User Manual

WISE-4000 Series

IoT Ethernet I/O Module

ADVANTECH

Enabling an Intelligent Planet

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Product Warranty

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 when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

FCC Class A

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

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

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:
    – The power cord or plug is damaged.
    – Liquid has penetrated into the equipment.
    – The equipment has been exposed to moisture.
    – The equipment does not work well, or you cannot get it to work according to the user's manual.
    – The equipment has been dropped and damaged.
    – The equipment has obvious signs of breakage.
15. 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.
16. 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.
17. The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

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

Contents

Chapter 1

Product Overview

1.1 Introduction

WISE-4000 series is an Ethernet-based wired or wireless IoT device, which integrated with IoT data acquisition, processing, and publishing functions. Except various I/O type offering, WISE-4000 series provides data pre-scaling, data logic, and data logger functions. These data can be access via mobile devices and be published to cloud with security in anytime and anywhere.

1.2 Feature Highlights

1.2.1 RESTful Web Service

Integrated with HTML5, JavaScript, and RESTful web service which satisfy the needs of IT technology, and also open a new market for WISE-4000 I/O module. WISE-4000 will not only sell to automation SI, but also the SI who has high level programming skill and network integration abilities

1.2.2 Data Storage Function

File-based cloud storage and data log function makes the data can be access at any time and in anywhere. User will never need to care about how to collect the data into any data logger or data gateway..

1.2.3 IoT Cloud Function

Direct cloud access and direct mobile devices access functions make the information easier to been access. With 3-levels security, these data can storage, access, and publish in more safety way.

1.3 Series Family and Specifications

1.3.1 Series Family

Interface	Model	Description
WLAN	WISE-4012E	6-ch Universal Input or Output Wireless IoT Ethernet I/O Module for IoT Developer
	WISE-4050	4-ch Digital Input and 4-ch Digital Output Wireless IoT Ethernet I/O Module
	WISE-4060	4-ch Digital Input and 4-ch Relay Output Wireless IoT Ethernet I/O Module
LAN	WISE-4010/LAN	4-ch Current Input and 4-ch Digital Output IoT Ethernet I/O Module
	WISE-4050/LAN	4-ch Digital Input and 4-ch Digital Output IoT Ethernet I/O Module
	WISE-4060/LAN	4-ch Digital Input and 4-ch Relay Output IoT Ethernet I/O Module

1.4 Mechanical Design and Dimensions

1.4.1 WISE-4000 Wireless Series Dimensions

1.4.2 WISE-4000/LAN Dimensions

1.5 Switch

Switch	Description	Position	ON (Default)	OFF
SW1	Operation Mode	P1	Normal Mode	Initial Mode
		P2	N/A	N/A
SW2	DI Type (all channels)	P1	Dry Contact	Wet Contact
		P2	Dry Contact	Wet Contact

Note 1 After the position 1 of SW1 been changed, user need to power on the module again to apply the operation mode

Note 2 SW2 in only for WISE-4050(/LAN) and WISE-4060(/LAN), all 4 channels have to be configured to dry contact or wet contact in the same time, and both P1 and P2 have to be changed together

1.6 LED Definition

■ **WISE-4000 Wireless Series**

LED	Color	Indication	Behavior
Status	Green	Blink	Module is normally at work. (1Hz)
		ON 30 Sec	When enable LOCATE function.
Com	Yellow	Blink	When TX/RX data in transmission
AP/Station	Green	ON	Limited AP Mode
		OFF	Station Mode
Signal Strength	Green	ON *4	Full Signal
		ON *3	Good Signal
		ON *2	Okay Signal
		ON *1	Poor Signal
		All OFF	No Signal

■ **WISE-4000/LAN Series**

LED	Color	Indication	Behavior
Status	Green	Blink	Module is normally at work. (1Hz)
		ON 30 Sec	When enable LOCATE function.
Com	Yellow	Blink	When TX/RX data in transmission
Link	Green	ON	Ethernet cable is connected
Speed	Yellow	ON/OFF	ON: 100 Mbps OFF: Less than 100 Mbps

1.7 Certification and Safety Standard

- FCC
  - FCC 47 CFR PART 15 (Class A)
  - IC ICES-003
- CE
  - EN 55011 / 55022 (Class A)
  - EN 61000-6-4
  - EN 61000-3-2
  - EN 61000-3-3
  - EN 55024
  - EN 61000-6-2
  - IEC 61000-4-2
  - IEC 61000-4-3
  - IEC 61000-4-4
  - IEC 61000-4-5
  - IEC 61000-4-6
  - IEC 61000-4-8
  - IEC 61000-4-11
  - RoHS
- China RoHS
- WEEE

1.8 Package Information

WISE-4000 Wireless Series
- WISE-4000 Module with bundle antenna and terminal connector x1
- Mounting bracket x1
- Quick startup manual with China RoHS declare

WISE-4000/LAN Series
- WISE-4000/LAN Module
- Mounting bracket x1
- Quick startup manual with China RoHS declare

WISE-4012E
- WISE-4012E Module with bundle antenna and terminal connector x1
- Quick startup manual with China RoHS declare
- USB drive with WebAccess
- USB power cable
- Extension board
- Screwdriver

Chapter 2

Product Specifications

2.1 General Specification

WLAN Interface

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

LAN Interface

- Ethernet: IEEE 802.3u 10/100Base-T(X)
- Connector: 1-port RJ-45

General

- Connector: 3.5mm spacing, 15-pole, plug-in screw terminal block (I/O and power)
- Watchdog Timer
  - System: 1.6 second
  - Communication
  - Programmable (FSV)
- Enclosure: PC
- Mounting: DIN 35 rail, wall, and stack
- Dimensions (W x H x D)
  - With bundle antenna
  - Without bundled antenna: 80 x 89 x 25 mm
- Operation Temperature:
  - WISE-4000 Wireless Series: -25~70°C (-13~158°F)
  - WISE-4000/LAN Series: -40~70°C (-40~158°F)
- Storage Temperature: -40~85°C (-40~185°F)
- Operating Humidity: 20~ 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.*

Power

- Power Input Voltage:
  10~30 V_{DC} (24 V_{DC} Standard)
  - WISE-4050
  - WISE-4060
  - WISE-4010/LAN
  - WISE-4050/LAN
  - WISE-4060/LAN
  USB 5V_{DC} ±10%
  - WISE-4012E
- Power Consumption
  - WISE-4012E: 2.2 W @ 5 V_{DC}
  - WISE-4050: 2.2 W @ 24 V_{DC}
  - WISE-4060: 2.5 W @ 24 V_{DC}
  - WISE-4010/LAN: 1.2 W @ 24 V_{DC}
  - WISE-4050/LAN: 2.2 W @ 24 V_{DC}
  - WISE-4060/LAN: 2.5 W @ 24 V_{DC}
- Power Protection

Software

- Configuration Interface: Web Interface, Windows Utility
- Utility: ADAM/Apax .NET Utility
- Library API (Driver): ADAM .NET Class Library
- Industrial Protocol: Modbus/TCP
- Supported Protocols: TCP/IP, UDP, HTTP, HTTPS, DHCP, ARP, SNTP
- Supported Web Functions: RESTful, HTML5, JavaScript, JSON

2.2 WISE-4010/LAN

2.2.1 I/O Specification

■ Current Input
  – Channel: 4
  – Resolution: 12-bit
  – Sampling Rate: 10/100 Hz/channel
  – Accuracy: ±0.2% of FSR @ 25°C
  – Input Range: 0~20 mA, 4~20 mA (Select by Web Configuration)
  – Input Impedance: 120 Ω
  – Burn-out Detection: Yes (4~20 mA only)
  – Supports Data Scaling and Averaging

■ Digital Output
  – Channels: 4
    – Open collector to 30 V, 500 mA max. for resistance load
    – Inductive loads require an external diode to eliminate back-EMF when the DO is turned off
  – On Resistance ($R_{DS(ON)}$): 0.3 Ω (max.) @ 500mA, 25°C
  – Supports 1 kHz Pules Output
  – Supports High-to-Low and Low-to-High Delay Output

2.2.2 Application Wiring
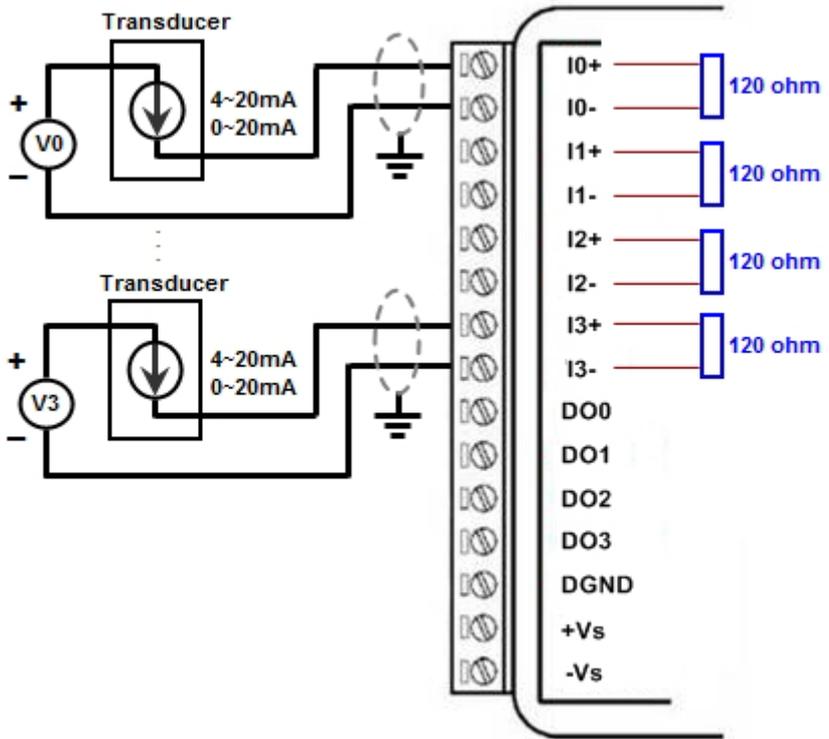
Figure 2.1 WISE-4010/LAN Current Input Wiring Diagram
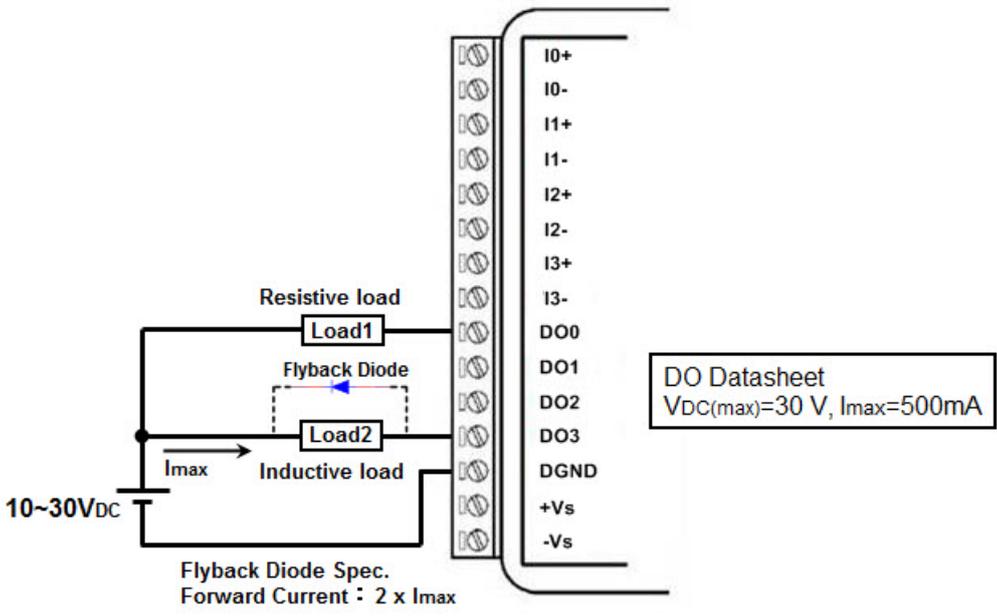
Figure 2.2 WISE-4010/LAN Digital Output Wiring Diagram

2.2.3 Pin Assignment
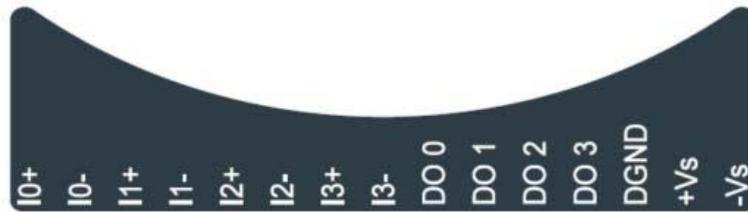
Figure 2.3 WISE-4010/LAN Pin Assignment

2.2.4 Block Diagram
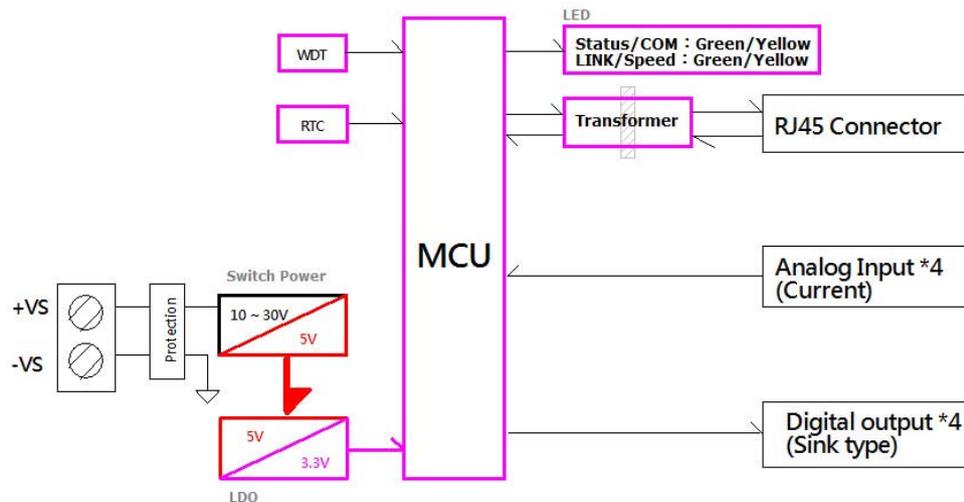
Figure 2.4 WISE-4010/LAN Block Diagram

2.3 WISE-4050/LAN

2.3.1 I/O Specification

- ■ Digital Input
  - – Channel: 4
  - – Logic level
    - –Dry Contact   0: Open
      - 1: Close to DI COM
    - –Wet Contact   0: 0~3 V_{DC} (0.8 mA max.)
      - 1: 10~30 V_{DC} (3 mA min.)
    - –All 4 channels should be configured to dry contact or wet contact in the same time
  - – Isolation: 3,000 V_{rms}
  - – Supports 3 kHz Counter Input (32-bit + 1-bit overflow)
  - – Keep/Discard Counter Value when Power-off
  - – Supports 3 kHz Frequency Input
  - – Supports Inverted DI Status

■ Digital Output
  – Channels: 4
  – Open collector to 30 V, 500 mA max. for resistance load
  – Inductive loads require an external diode to eliminate back-EMF when the DO is turned off
  – Isolation: 3,000 V_{rms}
  – On Resistance ($R_{DS(ON)}$): 0.3 Ω (max.) @ 500mA, 25°C
  – Supports 1 kHz Pules Output
  – Supports High-to-Low and Low-to-High Delay Output

2.3.2 Application Wiring
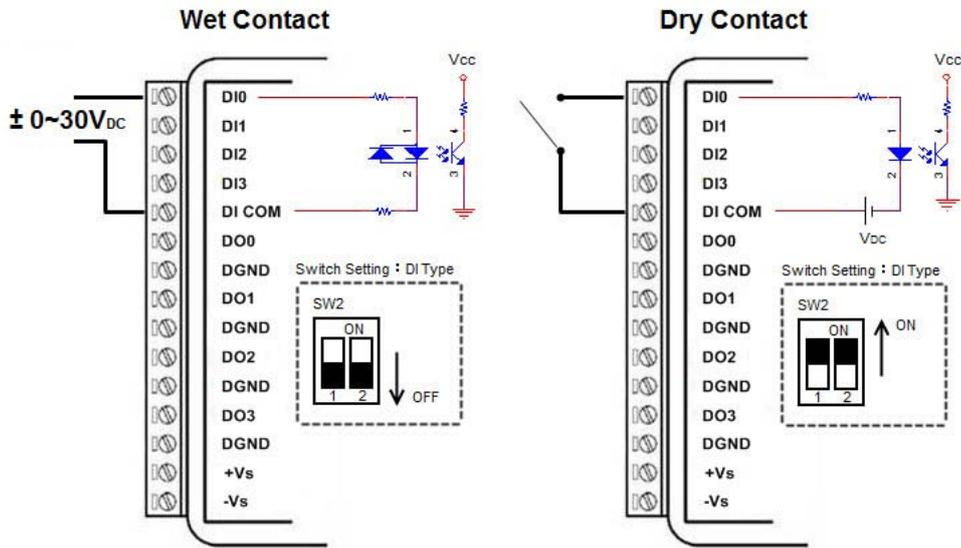
Figure 2.5 WISE-4050/LAN Digital Input Wiring Diagram
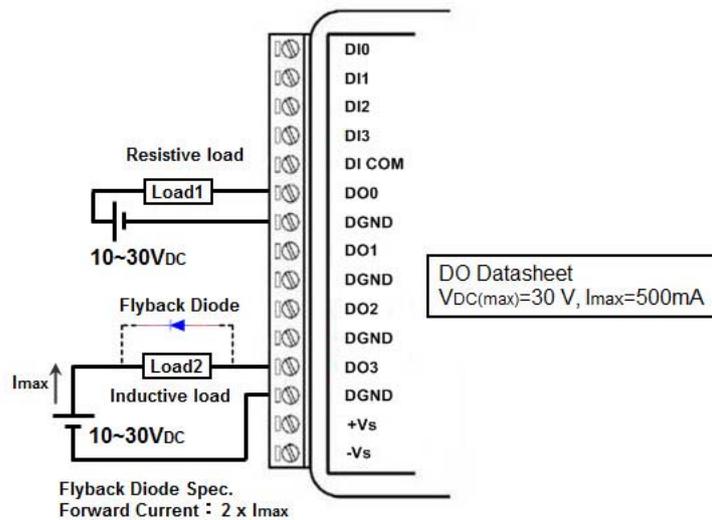
Figure 2.6 WISE-4050/LAN Digital Output Wiring Diagram

2.3.3 Pin Assignment
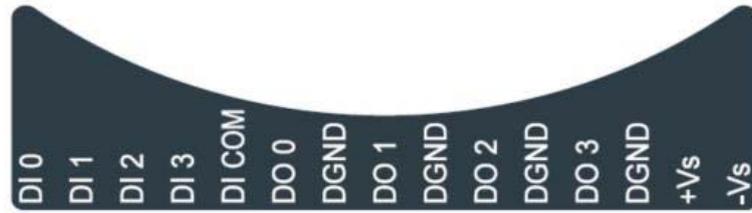
Figure 2.7 WISE-4050/LAN Pin Assignment

2.3.4 Block Diagram
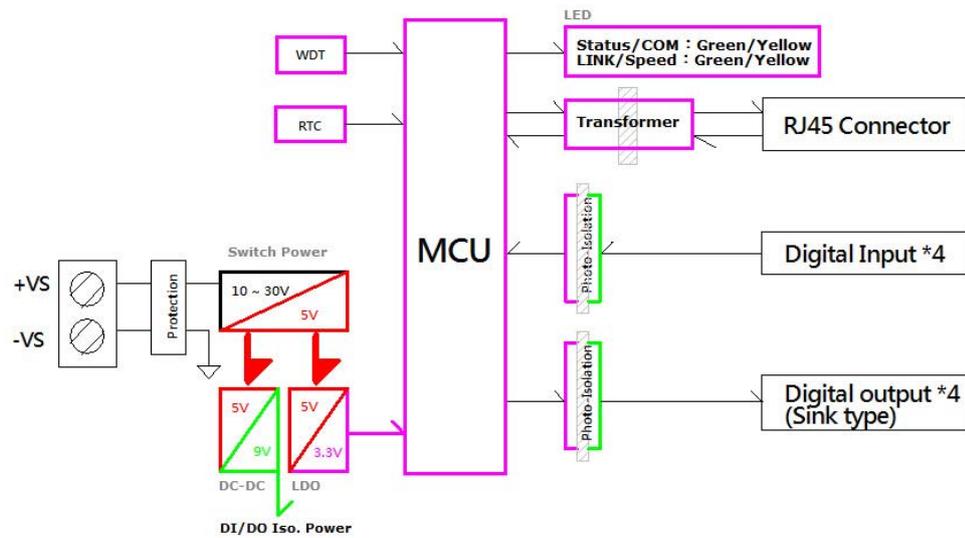
Figure 2.8 WISE-4050/LAN Block Diagram

2.4   WISE-4060/LAN

2.4.1   I/O Specification

- ■ Digital Input
  - – Channel: 4
  - – Logic level
  - – Dry Contact   0: Open
                    1: Close to DI COM
  - – Wet Contact 0: 0~3 V_{DC} (0.8 mA max.)
                    1: 10~30 V_{DC} (3 mA min.)
  - – Isolation: 3,000 V_{rms}
  - – Supports 3 kHz Counter Input (32-bit + 1-bit overflow)
  - – Keep/Discard Counter Value when Power-off
  - – Supports 3 kHz Frequency Input
  - – Supports Inverted DI Status

- ■ Relay Output
  - – Channels: 4 (Form A)
  - – Contact Rating
    –250 V_{AC} @ 5 A
    –30 V_{DC} @ 3 A
  - – Relay On Time: 10 ms
  - – Relay Off Time: 5 ms
  - – Insulation Resistance: 1 GΩ min. @ 500 V_{DC}
  - – Dielectric Strength
    –Between Contacts: 1000 V_{AC} (1min)
    –Between Coil to Contact: 3000 V_{AC} (1min)
  - – Maximum Switching: 60 operations/minute
  - – Supports Pules Output
  - – Supports High-to-Low and Low-to-High Delay Output

2.4.2 Application Wiring
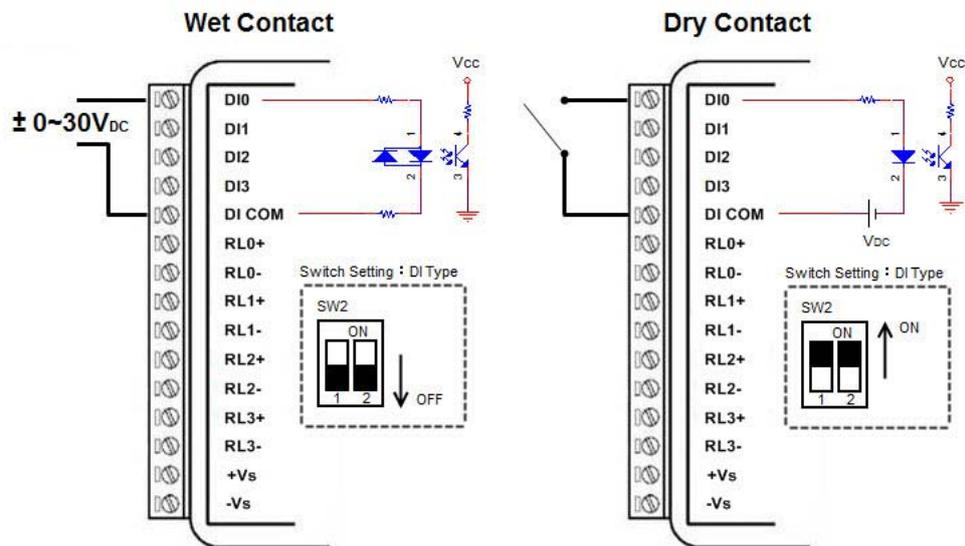
Figure 2.9 WISE-4060/LAN Digital Input Wiring Diagram
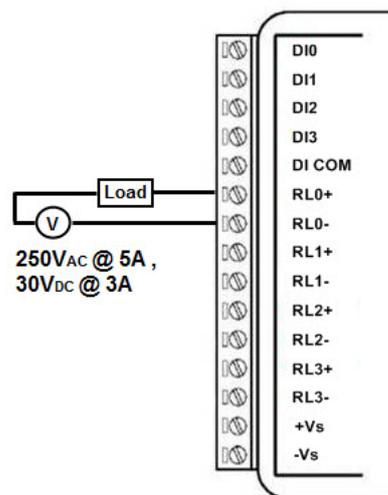
Figure 2.10 WISE-4060/LAN Relay Output Wiring Diagram

2.4.3 Pin Assignment

Figure 2.11 WISE-4060/LAN Pin Assignment

2.4.4 Block Diagram
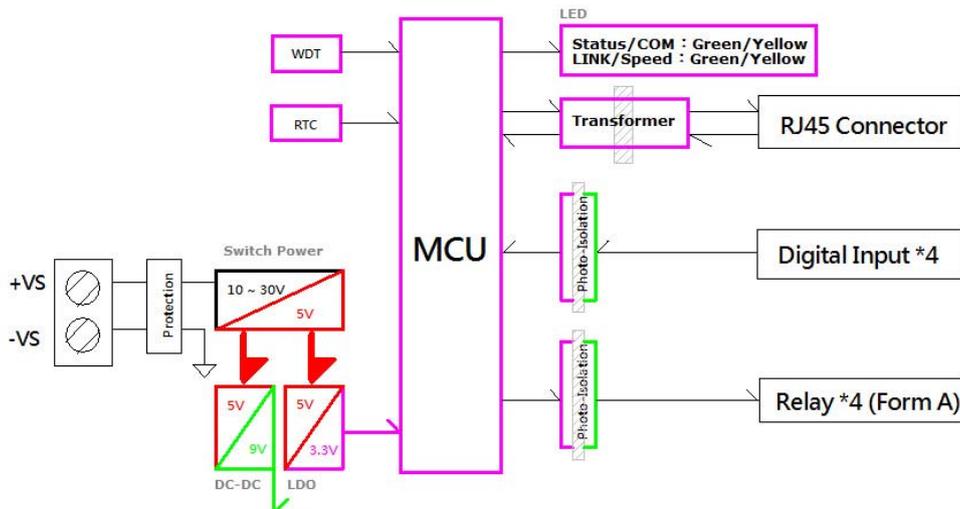
Figure 2.12 WISE-4060/LAN Block Diagram

2.5 WISE-4012E

2.5.1 I/O Specification

- ■ Voltage Input
  - – Channel: 2
  - – Resolution: 12-bit
  - – Sampling Rate: 10 Hz (Total)
  - – Accuracy: ±0.1 V_{DC}
  - – Input Range: 0~10 V_{DC}
  - – Input Impedance: 100 kΩ
  - – Supports Data Scaling and Averaging

- ■ Digital Input
  - – Channel: 2
  - – Logic level
    - –Dry Contact 0: Open
      - 1: Close to GND
  - – Supports 3 kHz Counter Input (32-bit + 1-bit overflow)
  - – Keep/Discard Counter Value when Power-off
  - – Supports 3 kHz Frequency Input
  - – Supports Inverted DI Status

- ■ Relay Output
  - – Channels: 2 (Form A)
  - – Contact Rating
    - –120 V_{AC} @ 0.5 A
    - –30 V_{DC} @ 1A
  - – Isolation: 500V_{rms}
  - – Relay On Time: 5 ms
  - – Relay Off Time: 6 ms
  - – Insulation Resistance: 1 GΩ min. @ 500 V_{DC}
  - – Maximum Switching: 60 operations/minute
  - – Supports Pules Output
  - – Supports High-to-Low and Low-to-High Delay Output

2.5.2 Application Wiring
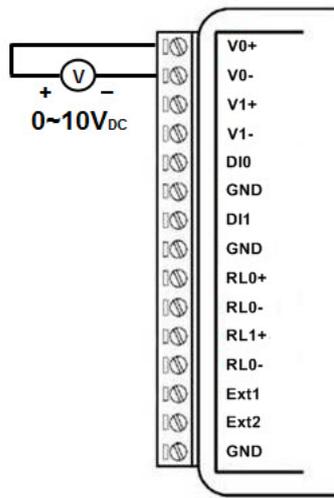
Figure 2.13 WISE-4012E Voltage Input Wiring Diagram
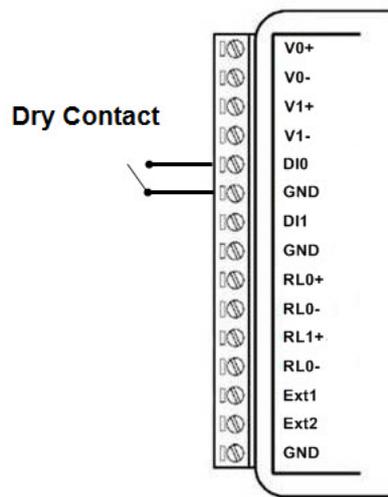
Figure 2.14 WISE-4012E Digital Input Wiring Diagram
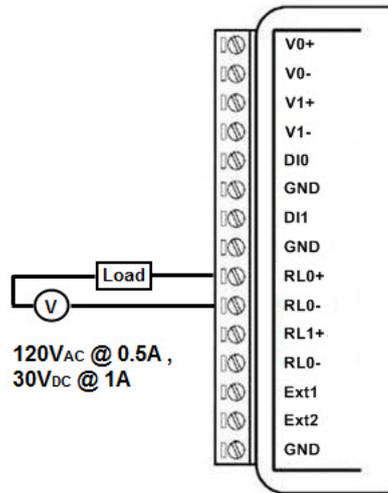
Figure 2.15 WISE-4012E Relay Output Wiring Diagram

2.5.3 Pin Assignment

Figure 2.16 WISE-4012E Pin Assignment

2.5.4 Block Diagram
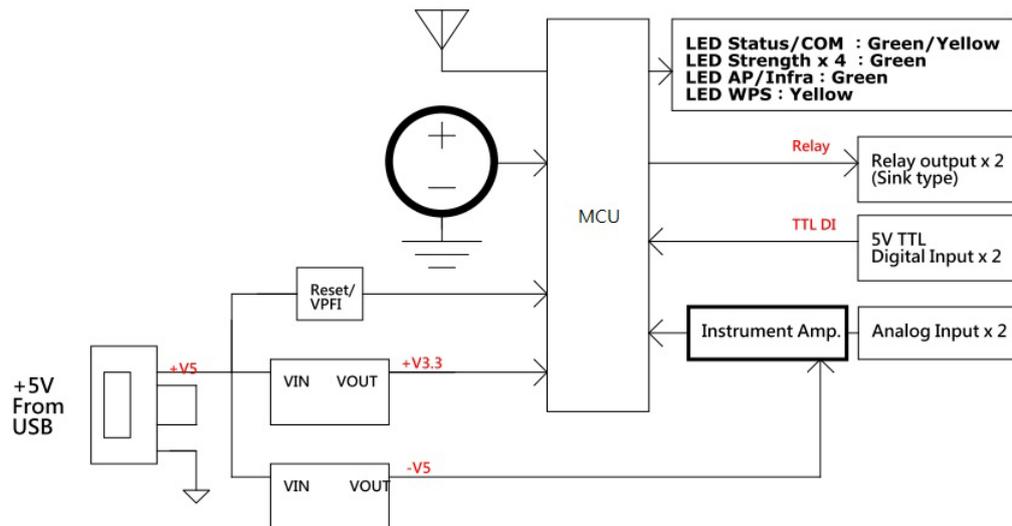
Figure 2.17 WISE-4012E Block Diagram

2.6   WISE-4050

2.6.1   I/O Specification

■   Digital Input
  – Channel: 4
  – Logic level
    –Dry Contact   0: Open
                   1: Close to DI COM
    –Wet Contact 0: 0~3 V_{DC} (0.8 mA max.)
                   1: 10~30 V_{DC} (3 mA min.)
    –All 4 channels should be configured to dry contact or wet contact in the same time
  – Isolation: 3,000 V_{rms}
  – Supports 3 kHz Counter Input (32-bit + 1-bit overflow)
  – Keep/Discard Counter Value when Power-off
  – Supports 3 kHz Frequency Input
  – Supports Inverted DI Status

■   Digital Output
  – Channels: 4 (Open collector to 30 V, 500 mA max. for resistance load)
  – Isolation: 3,000 V_{rms}
  – On Resistance ($R_{DS(ON)}$): 0.3 Ω (max.) @ 500mA, 25°C
  – Supports 1 kHz Pules Output
  – Supports High-to-Low and Low-to-High Delay Output

2.6.2 Application Wiring
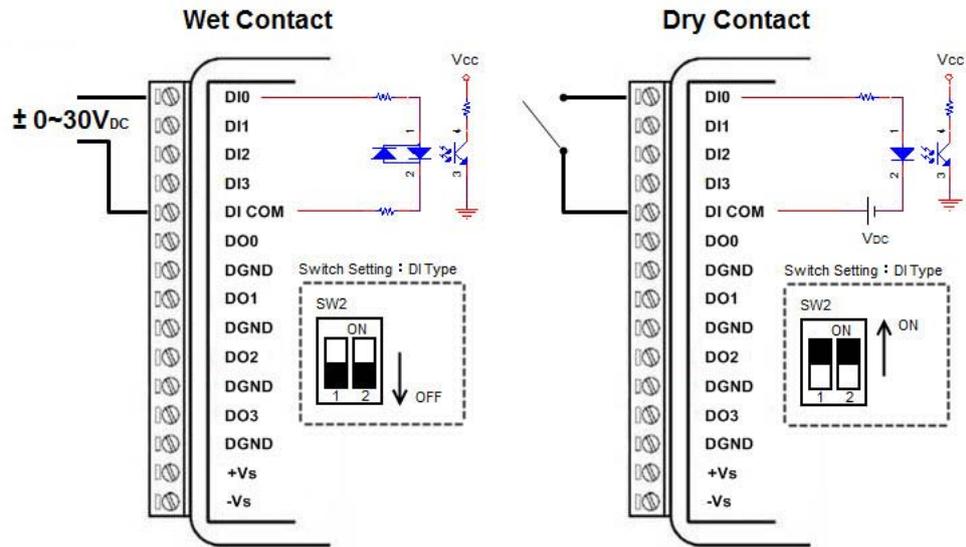
Figure 2.18 WISE-4050 Digital Input Wiring Diagram
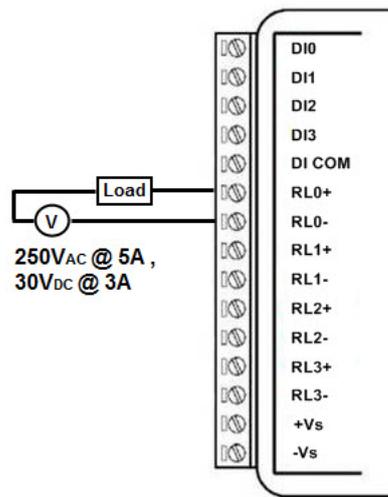
Figure 2.19 WISE-4050 Digital Output Wiring Diagram

2.6.3 Pin Assignment
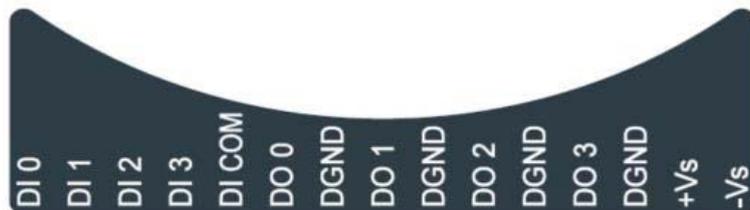
Figure 2.20 WISE-4050 Pin Assignment

2.6.4 Block Diagram
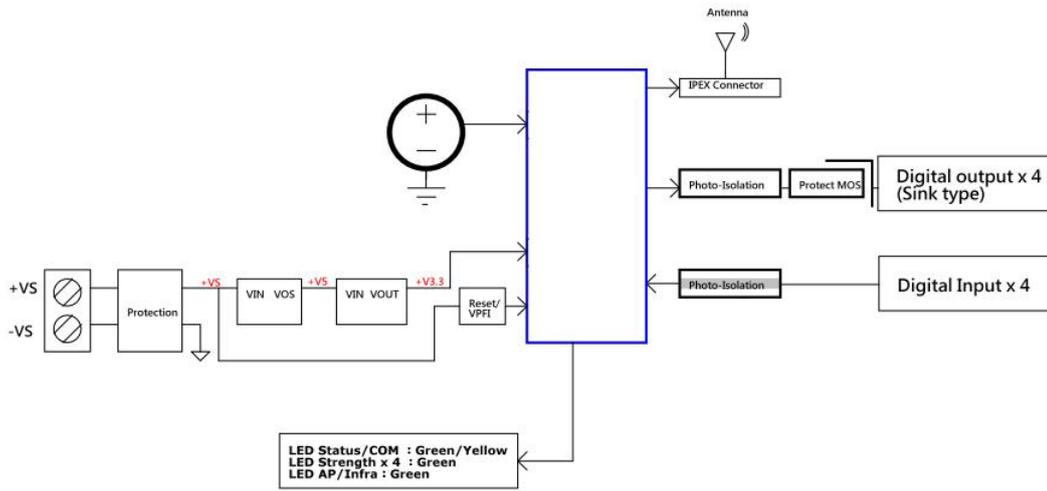
Figure 2.21 WISE-4050 Block Diagram

2.7 WISE-4060

2.7.1 I/O Specification

- ■ Digital Input
  - – Channel: 4
  - – Logic level
    - –Dry Contact 0: Open
      - 1: Close to DI COM
    - –Wet Contact 0: 0~3 V_{DC} (0.8 mA max.)
      - 1: 10~30 V_{DC} (3 mA min.)
  - – Isolation: 3,000 V_{rms}
  - – Supports 3 kHz Counter Input (32-bit + 1-bit overflow)
  - – Keep/Discard Counter Value when Power-off
  - – Supports 3 kHz Frequency Input
  - – Supports Inverted DI Status
- ■ Relay Output
  - – Channels: 4 (Form A)
  - – Contact Rating
    - –250 V_{AC} @ 5 A
    - –30 V_{DC} @ 3 A
  - – Relay On Time: 10 ms
  - – Relay Off Time: 5 ms
  - – Insulation Resistance: 1 GΩ min. @ 500 V_{DC}
  - – Dielectric Strength
    - –Between Contacts: 1000 V_{AC} (1min)
    - –Between Coil to Contact: 3000 V_{AC} (1min)
  - – Maximum Switching: 60 operations/minute
  - – Supports Pules Output
  - – Supports High-to-Low and Low-to-High Delay Output

2.7.2 Application Wiring
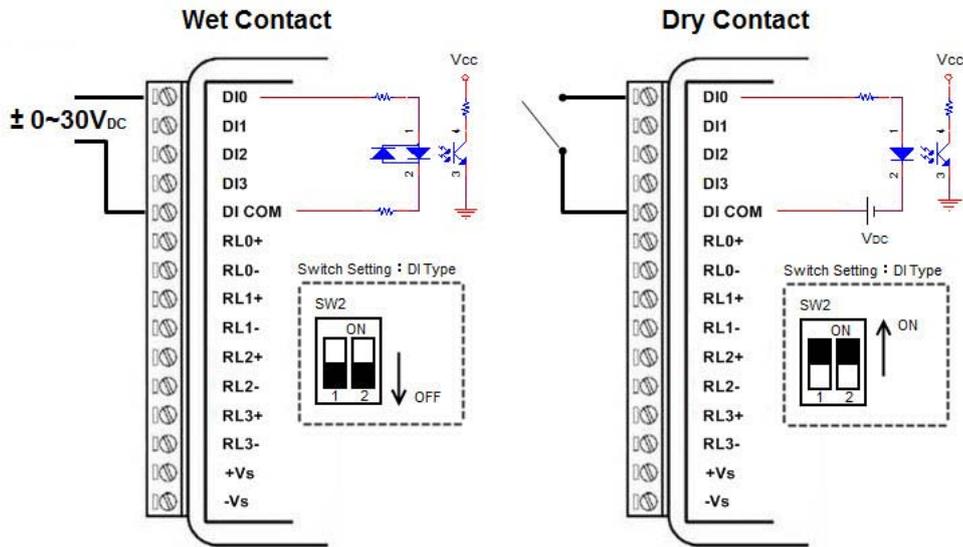
Figure 2.22 WISE-4060 Digital Input Wiring Diagram
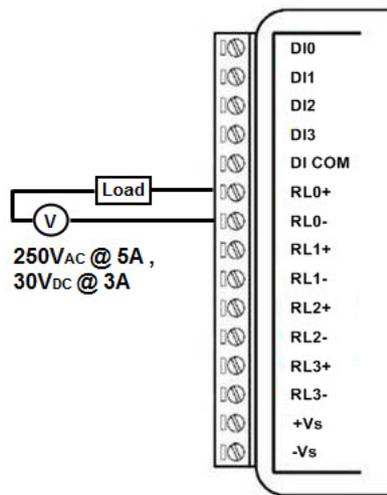
Figure 2.23 WISE-4060 Relay Output Wiring Diagram

2.7.3 Pin Assignment

Figure 2.24 WISE-4060 Pin Assignment

2.7.4 Block Diagram
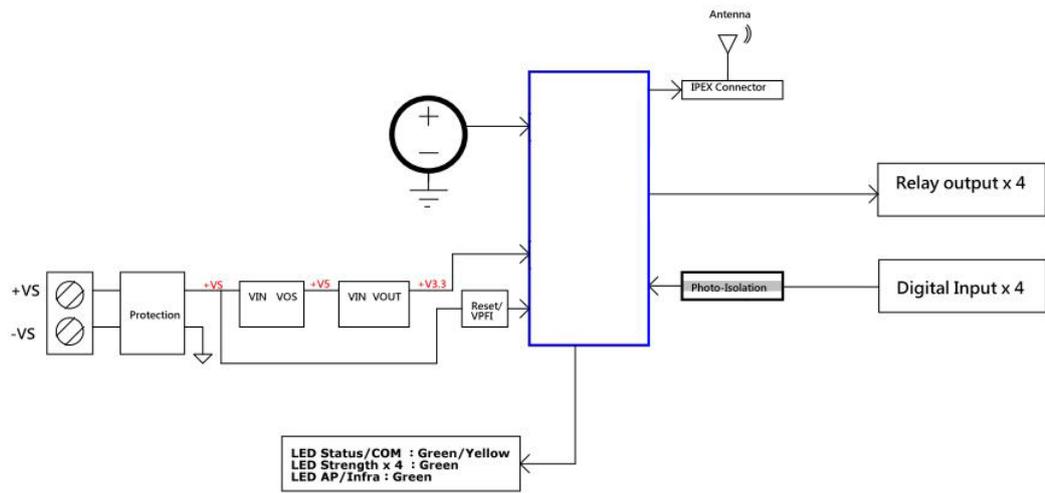
Figure 2.25 WISE-4060 Block Diagram

Chapter 3

Hardware Installation

3.1 Interface Introduction

3.2 Mounting

WISE-4000 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-4000 module can also be fixed to the cabinet by using mounting rails. You need to assemble the DIN rail adapter to WISE-4000 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.
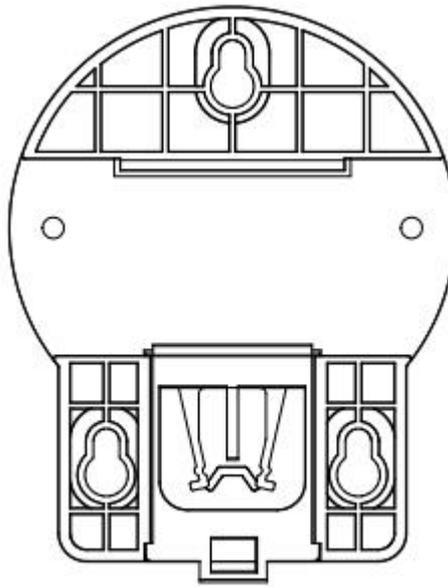
Figure 3.1 Mounting Kit Back View
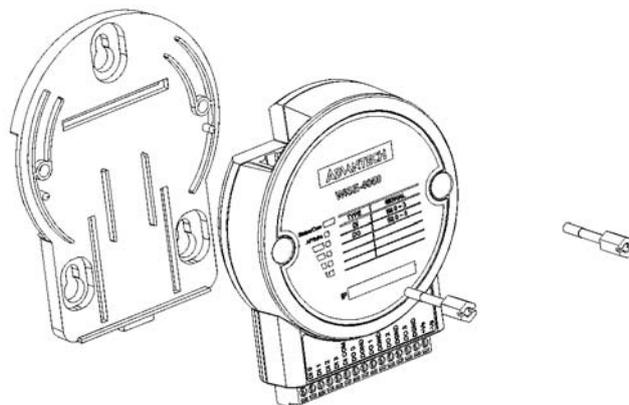
Figure 3.2 Installing the Mounting Kit for a DIN-Rail
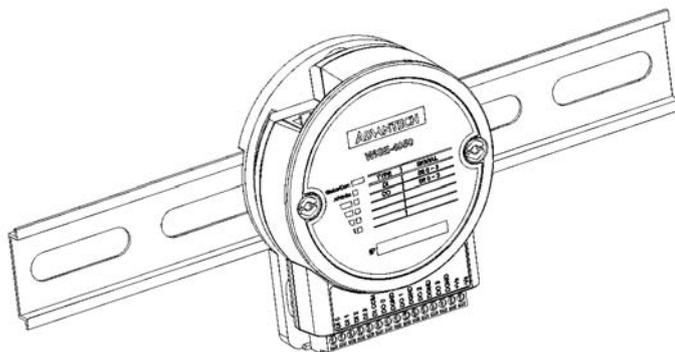
Figure 3.3 Mounting on the DIN-Rail
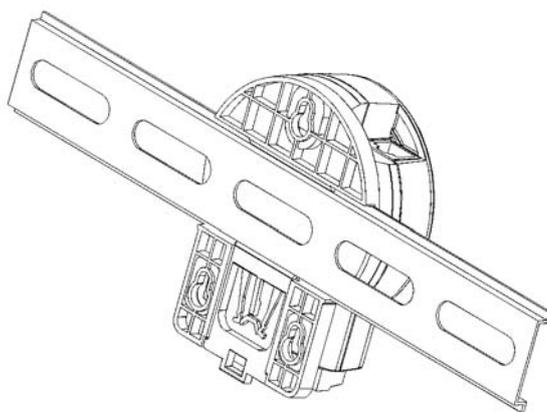
Figure 3.4 Rear View of DIN-Rail Mounting

3.2.2 Wall Mounting

Each WISE-4000 module is packed with a plastic wall mounting bracket. User can refer the bracket dimension and assembling figure to configure an optimal placement in a wall, panel, or cabinet.
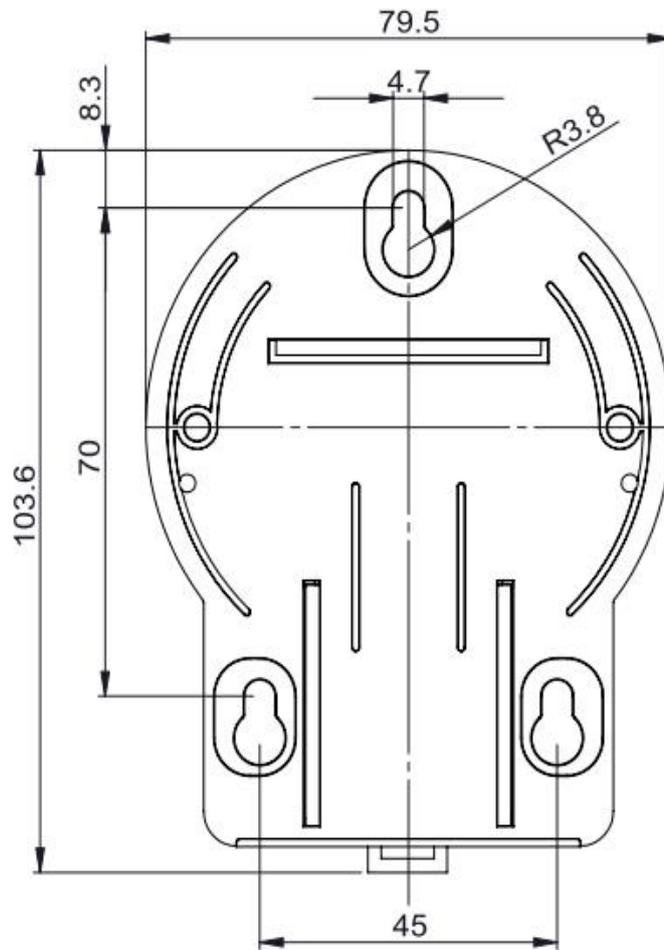
Figure 3.5 Mounting Kit Dimensions
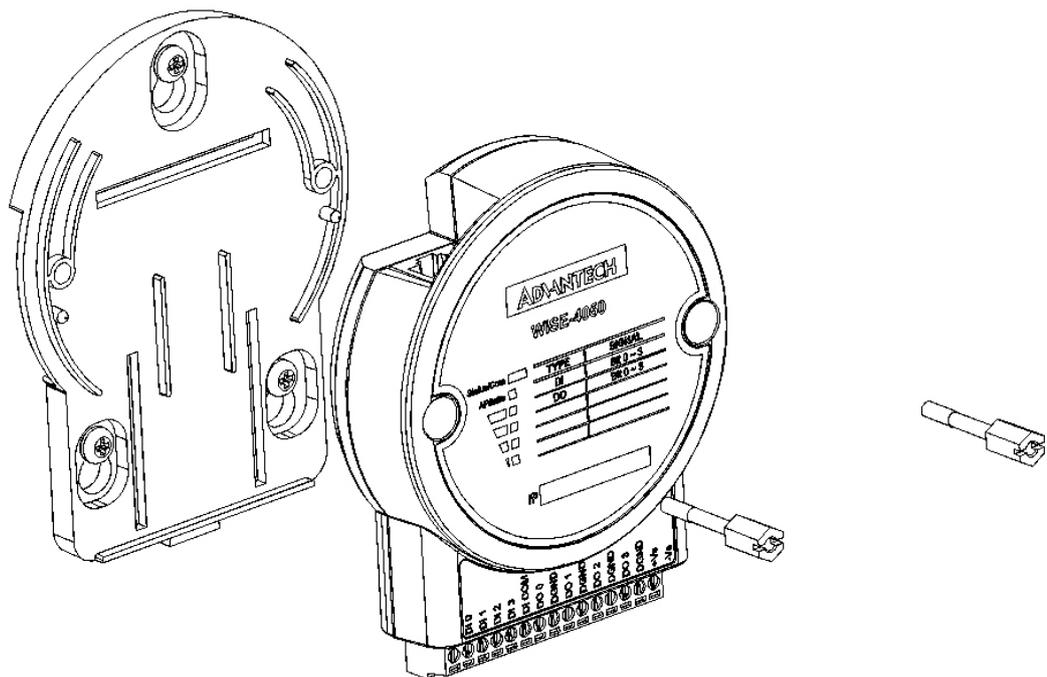
Figure 3.6 Wall Mounting
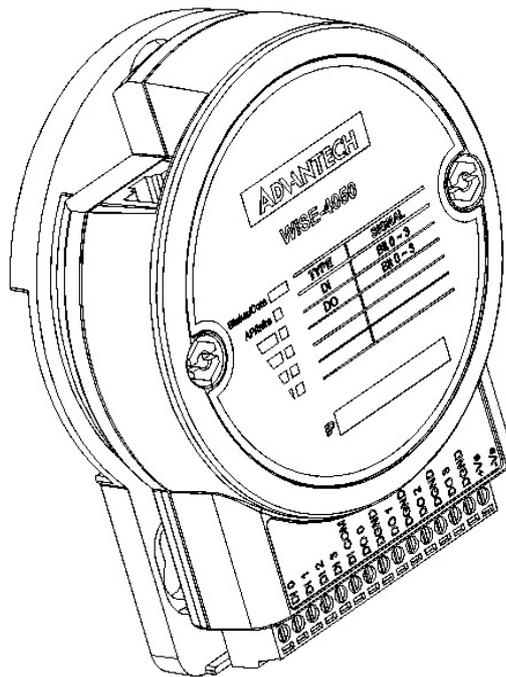
Figure 3.7 Wall Mounting Finished

3.2.3 Stack Mounting
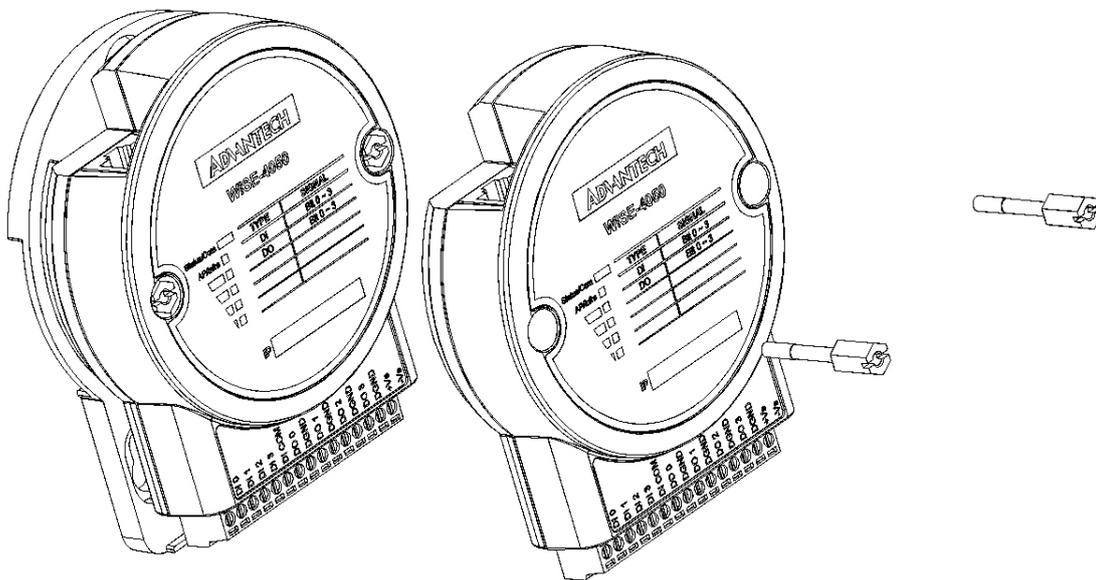
Figure 3.8 Stack Mounting
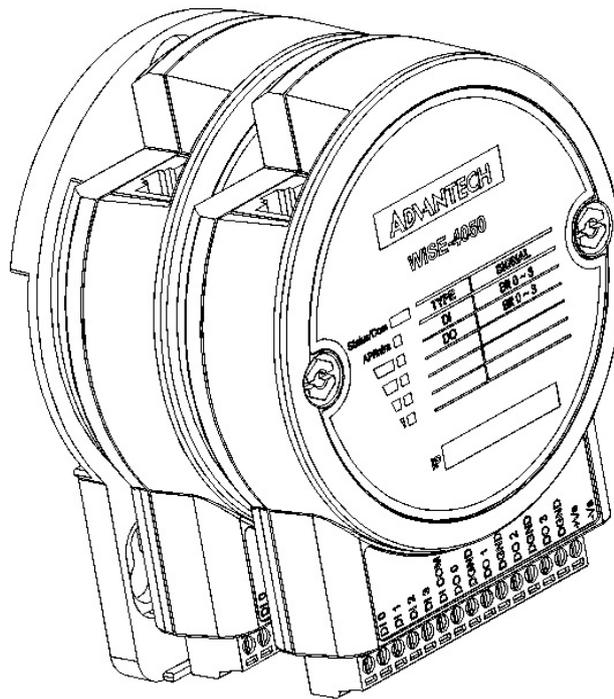
Figure 3.9 Finished Stack Mounting

3.3 Wiring & Connections

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

3.3.1 Power Supply Wiring

The system of WISE- 4000 is designed for a standard industrial unregulated 24 V_{DC} power supply. For further application, it can also accept +10 to +30 V_{DC} of power input, 200mV peak to peak of power ripple, and the immediate ripple voltage should be maintained between +10 and +30 V_{DC}.

Screw terminals +Vs and -Vs are for power supply wiring
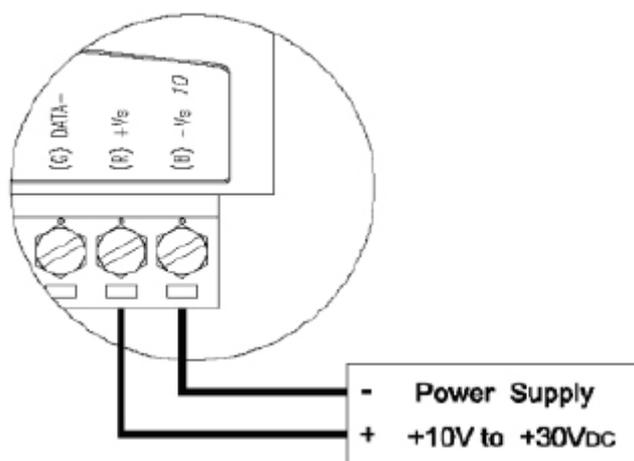
Note!   *The wires used should be at least 2 mm.*

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.

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

Chapter 4

System Configuration

4.1 Connection

1. Plug DC power source in +Vs, -Vs pin of WISE module and turn the power on.
2. Connect your computer to Ethernet port of WISE module with RJ-45 cross-over Ethernet cable)

4.2 Configure WISE Using the Web Interface

4.2.1 System Requirements

module is developed by public HTML 5 base, but for detailed indication and data transmission mode may be different on Web page of the operating system.

For mobile devices, the minimum requirement of web browsers 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 Browse	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 requirement of web browsers as below:

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

Mobile Browse	Chrome	Firefox	Safari	IE11	IE10	IE9
Configuration	Y	Y	Y	Y	Y	Y
File Upload	Y	Y	N	Y	N	N
Data Log Chart	Y	Y	Y	Y	Y	N
Data Log Export	Y	Y	N	N	N	N

4.2.2 List of WISE-4000 Default Ethernet Ports

Application	Protocol	Port	Note
WebServer	TCP	80	Configurable
Modbus Server	TCP	502	-
Search Engine	UDP	5048	-
SNTP Client	UDP	-	Randomly

4.2.3 Factory Default Settings

WISE-4000/LAN Series

- IP Mode: Static IP Address
- Default IP: 10.0.0.1
- Subnet Mask: 255.0.0.0
- Default Gateway: 0.0.0.0
- Default Connection Timeout: 720 second
- HTTP Port: 80

4.2.4 Module Authorization

Account	Default Password	Access Ability
Root	00000000	All the privileges
Admin	00000000	All the privileges except access control configuration
User	00000000	View module status only, not allow to do configuration

4.2.5 Operation Mode

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

Mode	WISE-4000/LAN Series	WISE-4000 Wireless Series
Initial Mode	Fixed IP address: 10.0.0.1	Fixed IP address: 192.168.1.1 Fixed Wi-Fi Mode: AP Mode
Normal Mode	Default IP address: 10.0.0.1	Default IP address: 192.168.1.1 Default Wi-Fi Mode: AP Mode

4.2.6 Using a Browser to Configure the Module

- Configure URL: http://IP_address/config
- Default URL: http://10.0.0.1/config
- Configuration Steps

Login Web Configuration Page	
	1. Wirelessly connect your smart phone to your local Ethernet network and open the browser of your smart phone. 2. Enter IP address of module with "/config", for example, the default URL: http://10.0.0.1/config 3. Then you will see the login page, please enter the account and password, then click Login button
	4. After login you will see the configuration web page
	5. Scroll down the tab, you can change the login user here
	6. Click the button on the top, you can switch to other pages
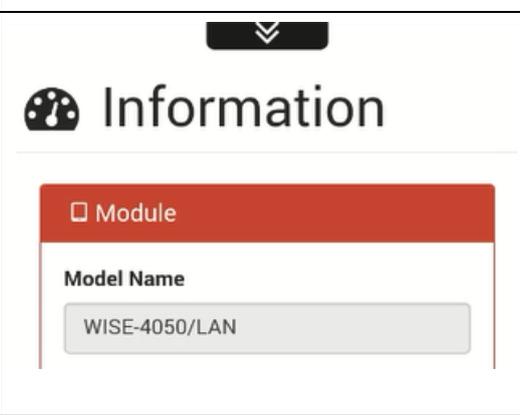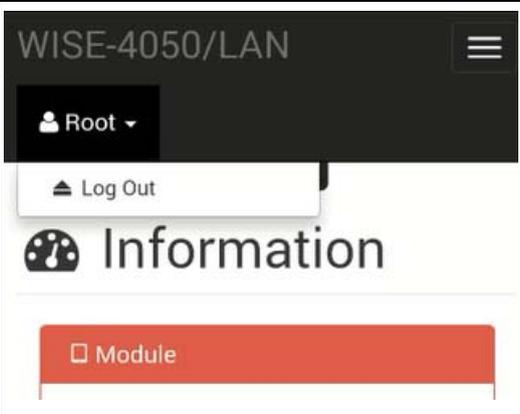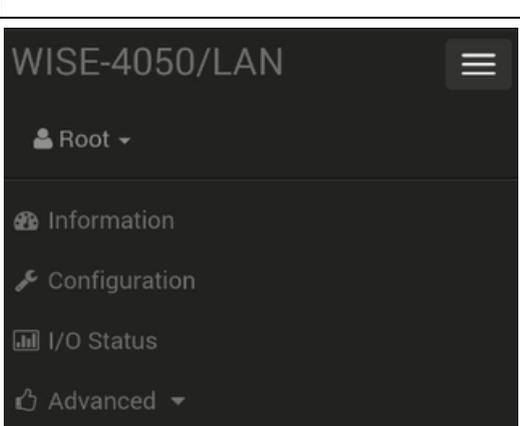
Module Information	
	1. In the information page, you can see the dashboard: module detail, network setting, and module information, including the firmware version. 2. Click "Go to Configuration" to perform the configuration.

Module Configuration	
	You can click different tab to switch the item you are going to configure
	[Information] **Customized Name / UUID** Means model name and UUID of the module. You also can rename it for recognition if required. **Description** You can add comments on this module for recognition. **Location Information** You can note the location information for the module

  Network Mac 00-D0-C9-66-00-49 IP 10.0.0.1 Subnet 255.0.0.0 Gateway 0.0.0.0 IP Mode ◉ Static ◯ DHCP	[Network] You can select the Connection mode as DHCP or Static IP and configure the IP address, Subnet address, and Default gateway.
  Application Network Web Server Port (Default:80) 80 💾 HostIdle (Timeout) 720 sec 💾 Communication WDT Mode ☐ Enable/Disable 💾 ✔ Submit	[Network App] You configure the web server port, Host Idle (timeout), and decide whether to enable communication WDT here
  Local Time Current Time ⟳ Time Zone (GMT+08:00) Taipei ▼ 💾 Time Calibration 🔧 Click Me... 💾	[Time & Date] You can see the current time here, decide which time zone for your local time, and also do the time calibration by read the time from host devices
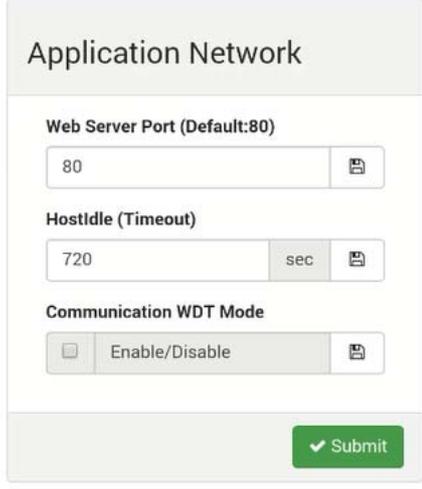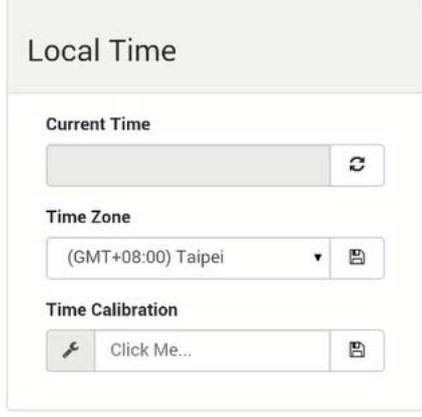
	[SNTP]
	You can enable the SNTP function, so the module can act as a SNTP client to do time synchronization from assigned SNTP server.
	[Modbus] In order to provide user with more flexible and scalable in deploying module, this module remove the limitation of Modbus address setting and make it configurable as user's actual need. Basically, there're two kinds of Modbus address section (0X and 4X) for you to configure each function item.

	[Diagnostic] Here you can know the status of this module
	[Control] **Enable Locate** It can help user search module with light sign. (Status LED will be constantly on for 10 sec when it enabled.) **Restore to Default** The system configuration of module will be clear and restored to factory default when it enabled. **Reset Password** You can reset the password here **System Restart** The system of this module will reboot when it enabled.
	[General] After Communication WDT been enabled in "Network App" tab, you can enable the IO FSV triggered by communication WDT
	[Firmware] You can upgrade the firmware and html file here
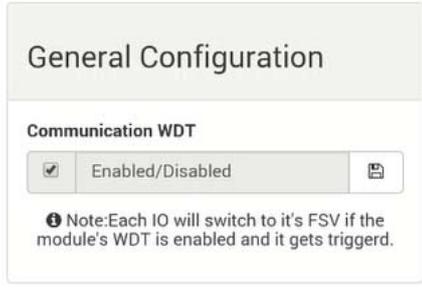
	[Account]
Account Type Password Authority Root 🔒 Change Password Read/Wr Admin 🔒 Change Password Read/Wr User 🔒 Change Password Read	You can change the passwords of each account here.

I/O Status

	[Status]
📊 IO Staus DI DO Status Configuration Trend Status Channel Staus 0 ⬛ 1 ⬛ 2 ⬛	The I/O statuses are shown here, for the output status, you can also change the I/O status here.

[Configuration]

Setting

User can do detail I/O setting in the tab, include the Tag Name, range type, filter, and also the working mode.

Calibration

For the analog module, after login root account, user can click calibration button to restore the factory calibration value.

Overview

In the end, there is an overview table for the configuration summary of each channel
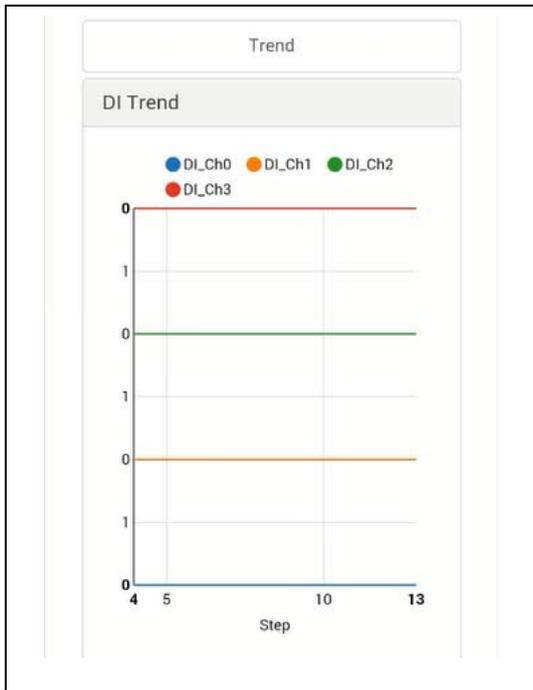
Trend DI Trend ● DI_Ch0 ● DI_Ch1 ● DI_Ch2 ● DI_Ch3	**[Trend]** The status trend of I/O will be shown here.

Advanced Function - Access Control

👍 Advanced Functions Access Control For avoiding from unauthorized access, this function provided manage which host PC or device has been permitted to remotely control module by IP or MAC Address. Go to ➡	To avoid unauthorized access, you can manage which host PC or device can remotely control the WISE-4000 module by IP or MAC Address.

	Enable one of the rows and enter the IP address or MAC address which allows to access the WISE-4000 device.

Advance Function - Data Log	
	The WISE-4000 series supports data log functions, the I/O status can be logged in the module and also be queried from the module .

[Viewer]

Data Format
User can configure which data will be logger and the timestamp format here

Filter
This filter is for setting the criteria to query the logged data. User can select the filter mode and click "Query" button to query the logged data

After the "Query" has been clicked, the data will be shown in the dashboard and also in the list. Users can click the "Save" button to save the logged data.

	[General Settings]
	I/O Data Logger
	Decide whether to enable data log function here
	Periodical Log
	Check the box to enable periodically logging, and the log period can be decided in "Period Interval" box
	Period Interval
	Decide the logging period if "Periodical Log" had been enabled. Pleased been noted that the period is increased by 0.1 sec, it means if user configure "600" here, the status of the I/O will be logged each minute.
	WDT Trigger
	If the communication WDT been enable, once the condition of WDT been met, the status of I/O will be logged
	Reset the Log on Restart
	Decided whether to keep last value when the logger had been restarted.
	Circular Operation
	Once the box been check, the data will been circular log when memory was full. Otherwise, the logger will stop.

	[Channel Setting]
	User can configure which channel of the module will be log and decide whether to log the data when the status is changed by check the box of "Change of Status"

4.3 Configure WISE-4000 with ADAM.NET Utility

1. Install ADAM.NET Utility in your computer.
   (After successfully installation, there will be a shortcut generated on the screen)

2. Double click the shortcut icon, and then you will see the main operation window.
3. Click Search Module icon in Toolbar. You will see all online modules in the left Module Tree screen and an unconfigured new module, whose default password is 00000000, will appear on the Others section as below. Now you can define the network mode of the module in the beginning. After that, you will be able to perform other settings.

Note! *The default password is 00000000*

4.3.1 Operation Framework

The operation window mainly contains 4 areas, including Menu, Toolbar, Module Tree screen and Main Operation screen.

4.3.1.1 Menu

a. File

■ **Open Favorite Group**
You can import the favorite configuration group file (.XML) from your computer.

■ **Save Favorite Group**
You can save the favorite group configuration group as XML file to your computer.

■ **Auto-Initial Group**
If you want to have the same favorite group configuration when you exit ADAM.NET utility and launch it again, you need to check this option.

■ **Exit**
Exit ADAM.NET Utility.

b. Tools

■ **Search Device**
Search all the WISE-4000 modules you connected in local Ethernet.

■ **Add Devices to Group**
It's used to add WISE-4000 modules to your favorite group. After activating search function, all online modules will show on Module Tree Screen area. Now you can enable this function to select the device you want to add in the Module Tree Screen.

■ **Group Configuration**
Group Configuration is on WISE-4000 series module. It can help you efficiently configure or maintain massive WISE-4000 modules with the same configuration file or firmware upgrade at one time in the local network. The following steps will instruct you how to operate it.

■ **Terminal for Command Testing**
WISE-4000 series module Modbus/TCP as communication protocol, so you can launch the terminal to directly communicate with WISE-4000 series module by these two protocols.

■ **Print Screen**
You can save current ADAM.NET Utility screen into an image file by this option.

■ **HTML File Packager**
You can pack your user web page by this tool:

1. Put all the files that you are going to pack in same folder, and "Browse…" the folder
2. Press "Save as…" and give a file name after it's been packaged
3. Check all the files had been selected in "File List"
4. Check "Gzip Compression" to reduce the file size
5. After pressing the "Apply" button, your user web page will be compressed as a "*.ehf" file, then you can download the file into your WISE module
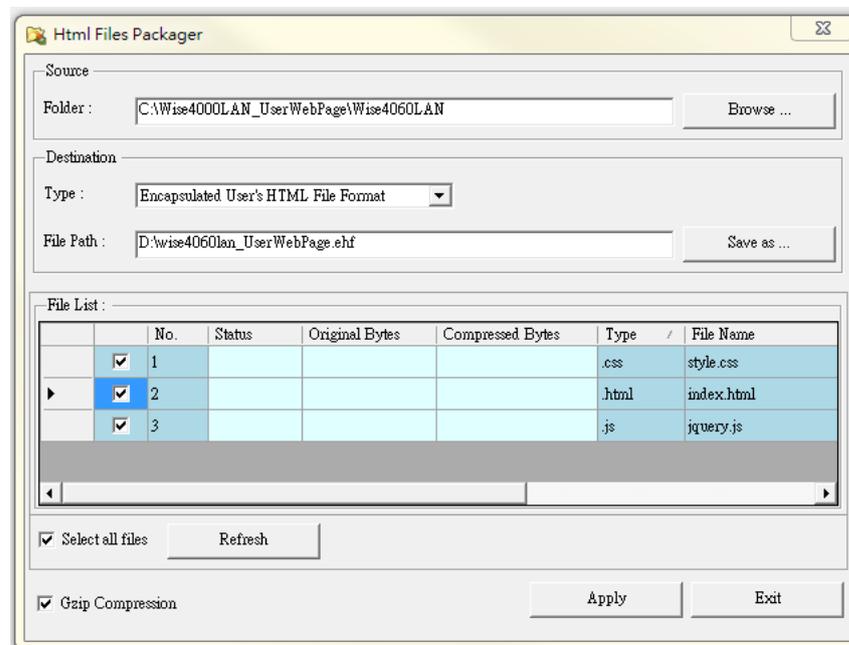
c. Setup

- ■ **Favorite Group**
  You can configure your favorite group including add one new device, modify or delete one current device, sort current devices and diagnose connection to one device.
- ■ **Refresh Serial and Ethernet**
  ADAM.NET utility will refresh the serial and LAN network connection situation.
- ■ **Add COM Ports**
  This option is used to add serial COM ports in ADAM.NET Utility. You won't need to use this option for WISE-4000 modules.
- ■ **Show TreeView**
  Check this option to display the Module Tree Screen area.
- ■ **Allow Calibration**
  Check this option to allow calibration function enabled on AI/O module.

d. Help

- ■ **Check Up-to-Date on the Web**
  It will automatically connect to support and download page of Advantech website when it enabled. You can find and download the latest version of WISE-4000 utility there.
- ■ **About ADAM.NET Utility**
  The current version of ADAM.NET Utility is installed on your computer.

4.3.1.2 Toolbar

There are 8 graphical icons for common used options of Menu on the toolbar.

Definition (from left to right)
1. Open favorite group
2. Save favorite group
3. Search Modules
4. Add Devices to Group
5. Terminal for Command Testing
6. Group Configuration
7. Monitor Data Stream/Event
8. Print Screen

4.3.1.3 Module Tree Screen

The Module Tree Screen locates on the left part of ADAM.NET utility operation window. There are four categories in this area:

Serial

All serial I/O Modules (ADAM-4000 and ADAM-5000 RS-485 serial modules) connected to the host PC will be listed in this category.

Ethernet

All Ethernet I/O Modules (ADAM-6000, ADAM-6100,and ADAM-5000 TCP modules) connected to the host PC will be listed in this category.

Favorite Group

You can define which devices listed in the three categories above into your personal favorite group. This will make you easier to find your interested modules. Right click on the WISE-4000 device item under the Favorite Group item and you can select Add New Group to create a new group. After you create your own group, right click on your group and Add New Device into your group. You can also select Diagnose connection to check the communication.

ADAM-4500_5510 Series

This is a DOS interface utility for remote controllers such as ADAM-4500 and ADAM-5510 series.

Wireless Sensor Networks

All wireless I/O Modules (ADAM-2000 modules) connected to the host PC, through wireless gateway, will be listed in this category.

4.3.1.4 Main Operation Screen

Main Operation Screen located on the right side of utility includes I/O status display and function setting. You can select different items in Module Tree Screen, and then Main Operation Screen will change dependently. You can do all configurations and test in this area.

In Information page (after clicking Ethernet), you can configure Connection/Send/Receive/Scan Timeout. The supervisor password is a shortcut to let you enter a password at one time which's applied for certain modules, so you don't need to enter the same password for each module when you check it.

4.4 Configuring WISE-4000 with ADAM.NET Utility (software)

ADAM.NET Utility, which is designed with graphical operation interface, is aimed to offer users directly configure, control WISE-4000 module, and monitor the real-time status of remote WISE-4000 module via Ethernet or Wireless connection.

To keep you informed with latest update, you also can check it from the following download link on Advantech website.
http://support.advantech.com.tw/Support/DownloadSRDetail.aspx?SR_ID=1-2AKUDB

> **Note!**
> ■ Before installing ADAM.NET Utility, you need to install .NET Framework 2.0 or higher version.
> ■ System requirement
> – Microsoft Windows XP/7
> – At least 32 MB RAM
> – 20 MB of hard disk space available
> – VGA color or higher resolution monitor
> – Mouse or other pointing devices
> – 10/100 Mbps or higher Ethernet Card

1. Configure the computer's IP address as the same domain as WISE-4000 module. For the new WISE-4000/LAN Series which default IP address is 10.0.0.1, the IP address of computer can be configured as 10.0.0.99 for example as following.

2. Open the Adam/Apax .NET Utility then you can see the IP address of computer been shown under "Ethernet" tree. You can right click to refresh the subnodes of this tree. Or click "Search Device" to find WISE-4000 module.
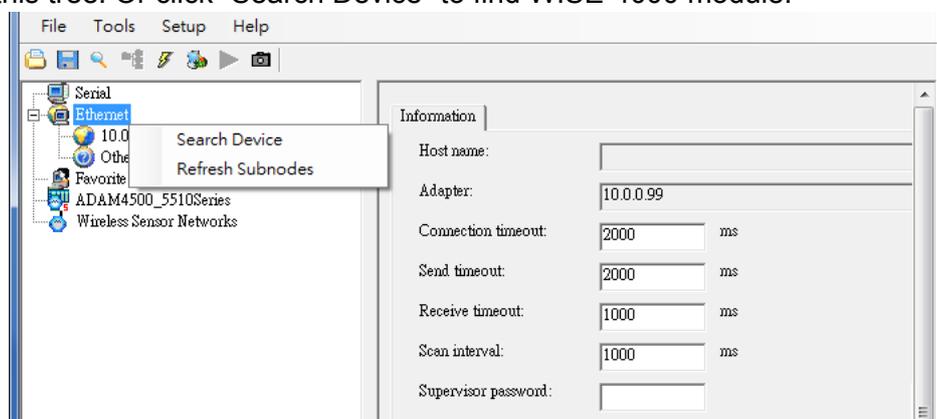
3. Users can also right click the IP address to find WISE-4000 module.
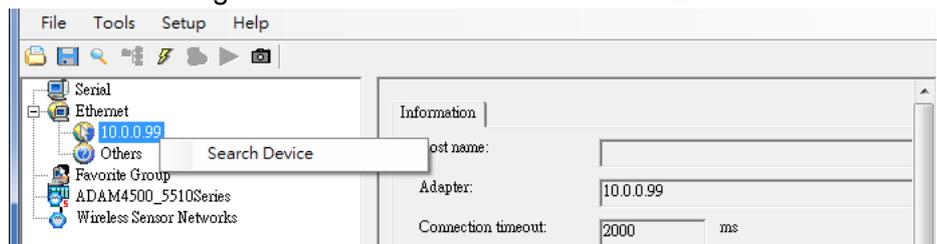
4. After the module been found, it will be listed under IP address in same domain, you can login the embedded web configuration web page for further configuration as introduced in previous section

5. There are some function provide in same pages in utility, first you can enter the account and password faster in "Login Info" tab.
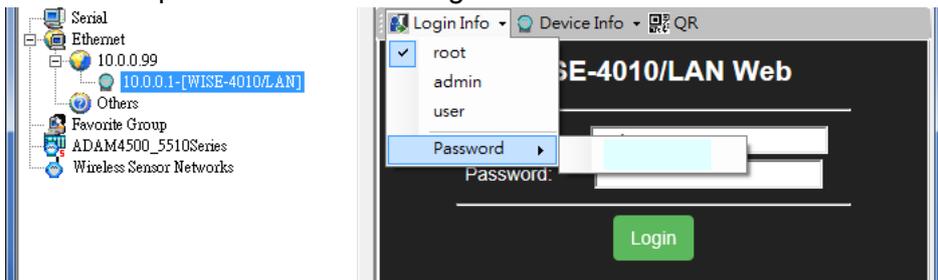
6. In the "Device Info" tab, the detail information of this module will been shown
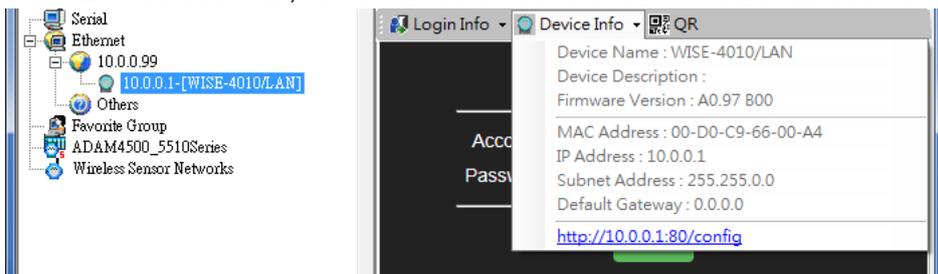
7. The "QR" tab will generate the QR code of the web configuration web page for mobile device to access the module. User can also click the QR code to open the browser for further configuration.
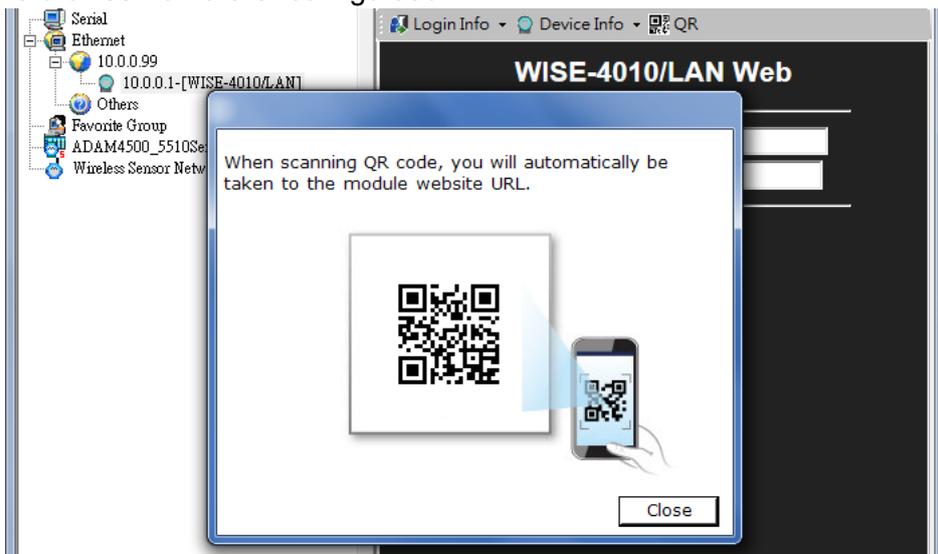
Note!

If you are not able to search the module, you can configure the SW1
behind the module to initial mode. After power up and search the mod-
ule in utility, user can find the module with default IP address, and the
device name will been shown in "Others" tree with (*) sign. So user can
change the device network setting in this page. Or try to locate the
device and also reset the password with same page. After the new net-
work setting been apply, please configure the SW1 back to normal
mode and power up again to reboot in new network setting.
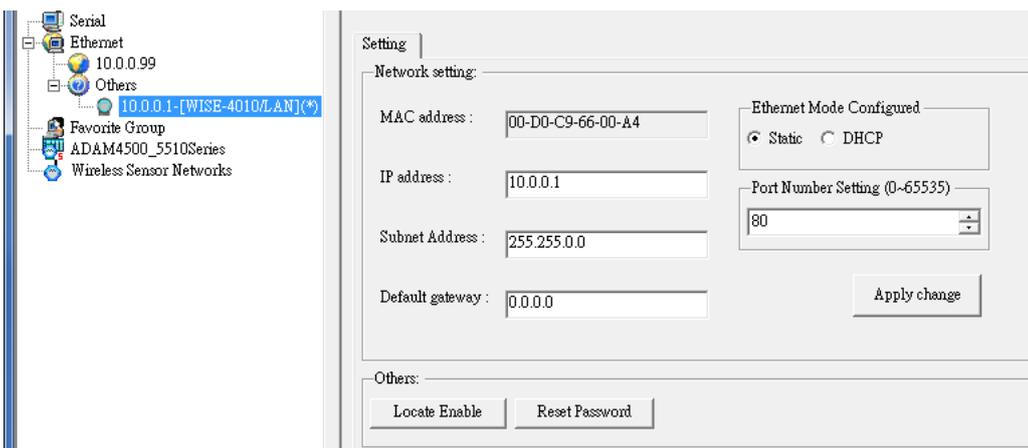
Appendix A

I/O Modbus Mapping Table

A.1 Modbus Function Code Introduction

To full-fill the programming requirement, there is a series of function code standard for user's reference.

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-4010/LAN Modbus Mapping Table

Address (0X):

Address (0X)	Channel	Description	Attribute
00017	0	DO Value	Read/Write
00018	1		Read/Write
00019	2		Read/Write
00020	3		Read/Write
00101	0	Reset Historical Maximum AI Value	Write
00102	1		Write
00103	2		Write
00104	3		Write
00105	Average Ch 0~3		Write
00111	0	Reset Historical Min. AI Value	Write
00112	1		Write
00113	2		Write
00114	3		Write
00115	Average Ch 0~3		Write
00121	0	Open-Circuit Flag (Burnout)	Read
00122	1		Read
00123	2		Read
00124	3		Read

00131	0		Read
00132	1		Read
00133	2	High Alarm Flag	Read
00134	3		Read
00135	Average Ch 0~3		Read

00141	0		Read
00142	1		Read
00143	2	Low Alarm Flag	Read
00144	3		Read
00145	Average Ch 0~3		Read

Address (4X):

Address (4X)	Channel	Description	Attribute
40211		Module Name 1	Read
40212		Module Name 2	Read
40221	All AI	AI Channel Enabled	Read/Write
40303	All DO	DO Value	Read/Write
40001	0		Read
40002	1		Read
40003	2	AI Value	Read
40004	3		Read
40005	Average Ch 0~3		Read
40009-40010	0		Read/Write
40011~40012	1	Pulse Output	Read/Write
40013~40014	2	Low Level Width	Read/Write
40015~40016	3		Read/Write
40017-40018	0		Read/Write
40019~40020	1	Pulse Output	Read/Write
40021~40022	2	High Level Width	Read/Write
40023~40024	3		Read/Write
40025-40026	0		Read/Write
40027~40028	1	Set Absolute Pule	Read/Write
40029~40030	2		Read/Write
40031~40032	3		Read/Write

40033~40034	0		Read/Write
40035~40035	1	Set Incremental Pulse	Read/Write
40037~40038	2		Read/Write
40037~40040	3		Read/Write
40101~40102	0		Read
40103~40104	1	AI Status*	Read
40105~40106	2		Read
40107~40108	3		Read
40111	0		Read
40112	1		Read
40113	2	Historical Maximum AI Value	Read
40114	3		Read
40115	Average Ch 0~3		Read
40121	0		Read
40122	1		Read
40123	2	Historical Minimum AI Value	Read
40124	3		Read
40125	Average Ch 0~3		Read
40131~40132	0		Read
40133~40134	1		Read
40135~40136	2	AI Floating Value (IEEE754)	Read
40137~40138	3		Read
40139~40140	Average Ch 0~3		Read
40151~40152	0		Read
40153~40154	1		Read
40155~40156	2	Historical Maximum AI Floating Value (IEEE754)	Read
40157~40158	3		Read
40159~40160	Average Ch 0~3		Read
40171~40172	0		Read
40173~40174	1		Read
40175~40176	2	Historical Minimum AI Floating Value (IEEE754)	Read
40177~40178	3		Read
40179~40180	Average Ch 0~3		Read
40191	0		Read
40192	1		Read
40193	2	AI Value After Scaling	Read
40194	3		Read
40195	Average Ch 0~3		Read

40201	0		Read/Write
40202	1	AI Type Code**	Read/Write
40203	2		Read/Write
40204	3	(The type codes of channels for average value can't be changed.)	Read/Write
40205	Average Ch 0~3		Read

* AI Status (2 Registers)

Lower Register		Higher Register	
Bit	Description	Bit	Description
0	Fail to Provide AI Value	0	DI triggered to Safety Value
1	Over Range	1	DI triggered to Startup Value
2	Under Range	2	Reserved
3	Open Circuit / Burnout	3	Reserved
4	Reserved	4	Reserved
5	Reserved	5	Reserved
6	Reserved	6	Reserved
7	ADC Initializing/Error	7	Reserved
8	Reserved	8	Reserved
9	Zero/Span Calibration Error	9	Reserved
10	Reserved	10	Reserved
11	Reserved	11	Reserved
12	Reserved	12	Reserved
13	Reserved	13	Reserved
14	Reserved	14	Reserved
15	Reserved	15	Reserved

** AI Type Code (2 Registers)

Type Code	Input Range
0x1080	4~20 mA
0x1082	0~20 mA

A.3 WISE-4050/LAN Modbus Mapping Table

Address 0X	Channel	Description	Attribute
00001	0		Read
00002	1	DI Value	Read
00003	2		Read
00004	3		Read
00017	0		Read/Write
00018	1	DO Value	Read/Write
00019	2		Read/Write
00020	3		Read/Write
00033	0	Counter Status	Read/Write
00034	1	(0: stop	Read/Write
00035	2	1: start)	Read/Write
00036	3		Read/Write
00037	0		Write
00038	1	Clear Counter	Write
00039	2	(1: write to clear value)	Write
00040	3		Write
00041	0	Clear Overflow	Read/Write
00042	1	(1: counter overflow,	Read/Write
00043	2	auto set to 0 after read)	Read/Write
00044	3		Read/Write
00045	0	DI Latch Status	Read/Write
00046	1	(1: DI latched,	Read/Write
00047	2	0: write to clear latch)	Read/Write
00048	3		Read/Write

Address 4X	Channel	Description	Attribute
40211	-	Module Name 1	Read
40212	-	Module Name 2	Read
40301	All DI	DI Value	Read
40303	All DO	DO Value	Read/Write
40001~40002	0		Read
40003~40004	1	Counter/Frequency	Read
40005~40006	2	Value	Read
40007~40008	3		Read

40009~40010	0		Read/Write
40011~40012	1	Pulse Output	Read/Write
40013~40014	2	Low Level Width	Read/Write
40015~40016	3		Read/Write

40017~40018	0		Read/Write
40019~40020	1	Pulse Output	Read/Write
40021~40022	2	High Level Width	Read/Write
40023~40024	3		Read/Write

40025~40026	0		Read/Write
40027~40028	1	Set Absolute	Read/Write
40029~40030	2	Pulse Output Number	Read/Write
40031~40032	3		Read/Write

40033~40034	0		Read/Write
40035~40035	1	Set Incremental	Read/Write
40037~40038	2	Pulse Output Number	Read/Write
40037~40040	3		Read/Write

A.4 WISE-4060/LAN Modbus Mapping Table

Address 0X	Channel	Description	Attribute
00001	0		Read
00002	1	DI Value	Read
00003	2		Read
00004	3		Read
00017	0		Read/Write
00018	1	DO Value	Read/Write
00019	2		Read/Write
00020	3		Read/Write
00033	0	Counter Status	Read/Write
00034	1	(0: stop	Read/Write
00035	2	1: start)	Read/Write
00036	3		Read/Write
00037	0	Clear Counter	Write
00038	1	(1: write to clear value)	Write
00039	2		Write
00040	3		Write
00041	0	Clear Overflow	Read/Write
00042	1	(1: counter overflow,	Read/Write
00043	2	auto set to 0 after read)	Read/Write
00044	3		Read/Write
00045	0	DI Latch Status	Read/Write
00046	1	(1: DI latched,	Read/Write
00047	2	0: write to clear latch)	Read/Write
00048	3		Read/Write

Address 4X	Channel	Description	Attribute
40211	-	Module Name 1	Read
40212	-	Module Name 2	Read
40301	All DI	DI Value	Read
40303	All DO	DO Value	Read/Write
40001~40002	0		Read
40003~40004	1	Counter/Frequency	Read
40005~40006	2	Value	Read
40007~40008	3		Read

40009~40010	0		Read/Write
40011~40012	1	Pulse Output	Read/Write
40013~40014	2	Low Level Width	Read/Write
40015~40016	3		Read/Write
40017~40018	0		Read/Write
40019~40020	1	Pulse Output	Read/Write
40021~40022	2	High Level Width	Read/Write
40023~40024	3		Read/Write
40025~40026	0		Read/Write
40027~40028	1	Set Absolute	Read/Write
40029~40030	2	Pulse Output Number	Read/Write
40031~40032	3		Read/Write
40033~40034	0		Read/Write
40035~40035	1	Set Incremental	Read/Write
40037~40038	2	Pulse Output Number	Read/Write
40037~40040	3		Read/Write

Appendix B

REST for WISE-4000

B.1 Introduction

REpresentational State Transfer (REST) is a design style of software architecture for Web application behaves and services including image indication, resource request and response and message delivery. It can be developed compatible with popular protocols or standards like HTTP, URI, JSON, HTML. With the advantage of scalability, simplicity and performance, it's already adopted in Web service by Amazon, Yahoo. The Web service of is developed based on HTML5 language, if user need to integrate this into other Web services, the following information/command list should be referred for implementation.

B.2 REST Resources for WISE-4000

B.2.1 Digital Input

B.2.1.1 /di_value/slot_index/ch_num

Description	Retrieves information about the digital input value resource on specific slot.
URL Structure	http://10.0.0.1/di_value/slot_index http://10.0.0.1/di_value/slot_index/ch_num
HTTP Method	GET:Returns the representation of all of digital input value resource. PUT:Replace all of digital input value resource PATCH:Apply partial modifications to digital input value resource.

GET	Multiple Channel Request:
	GET /di_value/slot_index
	Single Channel Request:
	GET /di_value/slot_index/ch_num
	
	[Example]
	
	Request: **GET /di_value/slot_0**
	
	Content-type: application/json
	Response: 200 OK
	``
	{
	 "DIVal": [
	  {
	    "Ch":0,
	    "Md":0,
	    "Stat":1,
	    "Val":1,
	    "Cnting":0,
	    "ClrCnt":0,
	    "OvLch": 0
	  },
	  {
	    "Ch":1,
	    "Md":0,
	    "Stat":0,
	    "Val":0,
	    "Cnting":0,
	    "ClrCnt":0,
	    "OvLch": 0
	  },
	  {
	    "Ch":2,
	    "Md":1,
	    "Stat":0,
	    "Val":3378,
	    "Cnting":1,
	    "ClrCnt":0,
	    "OvLch": 0
	  },
	  {
	    "Ch":3,
	    "Md":3,
	    "Stat":0,
	    "Val":1,
	    "Cnting":0,
	    "ClrCnt":0,
	    "OvLch": 0
	  }
	]
	}
	``
	Request : **GET /di_value/slot_0/ch_2**
	
	Content-type: application/json
	Response: 200 OK
	``
	{
	    "Ch":2,
	    "Md":0,
	    "Stat":1,
	    "Val":1,
	    "Cnting":0,
	    "ClrCnt":0,
	    "OvLch": 0
	}
	``

PUT	Single/Multiple Channel Request:
	PUT /di_value/slot_index
	Single Channel Request:
	PUT /di_value/slot_index/ch_num
	
	[Example]
	
	Request: **PUT /di_value/slot_0**
	
	Content-type: application/json
	{
	"DIVal": [
	
	  {
	   "Ch":0,
	   "Md":0,
	   "Stat":0,
	   "Val":0,
	   "Cnting":0,
	   "ClrCnt":0,
	   "OvLch": 0
	  },
	  {
	   "Ch":1,
	   "Md":0,
	   "Stat":0,
	   "Val":0,
	   "Cnting":0,
	   "ClrCnt":0,
	   "OvLch": 0
	  },
	  {
	   "Ch":2,
	   "Md":1,
	   "Stat":0,
	   "Val":3378,
	   "Cnting":0,
	   "ClrCnt":1,
	   "OvLch": 0
	  },
	  {
	   "Ch":3,
	   "Md":3,
	   "Stat":0,
	   "Val":0,
	   "Cnting":0,
	   "ClrCnt":0,
	   "OvLch": 0
	  }
	]
	}
	
	Response: 200 OK
	
	Request: **PUT /di_value/slot_0/ch_2**
	
	Content-type: application/json
	{
	   "Ch":2,
	   "Md":1,
	   "Stat":0,
	   "Val":3378,
	   "Cnting":0,
	   "ClrCnt":1,
	   "OvLch": 0
	}
	
	Response: 200 OK

| PATCH | Single/Multiple Channel Request:
PATCH /di_value/slot_index
Single Channel Request:
PATCH /di_value/slot_index/ch_num

[Example]

Request: **PATCH /di_value/slot_0**

Content-type: application/json
{
"DIVal": [
  {
   "Ch":2,
   "Cnting": 1
  },
  {
   "Ch":3,
   "OvLch":0
  }
 ]
}

Response: 200 OK

Request: **PATCH /di_value/slot_0/ch_3**
Content-type: application/json
{
"Ch":3,
  "ClrCnt":1
}

Response: 200 OK |

■   JSON array name definition:

Field	Abbreviation	Data Type
Array of Digital input configurations	DIVal	Array

■   Resource value definitions:

Field	Abbreviation	Data Type	Property	Description
Channel Number	Ch	Number	R	0, 1, …: Digital input channel number.
Mode	Md	Number	R	Digital input mode. | 0	DI
1	Counter
2	LowToHighLatch
3	HighToLowLatch
4	Frequency	
Signal Logic Status	Stat	Number	R	1, 0: Input signal is Logic High or Low.
Channel Value	Val	Number	R	DI measurement data | Input Mode	Value Description
DI	Logic Status of DI
Counter	Counter Value
LowToHighLatch	Logic status of DI
HighToLowLatch	Logic status of DI
Frequency	Frequency(unity 0.1 Hz	
Start Counter	Cnting	Number	RW	Start/Stop counter counting Read 1 : counter is counting 0 : not counting Write 1 : start counting 0 : stop counting
Clear Counter	ClrCnt	Number	W	1 : Clear the counter value
Get/Clear Counter Overflow or Latch Status	OvLch	Number	RW	counter overflow or latch status Read 1 : overflow/latch occurred. 0 : no overflow or latch Write 0 : clear the overflow or latch status

B.2.2 Digital Output

B.2.2.1 /do_value/slot_index/ch_num

Description	Retrieves information about the digital output value resource on specific slot.
URL Structure	http://10.0.0.1/do_value/slot_index http://10.0.0.1/do_value/slot_index/ch_num
HTTP Method	GET:Returns the representation of all of digital output value resource. PUT:Replace all of digital output value resource PATCH:Apply partial modifications to digital output value resource.

GET	Multiple Channel Request:
	GET /do_value/slot_index
	Single Channel Request:
	GET /do_value/slot_index/ch_num
	
	[Example]
	
	Request: **GET /do_value/slot_0**
	
	Content-type: application/json
	Response: 200 OK
	{
	  "DOVal": [
	   {
	    "Ch":0,
	    "Md":0,
	    "Stat":1,
	    "Val":1,
	    "PsCtn":0,
	    "PsStop":0,
	    "PsIV": 0
	   },
	   {
	    "Ch":1,
	    "Md":0,
	    "Stat":0,
	    "Val":0,
	    "PsCtn":0,
	    "PsStop":0,
	    "PsIV": 0
	   },
	   {
	    "Ch":2,
	    "Md":1,
	    "Stat":1,
	    "Val":3378,
	    "PsCtn":0,
	    "PsStop":0,
	    "PsIV": 0
	   },
	   {
	    "Ch":3,
	    "Md":3,
	    "Stat":1,
	    "Val":1,
	    "PsCtn":0,
	    "PsStop":0,
	    "PsIV": 0
	   }
	  ]
	}
	
	Request : **GET /do_value/slot_0/ch_2**
	
	Content-type: application/json
	Response: 200 OK
	{
	   "Ch":2,
	   "Md":0,
	   "Stat":1,
	   "Val":1,
	   "PsCtn":0,
	   "PsStop":0,
	   "PsIV": 0
	}

PUT	Single/Multiple Channel Request:
	PUT /do_value/slot_index
	Single Channel Request:
	PUT /do_value/slot_index/ch_num
	
	[Example]
	
	Request: **PUT /do_value/slot_0**
	
	Content-type: application/json
	``json
	{
	  "DOVal": [
	   {
	     "Ch":0,
	     "Md":0,
	     "Stat":1,
	     "Val":1,
	     "PsCtn":0,
	     "PsStop":0,
	     "PsIV": 0
	   },
	   {
	     "Ch":1,
	     "Md":0,
	     "Stat":0,
	     "Val":0,
	     "PsCtn":0,
	     "PsStop":0,
	     "PsIV": 0
	   },
	   {
	     "Ch":2,
	     "Md":1,
	     "Stat":1,
	     "Val":3378,
	     "PsCtn":0,
	     "PsStop":0,
	     "PsIV": 0
	   },
	   {
	     "Ch":3,
	     "Md":3,
	     "Stat":1,
	     "Val":1,
	     "PsCtn":0,
	     "PsStop":0,
	     "PsIV": 0
	   }
	  ]
	}
	``
	Response: 200 OK
	
	Request: **PUT /do_value/slot_0/ch_2**
	
	Content-type: application/json
	``json
	{
	    "Ch":2,
	    "Md":2,
	    "Stat":0,
	    "Val":0,
	    "PsCtn":0,
	    "PsStop":0,
	    "PsIV": 0
	}
	``
	Response: 200 OK

PATCH	Single/Multiple Channel Request:
	PATCH /do_value/slot_index
	Single Channel Request:
	PATCH /do_value/slot_index/ch_num
	
	[Example]
	
	Request: **PATCH /do_value/slot_0**
	
	Content-type: application/json
	{
	"DOVal": [
	  {
	    "Ch":2,
	    "Md": 2
	  },
	  {
	    "Ch":3,
	    "PsStop":1
	  }
	]
	}
	
	Response: 200 OK
	
	Request: **PATCH /do_value/slot_0/ch_3**
	
	Content-type: application/json
	{
	"Ch":3,
	    "PsCtn":1
	}
	
	Response: 200 OK

■ JSON array name definition:

Field	Abbreviation	Data Type
Array of Digital input configurations	DOVal	Array

■ Resource value definitions:

Field	Abbreviation	Data Type	Property	Description
Channel Number	Ch	Number	R	0, 1, …: Digital output channel number.
Mode	Md	Number	R	Digital output mode. | 0	DO
1	Pulse Output
2	LowToHighDelay
3	HighToLowDelay	
Signal Logic Status	Stat	Number	R	1, 0: Output signal is Logic High or Low.
Channel Value	Val	Number	RW	DO measurement data Output Mode Value Description DO Get the current signal status or set its status Pulse Output Get or set the absolute pulse count value LowToHighDelay Get the current signal status or set its status HighToLowDelay Get the current signal status or set its status
Pulse Output Continue State	PsCtn	Number	RW	1 / 0: Pulse outputting is continuous or not.
Stop Pulse Output	PsStop	Number	W	1: Stop the pulse outputting. (Continue is disabled, Absolute and incremental values are reset to zero. DO signal status is set to logic low.)
Incremental Pulse Output Value	PsIV	Number	RW	Incremental Pulse Output Value

B.2.3 Analog Input

B.2.3.1 /ai_value/slot_index/ch_num

Description	Retrieves information about the analog input value resource on specific slot.
URL Structure	http://10.0.0.1/ai_value/slot_index http://10.0.0.1/ai_value/slot_index/ch_num
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	Multiple Channel Request: **GET /ai_value/slot_index** Single Channel Request: GET /ai_value/slot_index/ch_num [Example] Request : **GET /ai_value/slot_0** Content-type: application/json Response: 200 OK `{` `"AIVal": [` `{` `"Ch":0,` `"En":1,` `"Rng":328,` `"Val":148,` `"Eg":650,` `"Evt":0,` `"LoA": 0,` `"HiA": 0,` `"HVal":190,` `"HEg":1250,` `"LVal":15,` `"LEg":500,` `"SVal":148,` `"ClrH": 0,` `"ClrL": 0` `},` `{` `"Ch":1,` `"En":1,` `"Rng":328,` `"Val":0,` `"Eg":0,` `"Evt":0,` `"LoA":0,` `"HiA":0,` `"HVal":0,` `"HEg":0,` `"LVal":0,` `"LEg":0,` `"SVal":0,` `"ClrH": 0,` `"ClrL": 0` `},` `{` `"Ch":2,` `"En":1,`

| | ```
      "Rng":328,
      "Val":0,
      "Eg":0,
      "Evt":8,
      "LoA":0,
      "HiA":0,
      "HVal":0,
      "HEg":0,
      "LVal":0,
      "LEg":0,
      "SVal":0,
      "ClrH": 0,
      "ClrL": 0
    },
    {
      "Ch":3,
"En":1,
      "Rng":328,
      "Val":0,
      "Eg":0,
      "Evt":0,
      "LoA":0,
      "HiA":0,
      "HVal":0,
      "HEg":0,
      "LVal":0,
      "LEg":0,
      "SVal":0,
      "ClrH": 0,
      "ClrL": 0
    },
    {
      "Ch":4,
"En":1,
      "Rng":328,
      "Val":0,
      "Eg":0,
      "Evt":0,
      "LoA":0,
      "HiA":0,
      "HVal":0,
      "HEg":0,
      "LVal":0,
      "LEg":0,
      "SVal":0,
      "ClrH": 0,
      "ClrL": 0
    }
  ]
}
``` <br><br> Request : **GET /ai_value/slot_0/ch_2** <br><br> Content-type: application/json<br>Response: 200 OK <br> ```
{
    "Ch":2,
"En":1,
    "Rng":328,
    "Val":0,
    "Eg":0,
    "Evt":8,
    "LoA":0,
    "HiA":0,
    "HVal":0,
    "HEg":0,
    "LVal":0,
    "LEg":0,
    "SVal":0,
    "ClrH": 0,
    "ClrL": 0
}
``` |
| PUT | None |

PATCH	Single/Multi Channel Request:
	PATCH /ai_value/slot_index
	Single Channel Request:
	PATCH /ai_value/slot_index/ch_num
	
	[Example]
	
	Request: **PATCH /ai_value/slot_0**
	
	Content-type: application/json
	{
	"AIVal": [
	  {
	    "Ch":2,
	    "LoA": 0
	  },
	  {
	    "Ch":3,
	    "HiA":0
	  }
	]
	}
	
	Response: 200 OK
	
	Request: **PATCH /ai_value/slot_0/ch_3**
	
	Content-type: application/json
	{
	   "LoA":0
	}
	
	Response: 200 OK

■ JSON array name definition:

Field	Abbreviation	Data Type
Array of Analog input configurations	AIVal	Array

■ Resource value definitions (Total channels = AI channel number + 1 average channel):

Field	Abbreviation	Data Type	Property	Description
Channel Number	Ch	Number	R	0, 1, …: Analog input channel number. Note for the average channel: The average channel number for a 4-ch AI module is 4.
Input Range	Rng	Number	R	Analog input range.

Range code	
328	(0x0148) 0 – 10 V
259	(0x0103) +/- 150 m\`
260	(0x0104) +/- 500 m\`
320	(0x0140) +/- 1 V
321	(0x0141) +/- 2.5 V
322	(0x0142) +/- 5 V
323	(0x0143) +/- 10 V
327	(0x0147) 0 ~ 5 V
384	(0x0180) 4 ~ 20 mA
385	(0x0181) +/- 20 mA
386	(0x0182) 0 ~ 20 mA
65535	Invalid range, if ave channel is disable

Field	Abbreviation	Data Type	Property	Description
Channel Enable	En	Number	R	1 / 0: Enable / Disable AI conversion Notice: Average channel is read only. When channel mask of average is not 0, the value is 1.
Channel Raw Value	Val	Number	R	0 ~ 65535 :AI measurement data (Raw data)
Channel Engi-neering data	Eg	Number	R	AI engineering data, the value is 1/1000 scale. For example, 1630 → 1.63
Channel Event Status	Evt	Number	R	AI statuses
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
Maximum AI Raw Value	HVal	Number	R	AI max. measurement data (Raw data)

Maximum AI Engineering data	HEg	Number	R	AI max. engineering data, the value is 1/1000 scale For example, 10200➔10.2
Minimum AI Raw Value	LVal	Number	R	AI min. measurement data (Raw data)
Minimum AI Engineering data	LEg	Number	R	AI min. engineering data, the value is 1/1000 scale For example, 250 ➔ 0.25
Channel Raw Value After Scaling	SVal	Number	R	0 ~ 65535 : AI measurement data (Raw data) after scaling
Clear Maximum AI Value	ClrH	Number	W	1 : Clear the Maximum AI value
Clear Minimum AI Value	ClrL	Number	W	1 : Clear the Minimum AI value

* AI Status (2 Registers)			
Lower Register		**Higher Register**	
Bit	**Description**	**Bit**	**Description**
0	Fail to Provide AI Value	0	DI triggered to Safety Value
1	Over Range	1	DI triggered to Startup Value
2	Under Range	2	Reserved
3	Open Circuit / Burnout	3	Reserved
4	Reserved	4	Reserved
5	Reserved	5	Reserved
6	Reserved	6	Reserved
7	ADC Initializing/Error	7	Reserved
8	Reserved	8	Reserved
9	Zero/Span Calibration Error	9	Reserved
10	Reserved	10	Reserved
11	Reserved	11	Reserved
12	Reserved	12	Reserved
13	Reserved	13	Reserved
14	Reserved	14	Reserved
15	Reserved	15	Reserved

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