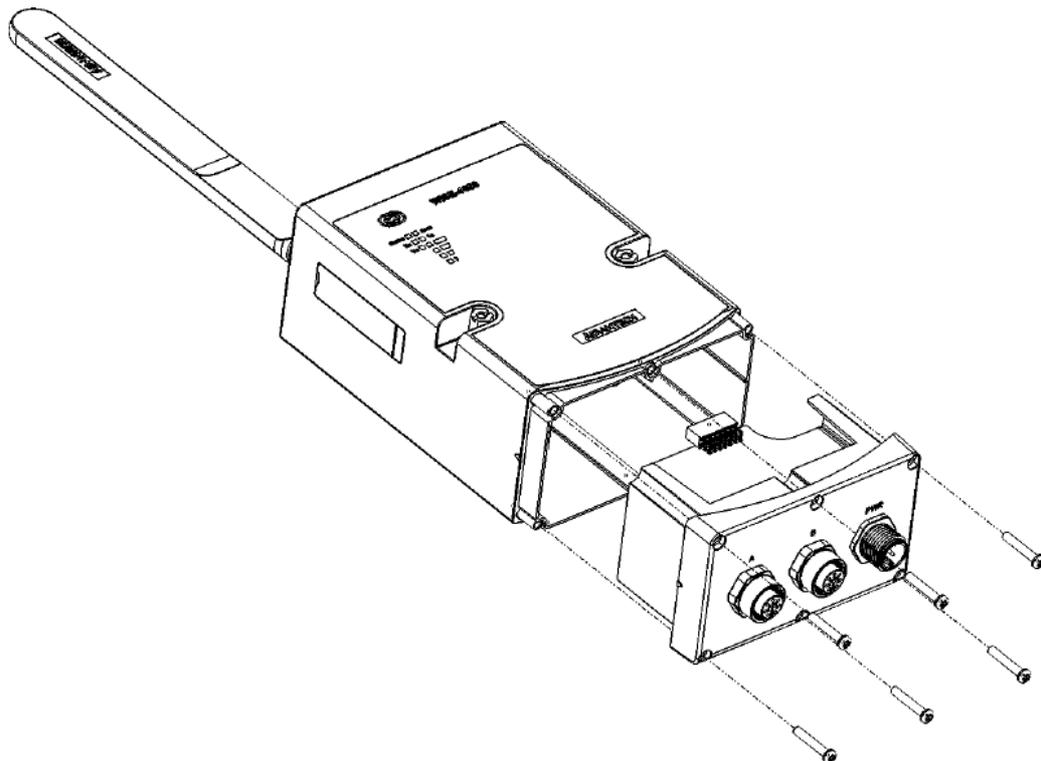


Figure 2.1 I/O Module Installation

Note! *The recommended screw torque is 2.5 ~ 3.0 kgf/cm².*



2.2 System Dimensions

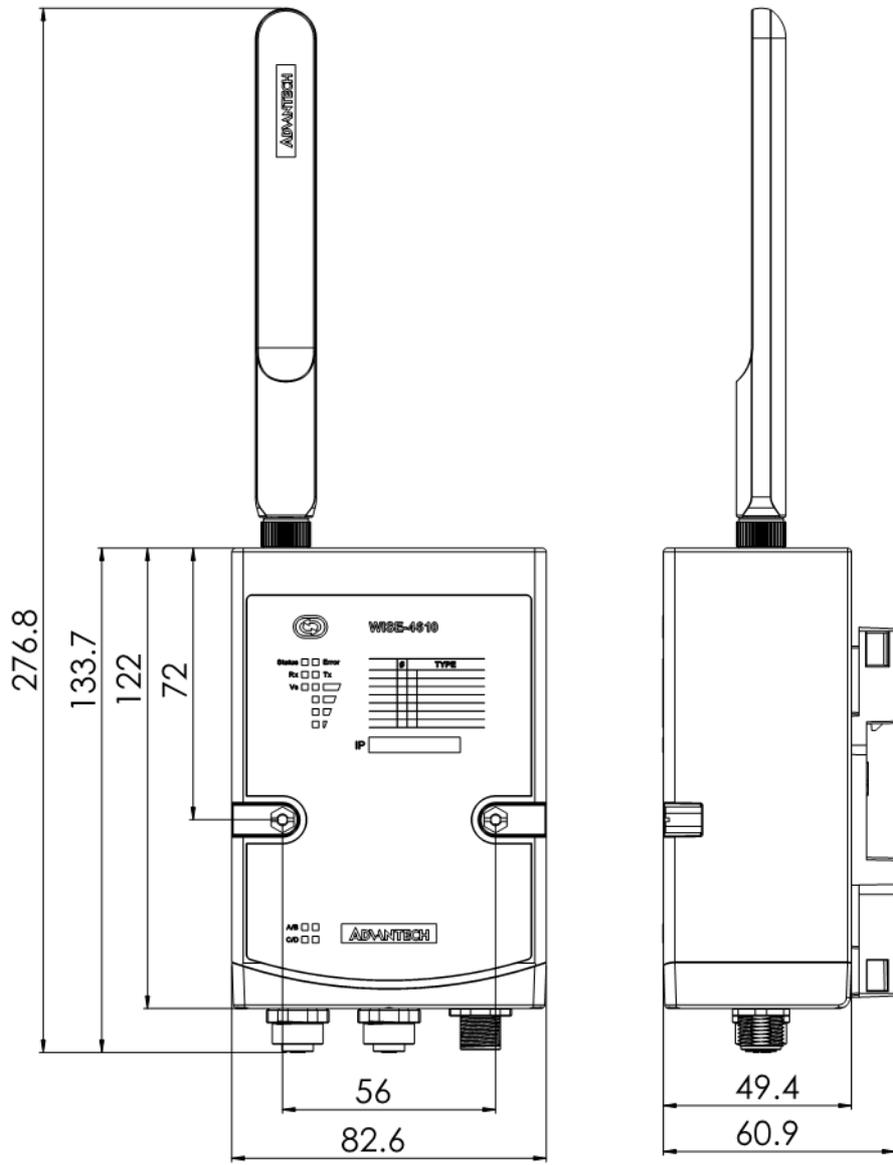


Figure 2.2 WISE-4610 Dimensions

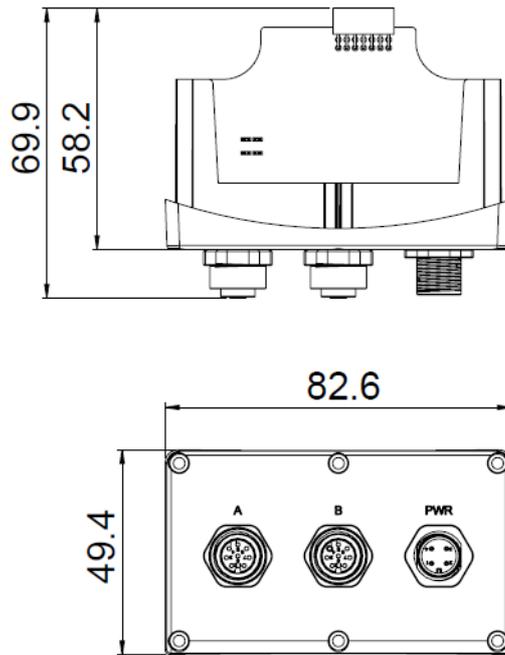


Figure 2.3 WISE-S600 Series I/O Module Dimensions

2.3 DIN-Rail Mounting

WISE-4610 modules can be fixed to a cabinet with mount rails. Use a flathead screwdriver to affix the DIN rail mounting adapter to the module. Then attach the end brackets provided with the product to prevent sliding.

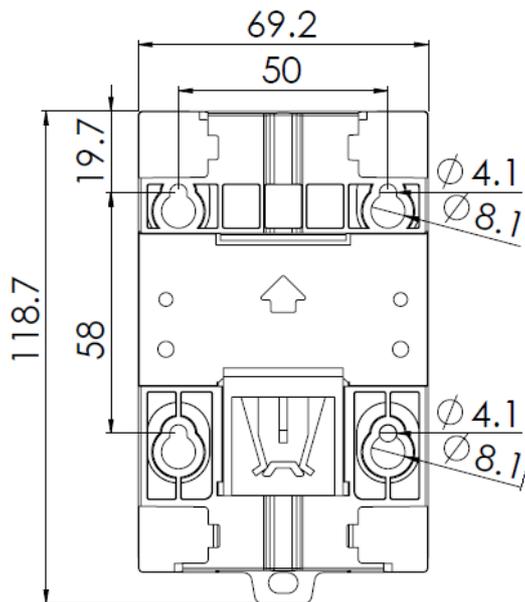


Figure 2.4 WISE-4000 Series Mount Kit Dimensions

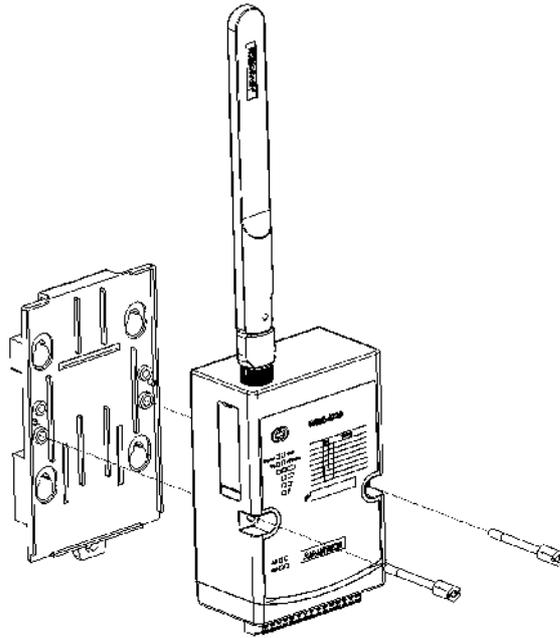


Figure 2.5 DIN-Rail Mounting Adapter Installation

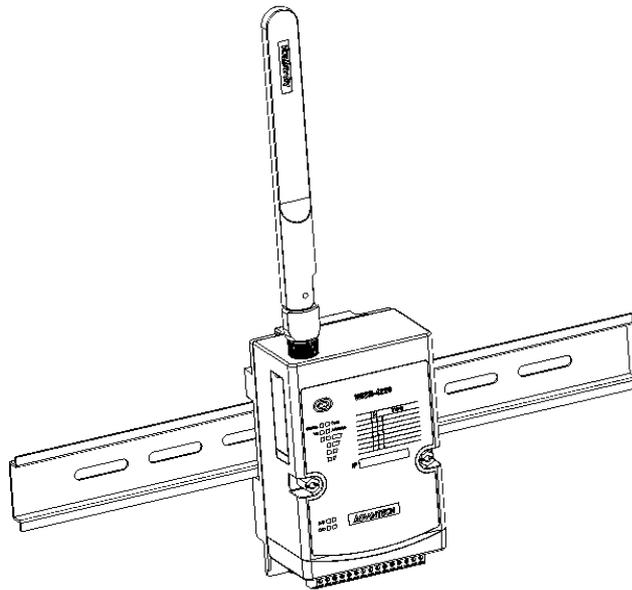


Figure 2.6 DIN-Rail Mounting (Front View)

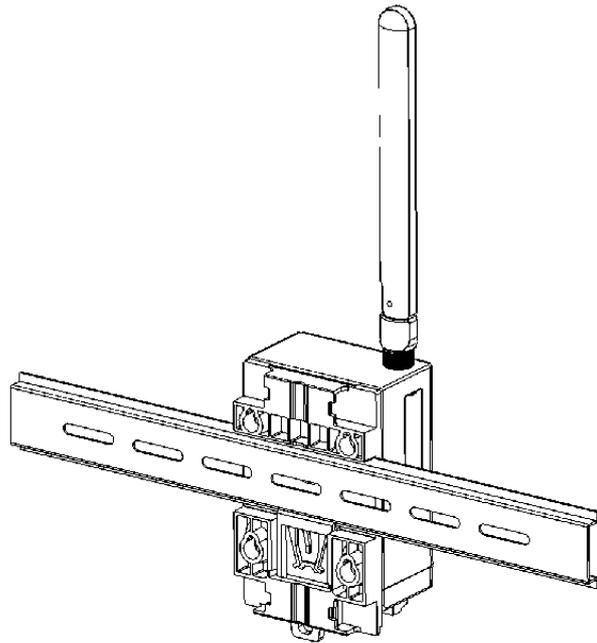


Figure 2.7 DIN-Rail Mounting (Rear View)

2.4 Wall Mounting

The plastic wall-mount bracket provided with the product, can be used to mount WISE-4610 on a wall, panel, or cabinet.

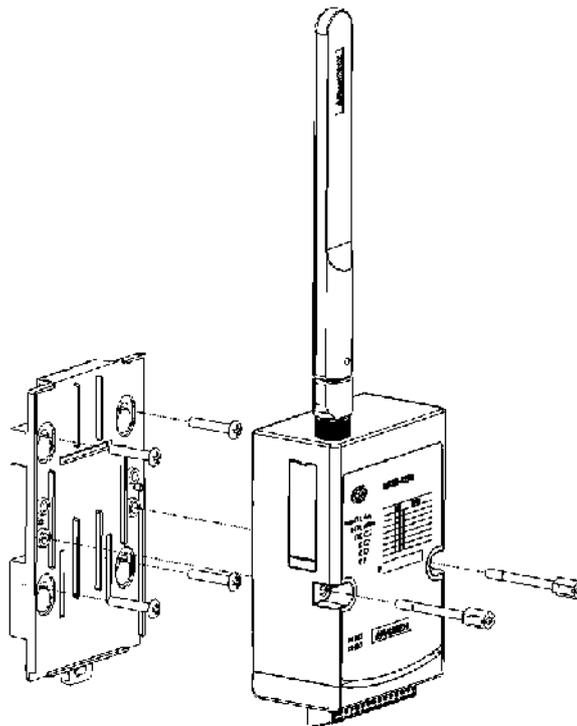


Figure 2.8 Wall Mount Bracket Installation

2.5 Pole Mounting

For pole mounting, feed the pole-mounting ring through the hole in the middle of the module. The pole-mounting ring must be unlocked with a screwdriver before inserting it into the module. To mount the module on the pole, tightly lock the pole-mounting ring.

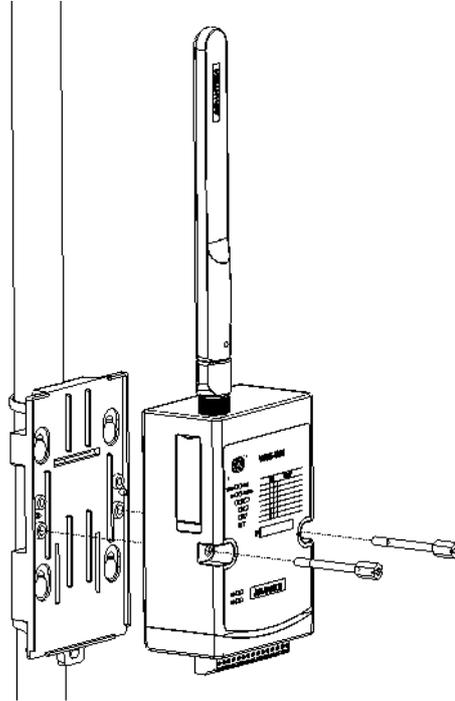


Figure 2.9 Pole Mount Bracket Installation (Front View)

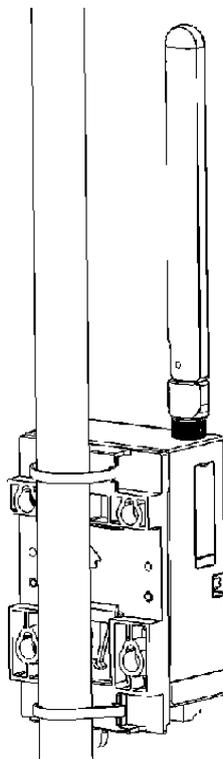


Figure 2.10 Pole Mount Bracket Installation (Rear View)

Chapter 3

Hardware
Specifications

3.1 Wireless Interface

- Frequency Band
 - 868.1-869.525MHz for EU(6 channel)
 - 903-927.5MHz for US(16 channels)
 - 920.6-923.4MHz for Japan (9 channels)
- Data Rate: Refer to Section 4.2.1 “LoRa Node Interface Design - Data Rate Configuration and Indicative Physical Bit Rate”
- Spreading Factor: 7~12
- Bandwidth: 125/250/500 KHz
- Outdoor Range: 5 km with line of sight (with 2 dBi antenna)
- Transmission Power: 18 dBm ± 2 dBm
- Receiver Sensitivity: Up to -136 dBm@ SF = 12/125 KHz
- Topology: Star

Channel List

		Radio Frequency				
Region	US	EU	JP	TW	AU	
	903	869.525	920.6	920.1		
	904.6	868.1	920.8	920.3		
	906.2	868.3	921	920.5	925.9	
	907.8	868.5	921.2	920.7	917.5	
	909.4	868.85	921.4	921	919.1	
	911	869.05	921.6	921.2	920.7	
	912.6		921.8	921.4	922.3	
	914.2		922	921.6	923.9	
Channel Frequency	923.3		922.2	921.8	925.5	
	923.9			922	927.1	
	924.5			922.2	923.3	
	925.1			922.5		
	925.7			922.7		
	926.3			922.9		
	926.9			923.1		
	927.5			923.3		
				923.5	924.1	
				924.7		

Note!  The outdoor range is estimated based on line of sight. The actual transmission distance will be affected by the application environment. Users should conduct a site survey to determine the setup range of a wireless network.

3.2 GPS

- GNSS Systems: GPS, GLONASS, Galileo, BeiDou, QZSS, and SBAS signals
- Maximum Update Rate:
Single GNSS: Up to 18 Hz
Concurrent GNSS: Up to 10 Hz
- Positioning Accuracy: 2.5 m CEP (50% confidence)
With SBAS: 2.0 m CEP (50% confidence)
- Acquisition:
Cold Starts: 57 s
Aided Starts: 7 s

3.3 General

- RTC Accuracy: ± 2 s/day
- Enclosure: PC + PBT
- Mount Options: DIN rail, wall, and pole
- Dimensions (W x H x D): 82 x 122 x 49 mm/3.22 x 4.8 x 1.92 in (without antenna)
- Operating Temperature:
 - With rechargeable battery: 0 ~ 60 °C (32 ~ 140 °F)
 - Without battery: -25 ~ 70 °C (-13 ~ 158 °F)
- Storage Temperature:
 - With rechargeable battery: -20 ~ 60 °C (-4 ~ 140 °F)
 - Without battery: -40 ~ 85 °C (-40 ~ 185 °F)
- Operating Humidity: 25 ~ 95% RH (non-condensing)
- Storage Humidity: 0 ~ 95% RH (non-condensing)

Note! *The storage and operation of WISE-4610 modules **MUST** be in environments that meet the temperature specifications.*



Note! *WISE-4610 modules can withstand operation in environments with less than 30% humidity. However, environments with low relative humidity are prone to causing electrostatic discharge issues. Therefore, users should take adequate precautions and use grounding straps, anti-static floor coverings, or similar equipment when manually handling the modules, especially in low-humidity environments.*



Note! *Batteries are at risk of exploding if it is incorrectly installed. Do not attempt to replace the battery yourself. Batteries should only be replaced by qualified service personnel.*



3.4 Power

- Power Input Voltage: 10 ~ 50 V_{DC}
- Power Consumption:
 - WISE-4610: 11 W @ 24 V, when the battery is charging
 - WISE-S614: 1.9 W @ 24 V_{DC}
 - WISE-S672: 0.3W@24V_{DC}
- Solar Panel Input Voltage: 15 ~ 50 V_{DC}
- Battery Capacity: 4000 mA
- Battery Life: 6 months (with hourly data updates and daily GPS updates)

Note! The battery life is estimated for temperatures of 25 °C. Operation in low-temperature environments will reduce the battery life.



3.5 I/O Specifications

- Power Connector: 1 x M12 4-pin code-A male connector with male pins
- I/O Connector: 2 x M12 8-pin code-D female connector with female pins

3.5.1 WISE-S614 I/O Module

3.5.1.1 Digital Inputs

- Channels: 4
- Logic Level (Dry Contact):
 - 0: Open
 - 1: Close DI COM
- Non-isolation
- Supports 200 Hz counter input (32-bit + 1-bit overflow)
- Keep/discard counter value when power OFF
- Supports 200 Hz Frequency Input
- Supports inverted DI status

3.5.1.2 Analog Inputs

- Channels: 4
- Resolution: 16 bit
- Sampling Rate: 1 Hz per channel
- Accuracy:
 - ±0.1% of FSR (voltage)
 - ±0.2% of FSR (current)
- Input Range:
 - ±150mV, ±500mV, ±1 V, ±5V, ±10V, 0 ~ 150mV, 0 ~ 500mV, 0 ~ 1V, 0 ~ 5V, 0 ~ 10V, 0 ~ 20mA, 4 ~ 20mA, ±20mA
- Input Impedance:
 - > 2M Ω (voltage)
 - 240 Ω (external resistor for current)
- Isolation Voltage: 3000 V_{DC}
- Common Mode Voltage: 350 V_{DC}
- Burn-Out Detection: Yes (4 ~ 20mA only)

- Supports data scaling and averaging

3.5.2 WISE-S672 I/O Module

3.5.2.1 Digital Inputs

- Channels: 6
- Logic Level (Dry Contact):
 - 0: Open
 - 1: Close DI COM
- Non-isolation
- Supports 32-bit counter input function (maximum signal frequency: 200 Hz)
- Supports keep/discard counter value when power OFF
- Supports frequency input function (maximum signal frequency: 200 Hz)
- Supports inverted digital input status

3.5.2.2 COM Port #1

- Port Type: RS-485
- Baud Rate (bps): 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
- Data Bits: 7, 8
- Stop Bits: 1, 2
- Parity: None, Odd, Even
- Flow Control: Auto flow control
- Signals: DATA+ and DATA-
- Protection: 15 kV ESD
- Supported Protocols:
 - Modbus/RTU (Up to 32 addresses with a maximum of 8 instructions)

3.5.2.3 COM Port #2

- Port Type: RS-485 or RS-232
- Baud Rate (bps): 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
- Data Bits: 7, 8
- Stop Bits: 1, 2
- Parity: None, Odd, Even
- Flow Control: Auto flow control (RS-485 only)
- Signals: DATA+ and DATA-
- Protection: 15 kV ESD
- Supported Protocols:
 - Modbus/RTU (Up to 32 addresses with a maximum of 8 instructions)

3.6 I/O Pin Assignment

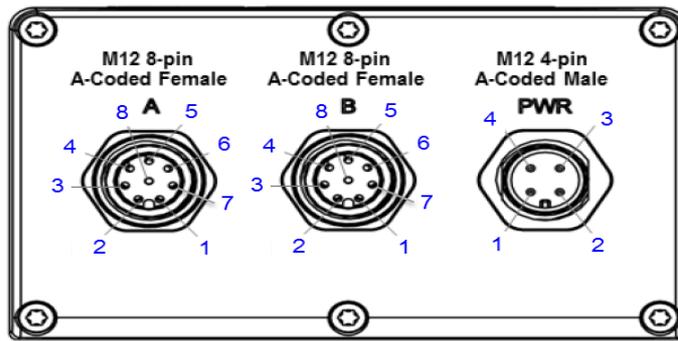


Figure 3.1 WISE-S600 Pin Out

Model Name	WISE-S614	WISE-S672	
	Pin Number		
A	1	DI0	DI0
	2	DI1	DI1
	3	DI2	DI2
	4	DI3	DI3
	5	NC	DI4
	6	NC	DI5
	7	NC	NC
	8	DI COM	DI COM
B	1	IA0+	DATA1-
	2	IA0-	DATA1+
	3	IA1+	TX
	4	IA1-	RX
	5	IA2+	DATA2-
	6	IA2-	DATA2+
	7	IA3+	NC
	8	IA3-	GND
PWR	1	+VS	+VS
	2	-VS	-VS
	3	SP+	SP+
	4	SP-	

3.6.1 WISE-S614 I/O Application Wiring

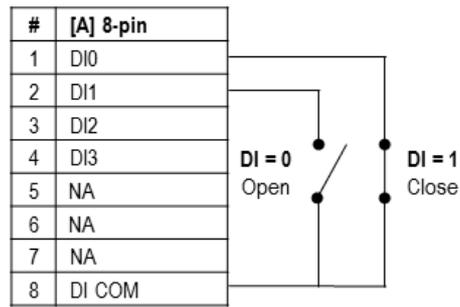


Figure 3.2 WISE-S614 Digital Input Wiring Diagram (Port A)

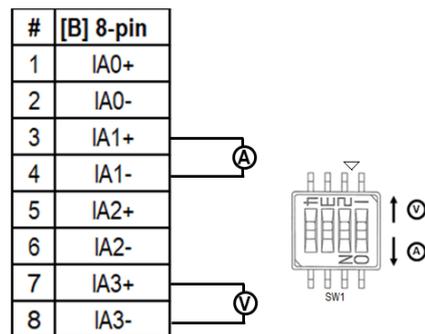


Figure 3.3 WISE-S614 Analog Input Wiring Diagram (Port B)

3.6.2 WISE-S672 Application Wiring

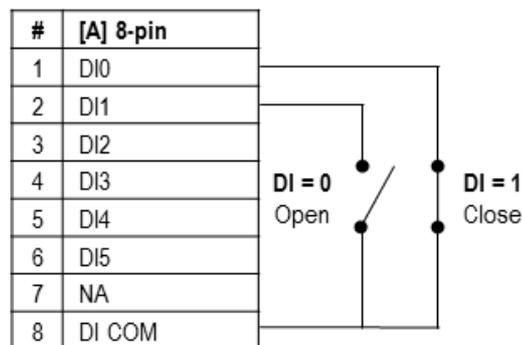


Figure 3.4 WISE-S672 Digital Input Wiring Diagram (Port A)

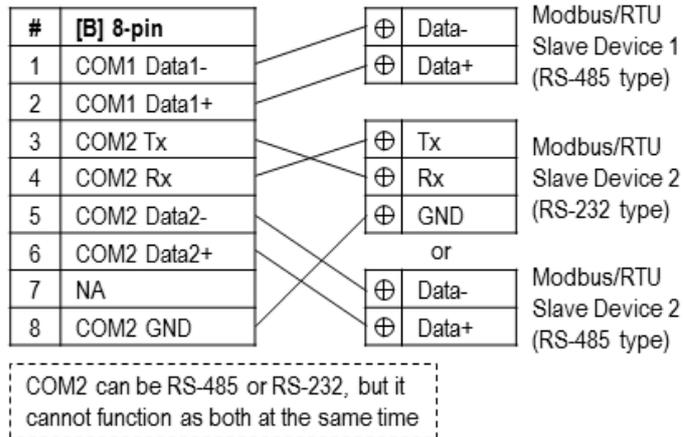


Figure 3.5 WISE-S672 Serial Port Wiring Diagram (Port B)

3.7 Power Supply Wiring

WISE-4610 modules are designed to support a standard unregulated 24- V_{DC} industrial power supply. However, they can also accept 10 ~ 50 V_{DC} input with a peak-to-peak power ripple of 200 mV. The immediate ripple voltage should be maintained at 10 ~ 50 V_{DC} . The screw terminals labeled “+Vs” and “-Vs” are for the power supply wiring. Refer to Section 3.6 “I/O Pin Assignment” for more details.

3.8 Block Diagram

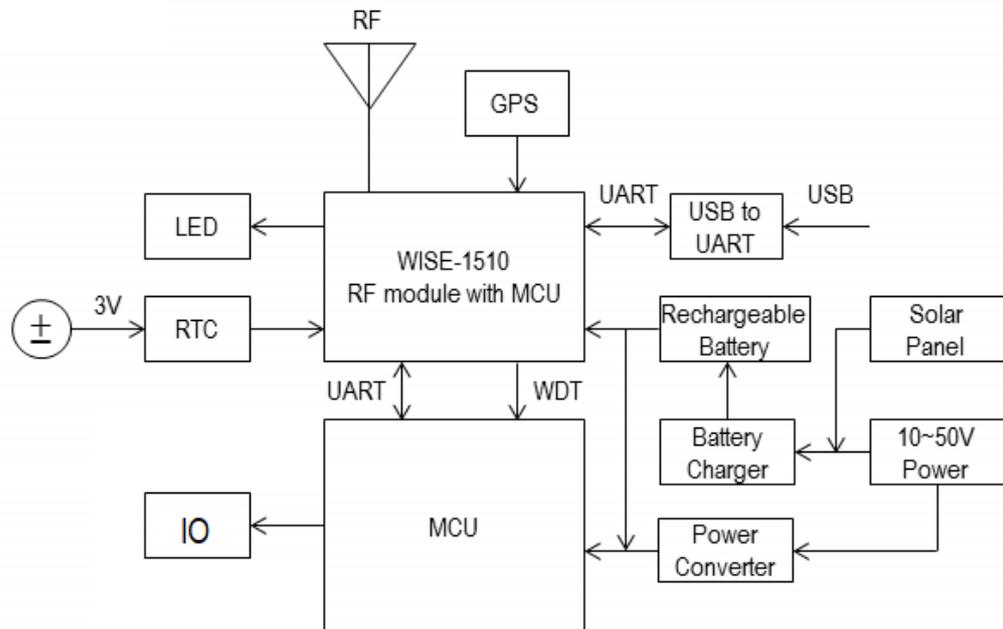


Figure 3.6 WISE-4610 Block Diagram

3.9 Configuration Interface

- Interface: USB virtual COM port
- Connector: Micro-B USB
- USB Chipset: Silicon Labs CP210x
- Driver: CP210x USB-to-UART bridge VCP drivers

Chapter 4

Firmware Specifications

4.1 WISE-Link SDK

WISE-4610 is the end node in a WISE-Link wireless network with a star topology and paired with a WISE-3610 gateway. The WISE-Link v1.0 node SDK architecture is used to define the RF communication mode between LoRa nodes and the LoRa gateway.

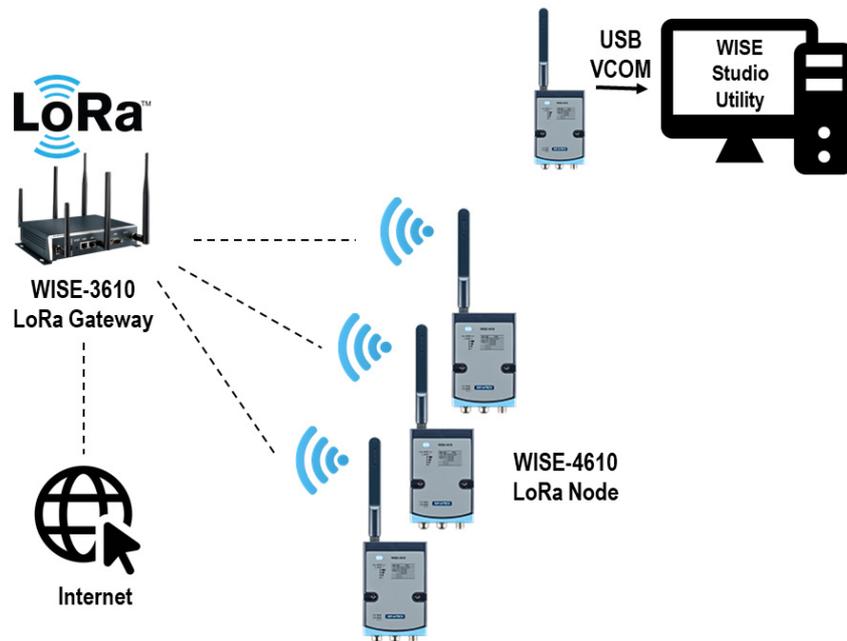


Figure 4.1 Communication Architecture

Note! Remove the USB cable after configuration to initiate RF communication.



4.2 Interface Design

4.2.1 LoRa Node Interface Design

■ Radio Frequency

Radio Frequency					
Region	US	EU	JP	TW	AU
Channel Frequency	903	869.525	920.6	920.1	
	904.6	868.1	920.8	920.3	
	906.2	868.3	921	920.5	925.9
	907.8	868.5	921.2	920.7	917.5
	909.4	868.85	921.4	921	919.1
	911	869.05	921.6	921.2	920.7
	912.6		921.8	921.4	922.3
	914.2		922	921.6	923.9
	923.3		922.2	921.8	925.5
	923.9			922	927.1
	924.5			922.2	923.3
	925.1			922.5	
	925.7			922.7	
	926.3			922.9	
	926.9			923.1	
	927.5			923.3	
				923.5	924.1
			924.7		

■ Data Rate

Region	US	EU	JP	TW	AU
Data Rate	DR4 - SF8/500 KHz	DR0 - SF12/125 KHz	DR0 - SF12/125 KHz	DR4 - SF8/500 KHz	DR4 - SF8/500 KHz
	DR8 - SF12/500 KHz	DR1 - SF11/125 KHz	DR1 - SF11/125 KHz	DR8 - SF12/500 KHz	DR8 - SF12/500 KHz
	DR9 - SF11/500 KHz	DR2 - SF10/125 KHz	DR2 - SF10/125 KHz	DR9 - SF11/500 KHz	DR9 - SF11/500 KHz
	DR10 - SF10/500 KHz	DR3 - SF9/125 KHz	DR3 - SF9/125 KHz	DR10 - SF10/500 KHz	DR10 - SF10/500 KHz
	DR11 - SF9/500 KHz	DR4 - SF8/125 KHz	DR4 - SF8/125 KHz	DR11 - SF9/500 KHz	DR11 - SF9/500 KHz
	DR12 - SF8/500 KHz	DR5 - SF7/125 KHz	DR5 - SF7/125 KHz	DR12 - SF8/500 KHz	DR12 - SF8/500 KHz
	DR13 - SF7/500 KHz	DR6 - SF7/250 KHz		DR13 - SF7/500 KHz	DR13 - SF7/500 KHz
		DR7 - FSK			

■ Tx Power

Region	US	EU	JP	TW	AU
TX Power	20 dBm				
	18 dBm	17 dBm	18 dBm	18 dBm	18 dBm
	16 dBm	14 dBm	16 dBm	16 dBm	16 dBm
	14 dBm	11 dBm	14 dBm	14 dBm	14 dBm
	12 dBm	8 dBm	12 dBm	12 dBm	12 dBm
	10 dBm	5 dBm	10 dBm	10 dBm	10 dBm
			2 dBm		

■ Data Rate Configuration and Indicative Physical Bit Rate

Data Rate	Indicative Physical Bit Rate (bit/s)
LoRa: SF10/125 KHz	980
LoRa: SF9/125 KHz	1760
LoRa: SF8/125 KHz	3125
LoRa: SF7/125 KHz	5470
LoRa: SF12/125 KHz	250
LoRa: SF11/125 KHz	440
LoRa: SF12/500 KHz	980
LoRa: SF11/500 KHz	1760
LoRa: SF10/500 KHz	3900
LoRa: SF9/500 KHz	7000
LoRa: SF8/500 KHz	12500
LoRa: SF7/500 KHz	21900

■ Configuring Nodes in a WISE-Link Network

By default, every LoRa node is defined as a globally unique end-device identifier (DevEUI).

Item	Description
DevEUI	The DevEUI is a globally unique end-device identifier in the IEEE EUI64 address space that uniquely identifies the end-device. (Length: 8 bytes)

The device address (DevAddr) adopts the last four bytes of DevEUI.

Device Address (DevAddr)	The DevAddr consists of 32 bits and identifies the end-device within the current network. (Length: 4 bytes)
---------------------------------	---

Item	Description
Device Operating Mode	(Default: 1) 1: WISE-Link v1 2: LoRaWAN
Device Class	(Default: 1) 1: Class A 2: Class B 3: Class C
Activation Mode	(Default: 2) 1: OTAA (Over-the-air activation) 2: ABP (Activation by personalization)
Application Identifier (AppEUI)	The AppEUI is a global application ID in the IEEE EUI64 address space that uniquely identifies the entity able to process the Join-Req frame. The AppEUI is stored in the end-device before the activation procedure is executed. (Length: 8 bytes)
Network Session Key (NwkSKey), if ABP	The NwkSKey is a network session key specific to the end-device. It is used by both the network server and the end-device to calculate and verify the MIC (message integrity code) of all data messages to ensure data integrity. It is further used to encrypt and decrypt the payload field of MAC-only data messages. (Length: 16 bytes)
Application Session Key (AppSKey), if ABP	The AppSKey is an application session key specific to the end-device. It is used by both the application server and the end-device to encrypt and decrypt the payload field of application-specific data messages. (Length: 16 bytes)
Application Key (AppKey), if OTAA	The AppKey is an AES-128 root key specific to the end-device. Whenever an end-device joins a network via OTAA, the AppKey is used to derive the NwkSKey and AppSKey session keys specific to the end-device for encrypting and verifying network communication and application data. (Length: 16 bytes)

4.2.2 Positioning

4.2.2.1 General Description

WISE-4610 accesses the u-blox EVA-M8M-0 GNSS module via the I2C interface. This GNSS module can provide geolocation and time information.

The features of EVA-M8M are listed below.

Features	
Receiver Type	72-channel u-blox M8 engine GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1 SBAS L1 C/A: WAAS, EGNOS, MSAS Galileo-ready E1B/C
Maximum Navigation Update Rate	Single GNSS: Up to 18 Hz Concurrent GNSS: Up to 10 Hz
Accuracy	Position: 2.5 m CEP SBAS: 2.0 m CEP
Acquisition	Cold starts: 27 s Aided starts: 4 s Reacquisition: 1 s
Sensitivity	Tracking and navigation: -164 dBm Cold starts: -147 dBm Hot starts: -156 dBm
Assistance GNSS	AssistNow Online AssistNow Offline AssistNow autonomous OMA SUPL and 3GPP compliant

■ Measurement Data

The data below is available from the GNSS module.

	Values	Description
UTC Time	2017~	Year
	1 ~ 12	Month
	1 ~ 31	Day
	0 ~ 23	Hour
	0 ~ 59	Minute
	0 ~ 59	Second
Position	Longitude	(+/- *10 ⁻⁷ degree), a minus sign if south of the equator
	Latitude	(+/- *10 ⁻⁷ degree), a minus sign if west of the prime meridian
	Altitude	(*10 ⁻³ m) height above mean sea level
	Speed	(*10 ⁻³ km/hr) ground speed
	Number of satellites	Satellites used for navigation

■ Configurations

Item	Description	
Positioning Enable/Disable	Enable or disable the GNSS module. (Default: Disable)	
Position Update Period	Time between two position fix attempts (15 sec ~ 1 day, unit: second) (Default: 1 hr)	
Select Permissible GNSS System	Specify which GNSS signals should be processed	
	Value	GNSS combination
	0	(Reserved)
	1	GPS + GLONASS (default)
	2	GPS + Galileo
	3	Galileo + GLONASS
	4	GPS + Galileo + GLONASS
	5	GPS + BeiDou
	6	Galileo + BeiDou
	7	GPS + Galileo + BeiDou
8	GLONASS + BeiDou	
*If GPS is enabled, SBAS and QZSS will also be enabled by default.		

4.2.3 LED Indicator Behaviors

- All LED indicators will turn OFF automatically after 15 seconds when the module is using battery power.

LED	Color	State	Description
Status	Green	Fast blink (0.2 sec ON, 0.3 sec OFF)	Waiting for connection or connecting
		Slow blink (0.2 sec ON, 1.8 sec OFF)	Connecting and operating normally
Error	Red	Fast blink (0.2 sec ON, 0.8 sec OFF)	Application errors <ul style="list-style-type: none"> ■ Network registration timeout ■ I/O error
		Slow blink (0.2 sec ON, 2.8 sec OFF)	<ul style="list-style-type: none"> ■ Low battery voltage ($v \leq 20\%$) ■ Low RTC battery voltage
		Off	No error
RF RX	Green	On	Receiving data from gateway
		Off	NA
RF TX	Yellow	On	Sending data to gateway
		Off	NA
Signal Strength	4 Green	On (if pressing the membrane button)	Main battery capacity <ul style="list-style-type: none"> ■ All OFF - $V \leq 20\%$ ■ 1 ON - $20\% < V < 40\%$ ■ 2 ON - $40\% \leq V < 60\%$ ■ 3 ON - $60\% \leq V < 80\%$ ■ 4 ON - $V \geq 80\%$

Error LED	Signal LEDs				Description	
	First (poor)	Second (Okay)	Third (Good)	Fourth (Full)		
Error	Fast blink	OFF	OFF	OFF	Fast blink	RF-related error
	Fast blink	OFF	OFF	Fast blink	OFF	I/O error
	Slow blink	OFF	OFF	OFF	OFF	Battery -elated error
	OFF	OFF	OFF	OFF	OFF	No error

4.2.4 Battery Charging

The battery IC serves as a gauge for estimating the remaining battery capacity.

Items	Values	Description
Remaining Battery Capacity	0 ~ 100%	An unsigned integer value of the predicted remaining battery capacity expressed as a percentage of full-charge capacity, with a range of 0 to 100%.
Cycle Count	0 ~ 65535	An unsigned integer value of the number of cycles the battery has undergone
Temperature	°C	An unsigned integer value of the battery temperature in units of 0.01 °C. * Temperature: 0x06/0x07 command used. It should be the external thermistor temperature.

		Flag Bit Definitions	
		Bit	Content
		15	OTC
		14	OTD
		13	BATHI
		12	BATLOW
		11	CHG_INH
		10	RSVD
		9	FC
		8	CHG
		7	OCVTAKEN
		6	ISD
		5	TDD
		4	HW1
		3	HW0
		2	SOC1
		1	SOCF
		0	DSG
Operating Status	Flags	<p>OTC = Over Temperature in Charge condition detected. True when set.</p> <p>OTD = Over Temperature in Discharge condition detected. True when set.</p> <p>BATHI = Battery High bit, indicating a high battery voltage condition.</p> <p>BATLOW = Battery Low bit, indicating a low battery voltage condition.</p> <p>CHG_INH = Charge Inhibit indicates the temperature is outside the range [Charge Inhibit Temp Low, Charge Inhibit Temp High]. True when set.</p> <p>FC = Fully charged condition reached (RMFCC = 1; Set. FC_Set% = -1% when RMFCC = 0). True when set.</p> <p>CHG = (Fast) charging allowed. True when set.</p> <p>OCVTAKEN = Cleared when switched to Relax mode, and set to 1 when OCV measurement is performed in Relax mode.</p> <p>ISD = Internal Short is detected. True when set.</p> <p>TDD = Tab Disconnect is detected. True when set.</p> <p>HW [1:0] Device Identification. Default is 01.</p> <p>SOC1 = State-of-Charge Threshold 1 (SOC1 Set) reached. True when set.</p> <p>SOCF = State-of-Charge Threshold Final (SOCF Set%) reached. True when set.</p> <p>DSG = Discharging detected. True when set.</p>	

■ Battery Events

Events	Condition	Error LED (Slow Blink)
Low voltage	Remaining battery capacity \leq 20%	✓
Over Temperature in Charge condition detected	Battery temperature < 0 °C or > 60 °C	
Over Temperature in Discharge condition detected	OTD flag of Operating Status set	
Internal Short detected	ISD flag of Operating Status set	✓
Fully charged condition reached	FC flag of Operating Status set	

■ Battery Temperature and Charging

	Battery Temp. T (°C)	Battery Level %	Charging
1	$T < 0$	-	Stop charging
2	$0 \leq T \leq 45$	-	Allow charging
3	$45 < T \leq 60$	$> 10\%$	Stop charging
		$\leq 10\%$	Charge to 20% only
4	$T > 60$	-	Stop charging

4.2.5 USB VCOM and RESTful

4.2.5.1 General Description

GET

The GET method means retrieve whatever information (in the form of an entity) is identified by the Request-URI. If the Request-URI refers to a data-producing process, the produced data is returned as the entity in the response and not the source text of the process, unless that text is the process output.

PUT

PUT can be used when the client is sending data to the server and the client is determining the URI for the newly created resource.

The PUT method requires that the enclosed entity be stored under the supplied Request-URI. If the Request-URI refers to an already existing resource, the enclosed entity SHOULD be considered a modified version of the one stored on the origin server. If the Request-URI does not point to an existing resource, and that URI is capable of being defined as a new resource by the requesting user agent, the origin server can create the resource with that URI.

client must supply the ID

if the resource exists, "replace" it with the inbound data

if it doesn't exist, create a new one (assuming you can do that)

PATCH

RFC5786 defines the new HTTP/1.1 [RFC2616] method, PATCH, which is used to apply partial modifications to a resource.

PATCH can be used when the client is sending one or more changes to be applied by the the server.

The PATCH method requests that a set of changes described in the request entity be applied to the resource identified by the Request-URI. The set of changes is represented in a format called a "patch document"...

The point is that PATCH is used to doing some kind of 'partial' update.

POST

POST can be used when the client is sending data to the server. The server determines the URI for the newly created resource.

“The POST method is used to request that the origin server accept the entity enclosed in the request as a new subordinate of the resource identified by the Request-URI in the Request-Line.”

This is what most of us think of when we talk about "creating data" on a web server.

4.2.6 WISE-Link I/O Data Format

To facilitate integration with the WISE-3610 gateway, WISE-4610 is designed to send I/O data to various payload field (see the table below). The raw data of DI, AI, COM1 and COM2 are all transmitted in TLV format.

■ Payload Field for WISE-4610

Field ID	WISE-4610-S672 (6-DI, 2-Serial)	WISE-4610-S614 (4-DI, 4-AI)
Default APPEUI	0000000053363732	0000000053363134
1	DI	DI
2	COM1	AI
3	COM2	Position (GPS)
4	Position (GPS)	

Payload Field Configurations on WISE-3610 for WISE-4610-S672

App EUI	Port	Payload Field	Id	Name	Type	Decimal Point	Sign	Unit	Minimum	Maximum	
0000000053363732	1	4	1	DI	Raw	-	-	-	-	-	
			2	COM1	Raw	-	-	-	-	-	
			3	COM2	Raw	-	-	-	-	-	
			4	Position	GPS	-	-	-	-	-	

Payload Field Configurations on WISE-3610 for WISE-4610-S614

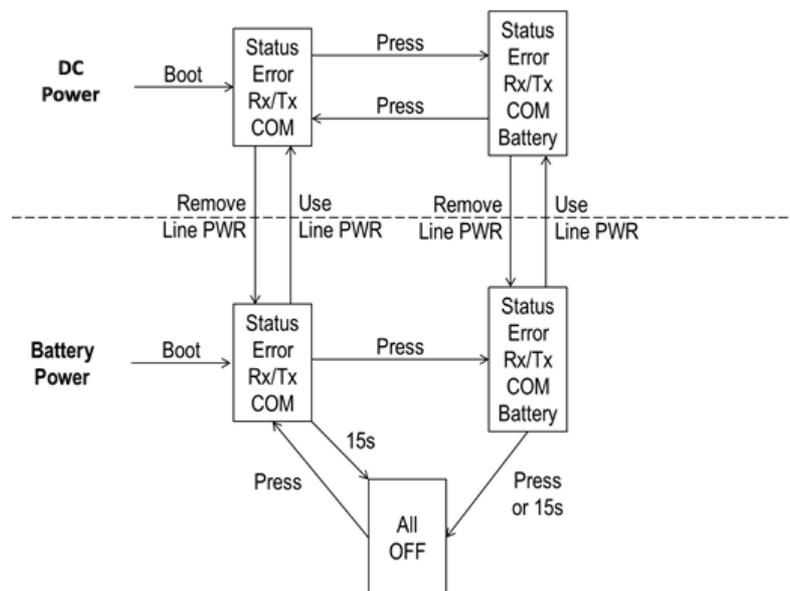
App EUI	Port	Payload Field	Id	Name	Type	Decimal Point	Sign	Unit	Minimum	Maximum	
0000000053363134	1	3	1	DI	Raw	-	-	-	-	-	
			2	AI	Raw	-	-	-	-	-	
			3	Position	GPS	-	-	-	-	-	

4.2.7 Membrane Button

Refer to Section 4.2.3 “LED Indicator Behaviors” for detailed information regarding the membrane button functionality.

- In the “DC Power Only” or “DC Power and Battery” modes, when WISE-4610 is powered via the power cable:
 1. The LED indicators are turned OFF as the default setting.
 2. To check the battery capacity, press the membrane button to light up the battery capacity indicator.
 3. Press the membrane button again to turn OFF the LED indicators and revert to State 1.
 4. If the power cable is removed and WISE-4610 is powered by the battery, the module will enter “Battery Power Only” mode.

- In “Battery Power Only” mode:
 1. The LED indicators are turned OFF as the default setting. The Status/Error/Rx/Tx/COM LEDs will light up for 15 seconds only.
 2. In State 1, all LED indicators will automatically turn OFF after 15 seconds to save power.
 3. In State 1, when the membrane button is pressed, all LED indicators, including the four battery capacity indicators, will light up. The indicators will automatically turn OFF after 15 seconds.
 4. In State 3, press the membrane button again to turn OFF the LED indicators.
 5. When all LED indicators are not illuminated, press the membrane button again to revert to State 1.
 6. When connected to the power supply cable, WISE-4610 will enter either the “DC Power Only” or “DC Power and Battery” modes.



4.2.8 Multiple Power Sources

WISE-4610 is compatible with three sources of power: batteries, DC power, and solar panels. The power source detection, power fail (remove cable and solar power), low-battery, and suspend LEDs will vary depending on the power source.

- Low-Battery Indicator - When the remaining battery capacity is 20% or less, the low-battery LED will blink slowly.
- Low-Battery Suspend - When the remaining battery capacity is 10% or less, module operations will be suspended.

Power Combination				Module Features				
DC Power	Solar Panel	Battery		Power source detection	Power fail (remove cable and solar panel)	Low battery		
			Switch			Error LED	Suspend	
Y	Y	Y	ON	Cable, battery	No PF signal, system running	Slow blink if $\leq 20\%$	No	
			OFF		PF			
		N	/	Cable	PF			
	N	Y	Y	ON	Cable, battery	No PF signal, system running	Slow blink if $\leq 20\%$	No
				OFF		PF		
		N	/	Cable	PF			
N	Y	Y	ON	Solar panel, battery	No PF signal, system running	Slow blink if $\leq 20\%$	No	
			OFF		PF			
		N	/	Solar panel	PF			
	N	Y	Y	ON	Battery	No PF signal (battery cannot be removed)	Slow blink if $\leq 20\%$	Suspend if $\leq 10\%$
				OFF		Module is not working		
		N	/					

Power Cable (DC/Panel)	Battery Power		Keep counter values
		Switch	
√	-		Remove power cable Yes
√	√	On	Remove power cable Based on battery level
		Off	
-	√	On	Switch ON→ OFF No

4.2.9 LoRaWAN Functions

WISE-4610 can be configured via WISE-Studio to establish a LoRaWAN.

Item	Description
Device Operating Mode	(Default: 1) 1: WISE-Link v1 2: LoRaWAN 3: Reserved for MAC-less 4: WISE-Link v2
Device Class	(Default: 1) 1: Class A 2: Class B 3: Class C
Activation Mode	(Default: 2) 1: OTAA (Over-The-Air Activation) 2: ABP (Activation By Personalization)
Port Field (FPort)	FPort values 1.223 (0x01.0xDF) are application-specific and any received frames with such an FPort SHALL be made available to the application layer by the LoRaWAN implementation.
Data Message Confirmed	1: Configure the module to send data message confirmations that must be acknowledged by the receiver. 0: Unconfirmed data messages.
Application Identifier (AppEUI), if OTAA	AppEUI is a global application ID in IEEE EUI64 address space that uniquely identifies the entity able to process the JoinReq frame. AppEUI is stored in the end-device before the activation procedure is executed. (Length: 8 bytes)
Application Key (AppKey), if OTAA	AppKey is an AES-128 root key specific to the end-device. Whenever an end-device joins a network via over-the-air activation, the AppKey is used to derive the NwkSKey and AppSKey session keys specific to that end-device for encrypting and verifying the network communication and application data. (Length: 16 bytes)
Network Session Key (NwkSKey), if ABP	The NwkSKey is a network session key specific for the end-device. It is used by both the network server and the end-device to calculate and verify the MIC (message integrity code) of all data messages to ensure data integrity. It is also used to encrypt and decrypt the payload field of MAC-only data messages. (Length: 16 bytes)
Application Session Key (AppSKey), if ABP	The AppSKey is an application session key specific to the end-device. It is used by both the application server and the end-device to encrypt and decrypt the payload field of application-specific data messages. (Length: 16 bytes)

4.2.10 Configuration Parameters for LoRaWAN

	OTAA	ABP
Globally Unique End-Device Identifier (DevEUI)	√	
Device Address (DevAddr)		√
Application Identifier (AppEUI)	√	
Application key (AppKey)	√	
Network Session Key (NwkSkey)		√
Application Session Key (AppSKey)		√

Chapter 5

Software
Specifications

5.1 Node and Gateway Connections

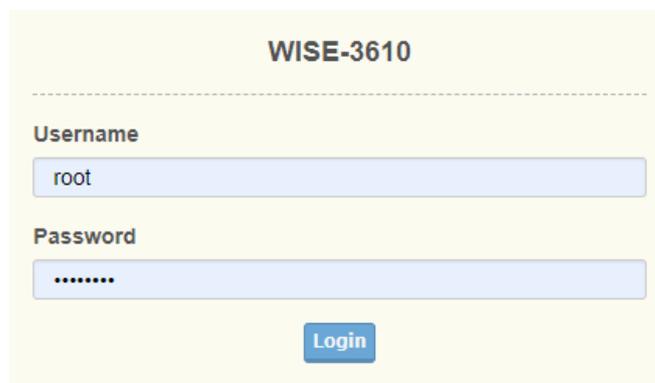
- Enter the default IP address “192.168.1.1” to configure the WISE-3610 gateway.
- Configure the WISE-4610 module using WISE-Studio through a USB port.

Note! After configuring WISE-4610, remove the USB cable for RF transmissions. Users can check the LED indicators for RF status.



5.1.1 WISE-3610 LoRa Gateway Setup

- Default IP Address: 192.168.1.1
- Default User Name: root
- Default Password: advantech

A screenshot of the WISE-3610 login interface. The title is "WISE-3610". Below the title is a dashed line. There are two input fields: "Username" with the text "root" and "Password" with masked characters "*****". A blue "Login" button is positioned below the password field.

WISE-3610

Username

root

Password

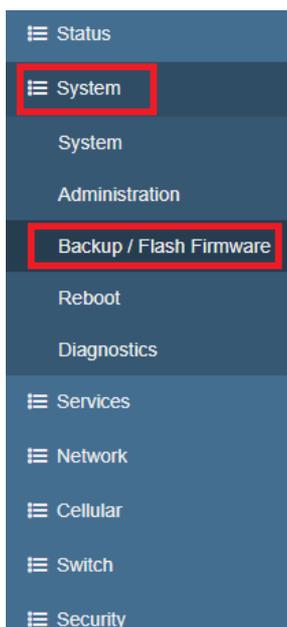
Login

- The first page of the gateway user interface displays the gateway status, including the **System, Memory, Network, and Wireless Technology** information.

A screenshot of the gateway status page. The title is "Status". Below the title is a dashed line. The page displays system information in a table format.

System	
Hostname	WISE-3610
Model	Advantech WISE-3610
Firmware Version	R1.0.19m01
Kernel Version	3.14.43
Local Time	Mon Nov 19 03:35:44 2018
Uptime	0h 58m 7s

- Users can upgrade the firmware image via System/Backup/Flash Firmware. After firmware upgrades, the system will automatically reboot.



Flash new firmware image

Upload a sysupgrade-compatible image here to replace the running firmware. Check "Keep settings" to retain the current configuration (requires an OpenWrt compatible firmware image).

Keep settings:

Image:

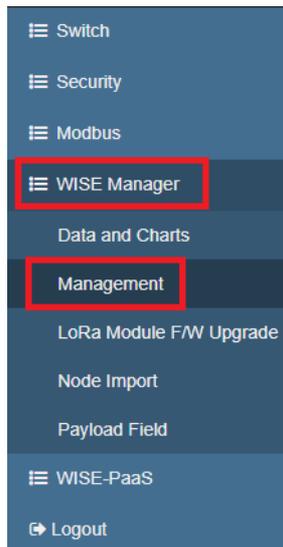
- Configure the WISE-3610 gateway via **WISE Manager/Management**.



- Click edit for further WISE-3610 settings.

LoRa Gateway					
Gateway EUI	Region	Radio Frequency #1		Radio Frequency #2	Action
74FE48FFFF19CEFB	US	Channel Frequency	903.000 MHz	Channel Frequency	923.300 MHz
		Data Rate	DR8 - SF12/500KHz	Data Rate	DR13 - SF7/500KHz
		TX Power	20 dBm	TX Power	20 dBm
					

- For WISE-Link v 1.0, disable the Beacon and Periodic Join functions on the WISE-Link page to enable OTAA. Additionally, in the Join tab, disable the Timestamp function and set the Rejoin Period as 24h.



WISE Link

WISE Link Join

Beacon

Periodical Join

WISE Link

WISE Link Join

Timestamp

Rejoin Period

- Configure nodes in the WISE-Link network.
Use WISE-4610 node data to complete the WISE-3610 gateway configuration.

LoRa Node

General Settings

Device EUI	<input type="text" value="74FE48FFFF2913D6"/>
App EUI	<input type="text" value="74FE48FFFF2913D6"/>
Device Class	<input type="text" value="A"/>
Activation	<input type="text" value="ABP"/>
Device Address	<input type="text" value="FF2913D6"/>
Network Session Key	<input type="text" value="....."/>
Application Session Key	<input type="text" value="....."/>
Payload Field	<input type="text" value="Enabled"/>
Remark	<input type="text" value="Remark"/>

- Navigate to the **WISE Manager/Payload Field** options to add a payload field for AI/DI/COM configuration.

ADVANTECH WISE-3610 Welcome, root

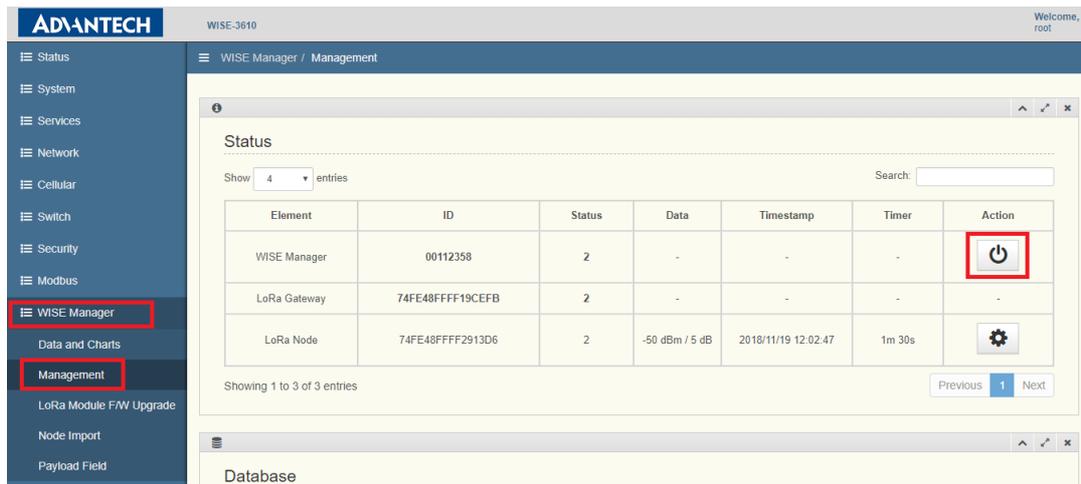
Payload Field

[+ Add Payload Field](#)

App EUI	Port	Payload Field	Id	Name	Type	Decimal Point	Sign	Unit	Minimum	Maximum	
0000000053363732	1	4	1	DI	Raw	-	-	-	-	-	
			2	COM1	Raw	-	-	-	-	-	
			3	COM2	Raw	-	-	-	-	-	
			4	Position	GPS	-	-	-	-	-	
0000000053363134	1	3	1	DI	Raw	-	-	-	-	-	
			2	AI	Raw	-	-	-	-	-	
			3	Position	GPS	-	-	-	-	-	

Note! Restart the system after all the settings have been configured.





5.1.2 Configure LoRa Nodes Using WISE-Studio

5.1.2.1 Minimum System Requirements

The minimum system requirements for WISE-Studio are as follows:

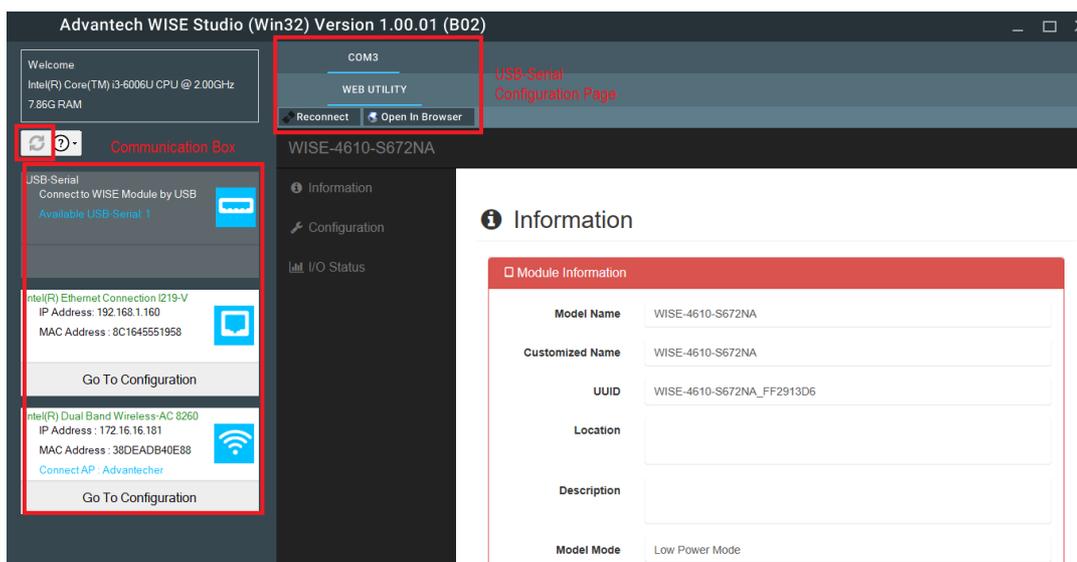
- Microsoft Windows 7 or later
- Microsoft .NET framework 3.5 or later
- Internet Explorer 10 or later

5.1.2.2 Installing WISE-Studio

The latest version of WISE-Studio is available on the Advantech support website <http://support.advantech.com/>. To install the software, download the installation file and execute it locally.

5.1.2.3 Introduction to WISE-Studio

WISE-Studio is a tool for configuring WISE modules. The software provides a web-based interface that is similar for different models. For WISE modules configured via Ethernet, LAN, or WLAN, WISE-Studio enables communication with the WISE module's internal web server. For modules configured via USB, WISE-Studio executes a web server on the computer installed with the software. The web server then uses the USB interface to communicate with the WISE module. The module information can be accessed via the embedded web page or a web browsers.



Communication Box

In this box, there are several communication interfaces for configuring various WISE modules. The WISE-4610 series uses the USB serial interface for configuration.

Refresh: Pressing this button refreshes the USB serial interface.

USB-Serial: This block is for connecting to a WISE module via USB. The available USB serial port number will be shown here. Click **Go to Configuration** to connect the USB COM port.

USB-Serial Configuration Page

After clicking **Go to Configuration**, all available USB COM ports will be displayed.

Choose the COM port to configure and click **Connect** to open the **Configuration** page. Users can also click **Open in Browser** to use your default browser to configure the WISE module (IE is the default browser embedded in WISE-Studio).

5.1.2.4 Information Page

Module Information

This page displays the name of the module and related information. Click **Go to Configuration** to view or change the settings.

Model Name: Model of WISE module

Customized Name/UUID: Refer to the model name and UUID of the module.

The default UUID is a combination of the model name and IMEI. Users can modify this value.

Location Information: The module location is provided here.

Description: Any comments about the module can be displayed here.

WISE-4610-S672NA

- Information
- Configuration
- I/O Status

Module Information

Model Name WISE-4610-S672NA

Customized Name WISE-4610-S672NA

UUID WISE-4610-S672NA_FF2913D6

Location

Description

Power Status displays the power source and battery status.

Power Status

Power Source	Line Power, Battery	RTC Battery	No Error
Battery Capacity	1 %		
Battery Temperature	24.25 °C	Battery Cycle Count	2
Battery Status	Battery: Charge Threshold Final reached, Charge Threshold 1 reached, (Fast)Charging allowed		

[Refresh](#)

LoRa Information shows the Activation Mode/Device Address/Device Class/Data Rate.

LoRa Information

Mode	WISE Link v1	Device Class	Class A
Activation Mode	ABP	Data Rate	DR13-SF7/500KHz
Device Address	FF2913D6		

Device Information lists the module firmware and web page version.

Device Information

Device Name	Device Description	Firmware Description
WISE-4610-S672NA	LoRaWAN WSN with 2 Serial Ports and 6-ch DI	Fw:A1.01 B04, Bootloader:A1.00 B00, A/D Fw:A1.03 B01, A/D Bootloader:A1.01 B00

5.1.2.5 Connecting to a LoRa Network

Use WISE-Studio to obtain data of the WISE-4610 node for configuring the WISE-3610 gateway.

LoRa Node

General Settings

Device EUI	74FE48FFFF2913D6
App EUI	74FE48FFFF2913D6
Device Class	A
Activation	ABP
Device Address	FF2913D6
Network Session Key
Application Session Key
Payload Field	Enabled
Remark	Remark

Below is the WISE-4610 node data. This page provides all the information needed for WISE-3610 configuration.

WISE-4610-S672NA

Information RF Module Data Update Time & Date Time Sync Control Positioning Firmware

Configuration

I/O Status

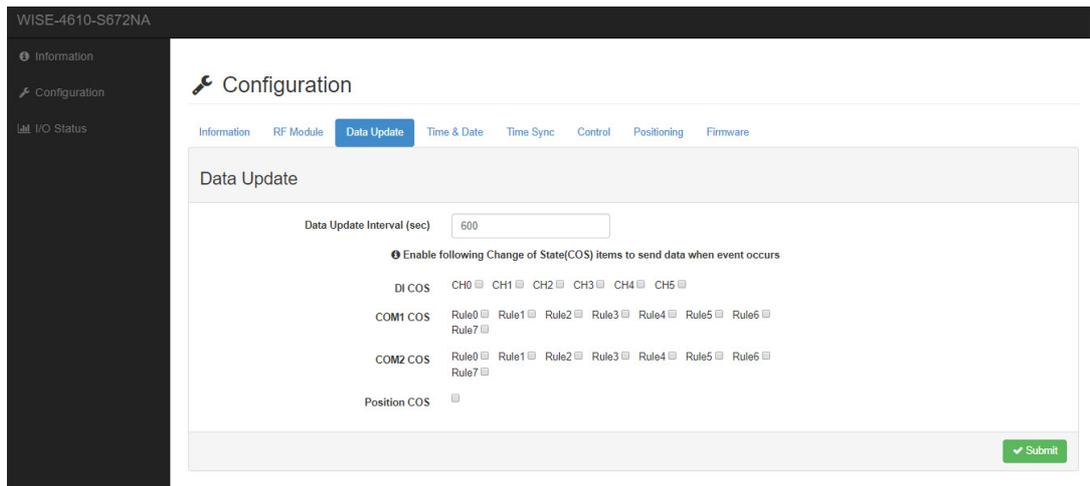
RF Module

Operation Region	US	Device Class	Class A
RF Operation Mode	WISE Link v1	Data Rate (bps)	DR13-SF7/500KHz
Activation Mode	ABP	Tx Power	-20
Channel Frequency (kHz)	923300	Device Address	FF2913D6
Device EUI	74FE48FFFF2913D6	Device EUI	74FE48FFFF2913D6
Network Session Key	00000000000000000000000000000011	Network Session Key	00000000000000000000000000000011

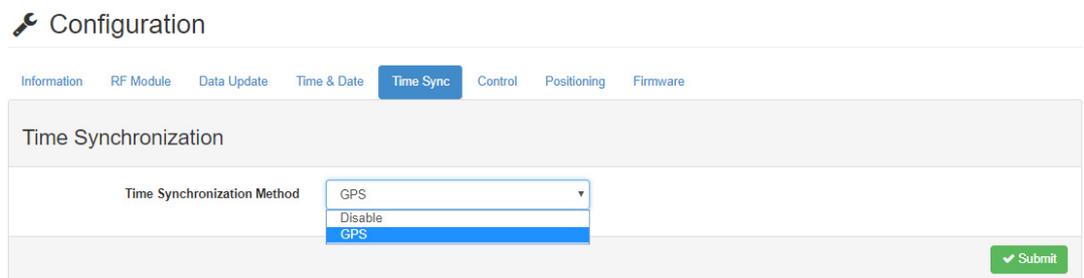
Application Information

Application EUI	00000000000000AB
Application Session Key	00000000000000000000000000000011
Application Port	1

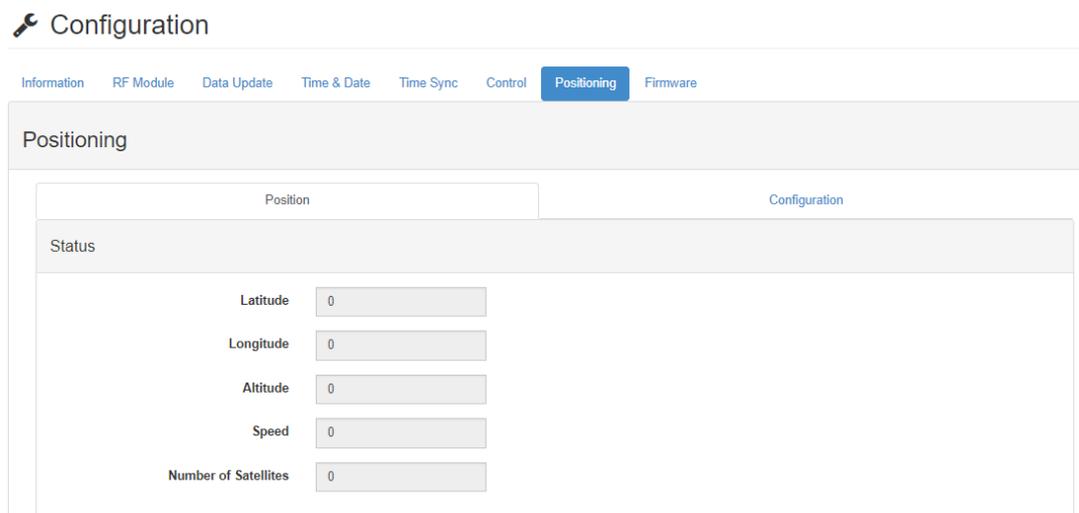
The items on this page allow users to set the **data update interval** (starting from 1 sec). The **Change of State** item allows users to configure the system to send data when an event occurs for selected I/O.



WISE-4610 supports **Time Synchronization** via GPS.



On this page, users can obtain the WISE module coordinates.



The WISE-4610 module is equipped with GPS. The options on this page allow users to enable/disable GPS positioning. To save power, GPS is disabled by default. Moreover, users can configure the specific update interval.

As shown below, the **GNSS System** field features a dropdown menu with different GPS system combination options. Users can select the system combination according to their usage requirements.

The screenshot shows the 'Positioning' configuration page. Under the 'Configuration' tab, 'Positioning Enable' is checked. The 'Update Interval(sec)' is set to 3600. The 'GNSS System' dropdown menu is open, showing the following options: GPS+GLONASS, GPS+Galileo (highlighted), Galileo+GLONASS, GPS+Galileo+GLONASS, GPS+BeiDou, Galileo+BeiDou, GPS+Galileo+BeiDou, and GLONASS+BeiDou. A 'Submit' button is located at the bottom right of the configuration area.

5.1.2.6 I/O Status Configuration

Digital Input

Status

The value of all digital input channels can be determined from the LED indicators on the DI tab (green LED = logic high; grey LED = logic low).

IO Status

The screenshot shows the 'IO Status' page with the 'DI' tab selected. The 'Status' section contains a table with the following data:

Channel	Mode	Status
0	DI	
1	DI	

Configuration

The digital input channels support several operation modes and can be configured from this page.

- **Channel:** Select the channel to be configured.
- **Tag Name:** Each channel can be given a name for identification.
- **Mode:** This item allows users to configure the operating mode for each channel. Channels can also be disabled/enabled to improve the overall performance.

After a channel has been configured, click **Submit** at the bottom of this page to implement the changes.

- **Channel Mask:** Each channel can be disabled individually to reduce data communication traffic.
- **Refresh:** This item allows users to refresh the system configuration settings.

The screenshot shows a web interface for configuring a Digital Input (DI) channel. At the top, there are tabs for 'DI', 'DO', and 'COM1', with 'DI' selected. Below the tabs are two main sections: 'Status' and 'Configuration'. The 'Configuration' section is active and contains the following fields:

- Channel:** A dropdown menu showing '0'.
- Tag Name:** A text input field containing 'W4471_047604-DI0'.
- Mode:** A dropdown menu showing 'DI'.
- Channel Mask:** A checkbox labeled 'Enabled/Disabled' which is checked.
- Refresh:** A blue button with a circular arrow icon and the text 'Refresh'.

Below the 'Mode' dropdown, there is a small informational message: 'Channel Mode is used for Channel Status Display only.'

- **Invert Signal:** WISE digital input channels support inverted digital input status. To enable/disable this function, click the **Invert Signal** check box on the Configuration page.
- **Digital Filter:** Digital input channels have a digital filter that can remove high-frequency noise. The filter can be enabled/disabled by clicking the **Digital Filter** check box. When the filter is enabled, the minimum acceptable signal width can be defined in the **Min. Low Signal Width** and **Min. High Signal Width** fields (increment: 0.1 ms).

The screenshot shows a configuration panel with the following sections:

- Invert Signal:** A checkbox labeled 'Enabled/Disabled' which is currently unchecked.
- Digital Filter:** A checkbox labeled 'Enabled/Disabled' which is currently unchecked.
- Min. Low Signal Width:** A text input field containing '1' and a unit selector dropdown set to '0.1ms'.
- Min. High Signal Width:** A text input field containing '1' and a unit selector dropdown set to '0.1ms'.

- **Counter:** When counter mode is selected for a given channel, the number of pulses in the digital signal from that channel are counted and recorded to the register. On the **Status** page, the current count value of the selected channel is displayed in the **Counter Value** field. The counter can be started/stopped by pressing **Start/Stop**. The counter can be reset (the value stored in the register will be reset to the default, which is zero) by clicking **Reset**. The predefined startup value is the value shown in the **Counter value** field. When this is reset, either by pressing **Reset** on the **Status** page or by issuing a command, the default settings will be restored (the default value for this field is zero). If **Keep Last Value** is enabled, the last counter value will be retained in the register when the module is powered OFF. When the module is powered ON, the counter will continue to count from that value. When this function is disabled, powering off the module will cause the counter to be reset and the count value in the register to be reset to zero.
- **Frequency:** For pure digital input channels, WISE modules support frequency mode, which calculates the frequency of the digital input signal of the selected channel. The frequency value will be displayed in the **Frequency value** field on the DI Status page. The **Precision** settings can be configured to specify the frequency for different input ranges. The **Value Reset Time** function allows users to specify when the frequency value is reset to zero if the pulse bandwidth is greater than expected.

The screenshot shows a configuration panel with the following elements:

- Counter: Startup Value:** A text input field containing the number '0' and a 'times' button to its right.
- Counter: Keep Last Value:** A checkbox that is currently unchecked, with the text 'Enabled/Disabled' to its right.
- Frequency: Precision:** A dropdown menu currently set to '0.1 Hz'.
- Frequency: Value Reset Time:** A text input field containing the number '100' and a '0.1 sec' button to its right.
- Submit:** A green button with a checkmark icon and the text 'Submit' located at the bottom right of the configuration area.

- **Low-to-High Latch:** Under low-to-high latch mode, once a digital input channel detects that the logic level has changed from low to high, the logic status will remain as “logic high” until the latch is cleared manually, which will return the logic status to “logic low”. The logic status can be determined via the latch status LED included on the **DI Status** page. Clear the latch by clicking **Clear**.
- **High-to-Low Latch:** Under high-to-low latch mode, once a digital input channel detects that the logic level has changed from high to low, the logic status will remain as “logic low” until the latch is cleared manually, which will return the logic status to “logic high”. The logic status can be determined via the latch status LED included on the **DI Status** page. Clear the latch by clicking **Clear**.

IO Status

Channel	Mode	Status
0	Low to High Latch	<input type="checkbox"/> Clear
1	High to Low Latch	<input type="checkbox"/> Clear

COM1 (RS-485 Port)

WISE-4610 features one RS-485 port for Modbus gateway functionality. This port can be used to poll data from RS-485 Modbus/RTU slave devices, such as Advantech's ADAM-4000 or ADAM-5000/485 series devices.

Status

Navigate to the **COM1** tab to check the status or configure the RS-485 Modbus master function. A total of 32 Modbus slave addresses can be mapped as the WISE module I/O. These 32 addresses can be coils or registers; coils will be mapped as extension bits of the WISE module, and registers will be mapped as extension words of the WISE module. In the **COM1** status tab, the bits and words are shown on individual pages.

- **Channel:** Indicates the number of bits. A maximum of 32 bits can be displayed, but less than 32 coils can be mapped as bits. The empty bits are invalid. The same applies to words, which may also have empty channels.
- **Value:** This shows the value polled from mapped addresses.
- **Status:** This shows the status of each bit or word. If a channel is empty or has not been mapped to a Modbus slave address, the status will be "Unavailable".
- **Slave ID:** This is the Modbus slave ID of RS-485 Modbus slave devices.
- **Slave Address:** This is the address of a bit or word from an RS-485 Modbus slave device.

For a writable bit or word, users can click **Edit** to switch to edit mode to change the value. Then click **Apply** to write the Modbus addresses individually.

IO Status

DI DO **COM1**

Status Modbus/RTU Configuration Diagnostician

Status

Bit Status Word Status

Show 16 entries [Edit](#)

Channel	Value	Status	Slave ID	Slave Address
0		Unavailable	0	0

Modbus Configuration - Common Settings Tab

The options on this tab allow users to configure the RS-485 port parameters.

- **Baud Rate:** 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bps
- **Data Bit:** 7, 8
- **Stop Bit:** 1, 2
- **Parity:** None, Odd, Even
- **Slave Response Timeout:** This item allows users to specify the response time for Modbus slaves
- **Delay Between Polls:** This item allows users to set the delay time between each Modbus instruction
- **CRC Check:** This item allows users to set the CRC check to ignore Modbus CRC errors

Modbus/RTU Configuration

Common Setting Rule Setting

Baud rate 9600 bps

Data Bit 8 bit

Parity None

Stop Bit 1 bit

Slave response timeout 50 ms

Delay between Polls 10 ms

CRC Check Disable Enable

[Submit](#)

Modbus Configuration - Rule Setting Tab

The items on this tab allow users to configure the Modbus address of end devices to be polled.

- **Rule:** Each COM port can support a maximum of 8 rules. Each rule can be for a different slave device. This means a maximum 8 of devices can be connected to the COM port. Alternatively, all the rules can be used for polling different addresses on the same slave device.
- **Slave ID:** Each slave device connected to the RS-485 port has a unique slave ID. This item is the slave address of the Modbus devices connected to the WISE module.
- **Type:** This device supports Modbus data types: 01 Coil Status (0x), 02 Input Status (1x), 03 Holding Registers (4x), and 04 Input Registers (3x). After one of the types has been configured in the rule, the rule will be enabled and the COM port will start polling after the configuration has been implemented.
- **Start Address:** Enter the first address number to be polled. The address base is 1. To poll the first address of a holding register (i.e., 40001), simply input the number "1" (users do not need to input the entire address "40001").
- **Length:** Input the length of the address to be polled in this rule. For example, to poll 40001 ~ 40008, set the length as "8". Because each COM port can poll a maximum of 32 addresses, the maximum length is 32, and the total number of all rules should not exceed 32.
- **R/W:** This item allows users to set whether the address in this rule is read or written. For coil statuses and holding registers, users can configure these addresses as read-only or write-only to reduce the polling effort.
- **Scan Interval (unit: s):** This item allows users to set the scan interval for the COM port to poll Modbus slave devices. The COM port optimizes the scan interval according to the setting configuration. However, the read scan interval may depend on factors such as the Baud rate, slave device response time, and delay between polls. See the **Diagnostician** page to check the real response time as a reference for the scan interval value.
- **Mapping Channel:** When the Modbus address of slave devices is configured in each rule, these addresses are also mapped to the WISE module. the coils and registers of Modbus slave devices are mapped as bits for RESTful web service. There are 32 continuous channels of bits and another 32 continuous channels of words that can be mapped. Ensure that the channels for each rule do not overlap.
- **Log:** This item allows users to set whether the data polled from this rule is logged in the data logger.
- **Deviation/Change of Status (COS):** When this item is enabled, the difference between the current poll and last poll values can trigger a deviation/COS (change of state) for push data or log data.
- **Rule Status:** The web configuration interface will check whether the rule settings have any overlap or conflict. Rules can be enabled/disabled by setting the **Type** value. Enabled rules will be denoted with a green icon. The system will prompt users to confirm the submission of rules.

Note! After configuring the rules, click *Submit* to implement them.



Note!  After changing the rule configurations, the data logger is cleared of all data to accommodate the new data structure under the new configuration.

Note!  Move the mouse cursor over the table title rows to view tips.

IO Status

DI DO **COM1**

Status Modbus/RTU Configuration Diagnostician

Modbus/RTU Configuration

Common Setting Rule Setting

Rule	Slave ID	Type	Start Address	Length	R/W	Scan Interval	Mapping Channel	Log	Deviation/COS	Deviation Value	Rule Status
0	1	Disable	1	1	R	60	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3276	
1	1	Disable	1	1	R	60	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	3276	

Diagnostician

Because every device has a different response time, the WISE-4610 module supports a diagnostics function for testing the response time of each rule. This is intended to reduce the scan interval. Users can refer to the response time shown on this page when configuring the **Scan Interval** in the **Rule Setting** pages. The test results shown on this page can be reset by clicking **Reset Response Time**.

IO Status

DI DO **COM1**

Status Modbus/RTU Configuration Diagnostician

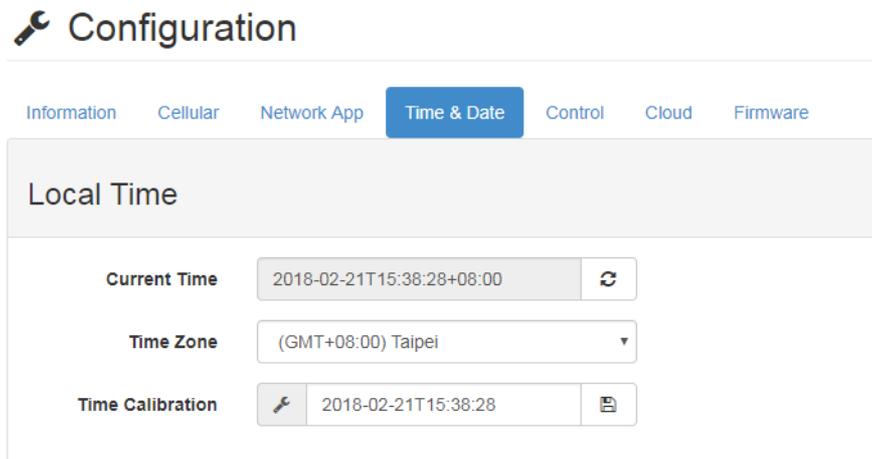
Modbus/RTU Slave Response Time

Rule	Current Response Time(ms)	Max Response Time(ms)	Min Response Time(ms)	Status
0	0	0	65535	Unavailable
1	0	0	65535	Unavailable

5.1.2.7 System Configuration

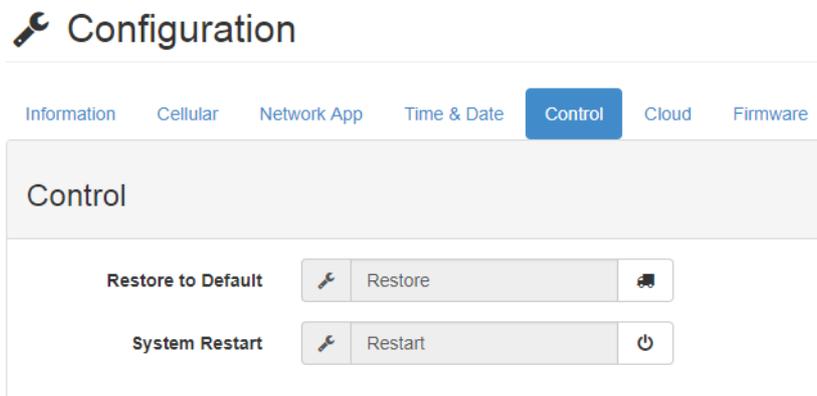
Time & Date

WISE modules have a built-in RTC that allows users to view the current time, set the time zone, and adjust the time by pressing **Click Me** to read the time from host devices.



Control

- **Restore to Default:** This item allows users to clear the system configuration and restore all default settings.
- **System Restart:** This item reboots the module for a system restart.



Firmware

To update the firmware, go to the **Firmware** page in **System Configuration** and click the update file. The latest official firmware releases are available on the Advantech support website (<http://support.advantech.com/>). Users can also upload or export the configuration file.

Configuration

Information Cellular Network App Time & Date Control Cloud **Firmware**

Files

Firmware Upload

Configuration File Upload

Configuration File Export

Export Configuration File

www.advantech.com

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