

# USB-4018 Series

# User Manual

V1.0.0, Mar. 2023



## Support

USB-4018HS

USB-4018HS-16

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Edited by Sunny Chiu

## Warranty

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All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

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# 1. Introduction

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The USB-4018 series module provides a new solution for data acquisition with easy USB plug-and-play operation. It offers simple and accurate measurement for all kinds of automation applications. Compared with the traditional PC-based cards like PCI, PC/104 and ISA cards, users can achieve data acquisition easier and quicker with the USB-4018 module.

The USB-4018 series is an 8/16-channel high speed thermocouple measurement module which supports thermocouple sensors type J, K, T, E, R, S, B, N, C, L, M as well as L<sub>DIN43710</sub>.

The USB-4018 series module provides extremely accurate thermocouple measurement and automatically cold-junction compensation for each channel. Besides, through USB-4018H Utility, users can configure and test the USB-4018HS / USB-4018HS-16 module easily without any coding.

## 1.1. Features

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- 8/16 Channel Analog Inputs
- High Speed Thermocouple Measurement
- USB 2.0 Full-Speed (12 Mbps)
- Support Windows 7 (32/64 bit), Windows 10 (32/64 bit)
- No external power supply (Bus Powered)
- LED indicators for power/error status
- Lockable USB cable
- 3000VDC intra-module isolation

## 1.2. Selection Guide

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Model	AI				
	Channel	Resolution	Isolation	Input Type	Sampling Rate
USB-4018HS	8	16-bit	3000 VDC	Thermocouple : J, K, T, E, R, S, B, N, C, L, M, L <sub>DIN43710</sub>	100 Hz (each channel)
USB-4018HS-16	16				

## 1.3. Software Overview

---

ICP DAS provides some free software tool and development tools as follows:

### 1.3.1. USB-4018H Utility



USB-4018H Utility is used to search, configure, and test the USB-4018 series module through the USB port on a Windows PC or a WES PAC.

(Refer to [Chapter 3](#) for more information)

### 1.3.2. EZ Data Logger



EZ Data Logger is the software that ICP DAS provides for users to easily build a SCADA system on Windows Vista/7/8/10. It comes with two versions, "Lite" & "Professional". The Lite version is not only full-functioned but free to all

ICP DAS users. (Refer to [Chapter 5](#) for more information)

#### **Functions:**

- Support DCON, Modbus RTU, Modbus ASCII, and Modbus TCP protocols
- Support multiple COM Ports and TCP/IP connections
- Support Virtual Channel definition
- Support Control Logic (VB Script)
- Support Alarm Notifier (by sending SMS or E-Mail)
- Flexible workgroup configuration
- Real-time data trend (with zoom in and zoom out)
- Provide a Layout view
- Provide IP Camera Viewer
- Access database supported (can be exported to Excel file or CVS file)
- Provide Reporter to print trend line or data
- Provide High/Low alarm with audio warning
- Can search for DCON and Modbus modules
- Provide value scaling
- Support three-level authority management
- Do not need highly programming skills

### 1.3.3. OPC Server



NAPOPC\_ST DA Server is a free OPC DA Server ("OPC" stands for "OLE for Process Control" and "DA" stands for "Data Access") for ICP DAS products.

Based on Microsoft's OLE COM (component object model) and DCOM (distributed component object model) technologies, NAPOPC\_ST DA Server defines a standard set of objects, interfaces, and methods for use in process control and manufacturing automation applications to facilitate the interoperability.

Using NAPOPC\_ST DA Server, the system integrates data with SCADA/HMI/Database software on the same computer and others. SCADA/ HMI/Database sends a request and NAPOPC DA Server fulfills the request by gathering the data of ICP DAS modules (License Free) and third-party devices (License Charge) to SCADA/HMI/Database.

For different OS of PAC products, ICP DAS provides several professional DA Servers:

Version	NAPOPC_ST	NAPOPC_XPE
Platform	Desktop Windows	Windows XP Embedded
Price	Free /\$	Free

For more information please visit

[https://www.icpdas.com/en/product/guide+Software+Applications+NAPOPC\\_DA\\_Server](https://www.icpdas.com/en/product/guide+Software+Applications+NAPOPC_DA_Server)

### 1.3.4. nModbus

nModbus can achieve protocol of Modbus. It is developed and maintained on a voluntary basis and provided free of charge. ICP DAS verified and improved the DLL based on the official released nModbus\_net-2.0\_1.11.0.0-source.zip. Programmers can use the DLL to develop a Modbus application for regular Windows based PCs or WinCE based devices.

The DLL features

- a. Modbus/RTU Master/Slave
- b. Modbus/ASCII Master/Slave
- c. Modbus/TCP Master/Slave
- d. Modbus/UDP Master/Slave

Visit the following website for more information:

[https://www.icpdas.com/en/product/guide+Software+Development\\_Tools+Modbus\\_Tool#440](https://www.icpdas.com/en/product/guide+Software+Development_Tools+Modbus_Tool#440)



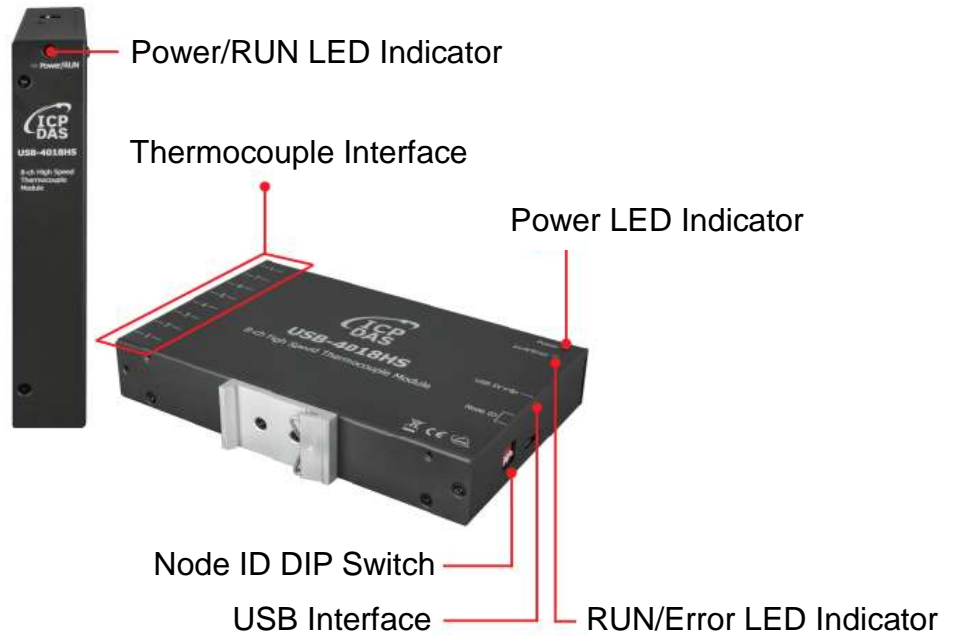
## 2. Hardware Installation

### 2.1. Specifications

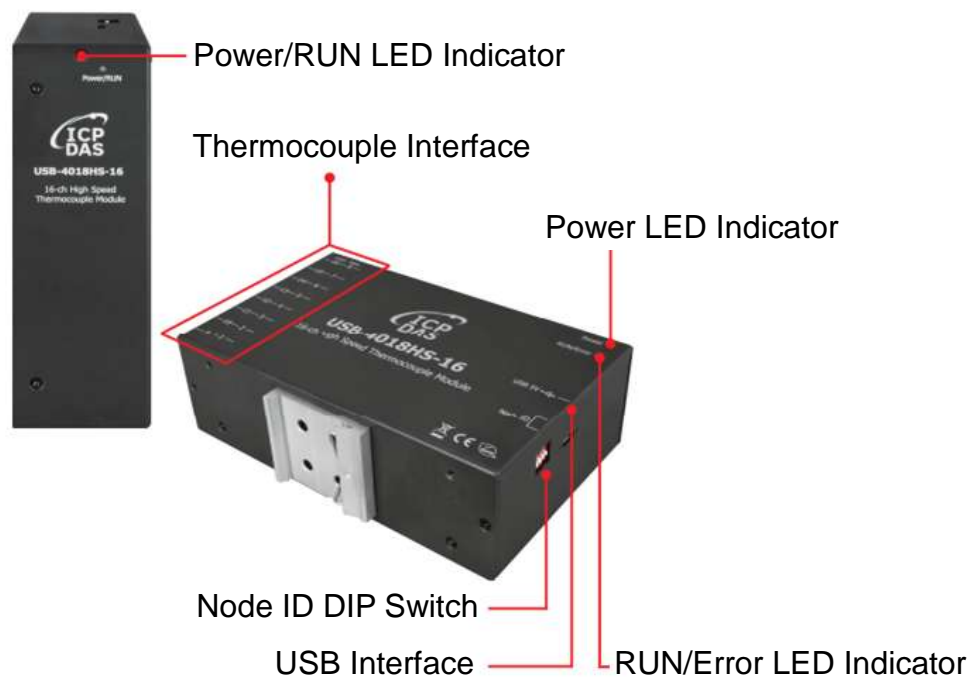
Model	USB-4018HS	USB-4018HS-16
<b>USB</b>		
Specification	USB 2.0 Full-Speed (12Mbps)	
Driver	USB Virtual COM Port Driver for Windows 7/10/11	
	Linux OS (kernel 2.6 or later version)	
Protocol	Modbus RTU	
<b>Software</b>		
OS Support	Windows 7 (32/64-bit), Windows 10 (32/64-bit)	
<b>CPU Module</b>		
Watchdog Timer	1 Hardware watchdog (1.6 second) 1 Software watchdog (Programmable)	
<b>Temperature Measurement</b>		
Sensor Type	Thermocouple : J, K, T, E, R, S, B, N, C, L, M, L DIN43710	
Channels	8	16
Resolution	0.1 °C	
Accuracy	±0.5 °C	
Sampling Rate	100 Hz (each channel)	
<b>LED Indicators</b>		
Status	PWR : Yellow for normal operation RUN / Error : Red for error indicator	
<b>Power</b>		
Consumption	0.17 W Max.	0.18 W Max
<b>Isolation</b>		
Intra-module Isolation,	3000 VDC	
<b>Mechanical</b>		
Dimensions (mm) (W x L x H)	113 x 169 x 29	113 x 169 x 54
<b>Environmental</b>		
Operating Temperature	-25 ~ +75 °C	
Storage Temperature	-40 ~ +85 °C	
Humidity	10 ~ 95% RH, Non-condensing	

## 2.2. Appearance

### USB-4018HS



### USB-4018HS-16



## System LED Indicators

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LED Indicator	Color	Status	Description
PWR	Orange	On	Power is applied.
RUN/Error	Green/Red	Off	The indicator is always off.

## Node ID DIP Switch

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Node ID dip switches 1 to 4 are in the down (off) position by default. (Node ID = 0). If more than one USB-4018 series modules are present in a project, adjusting the Node ID dip switch to set a unique number (0 -15) for each module.



## USB Interface

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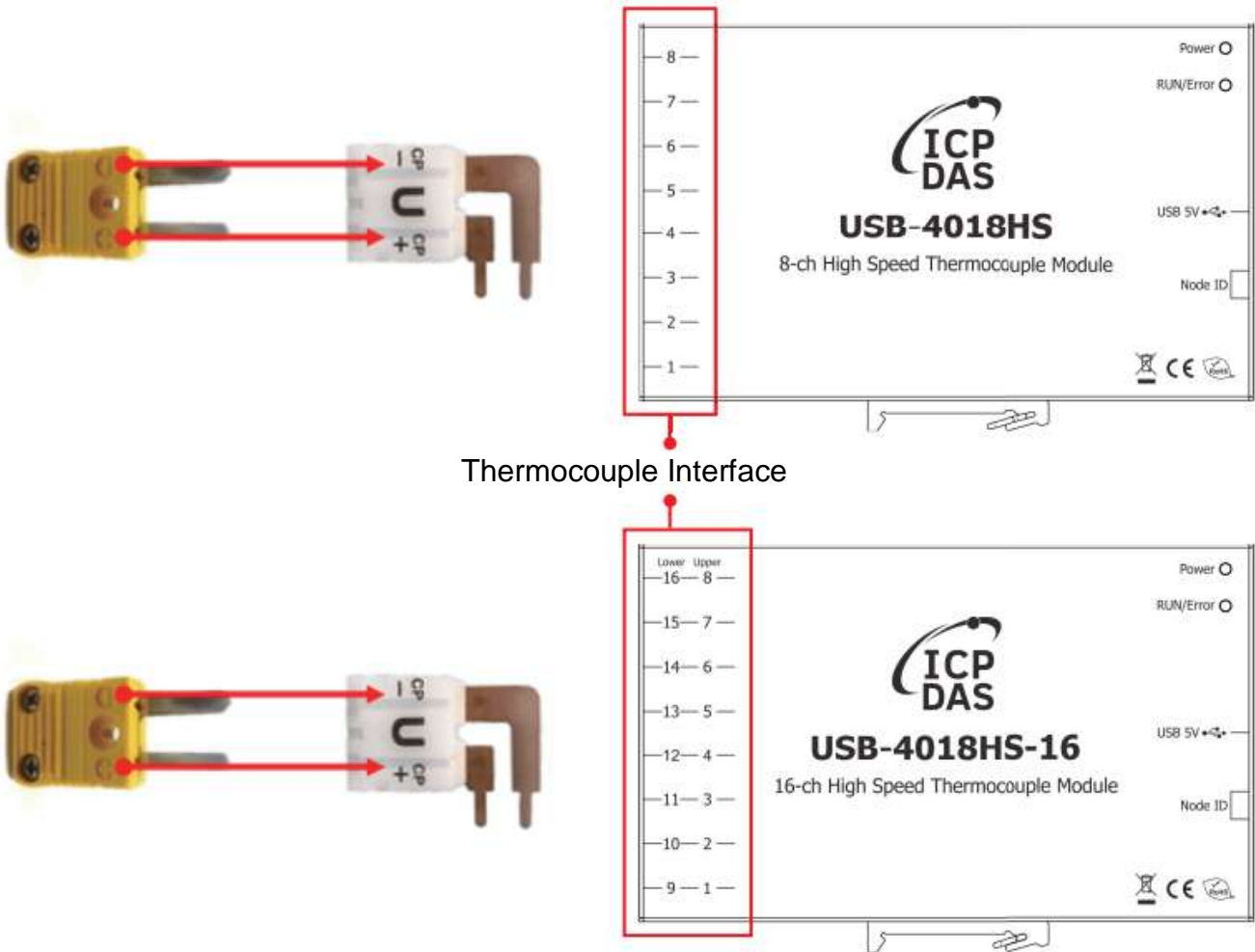
The USB-4018 series adopts type C connector design, which is compatible with USB 2.0 full-speed (12 Mbps) standard.

## Thermocouple Interface

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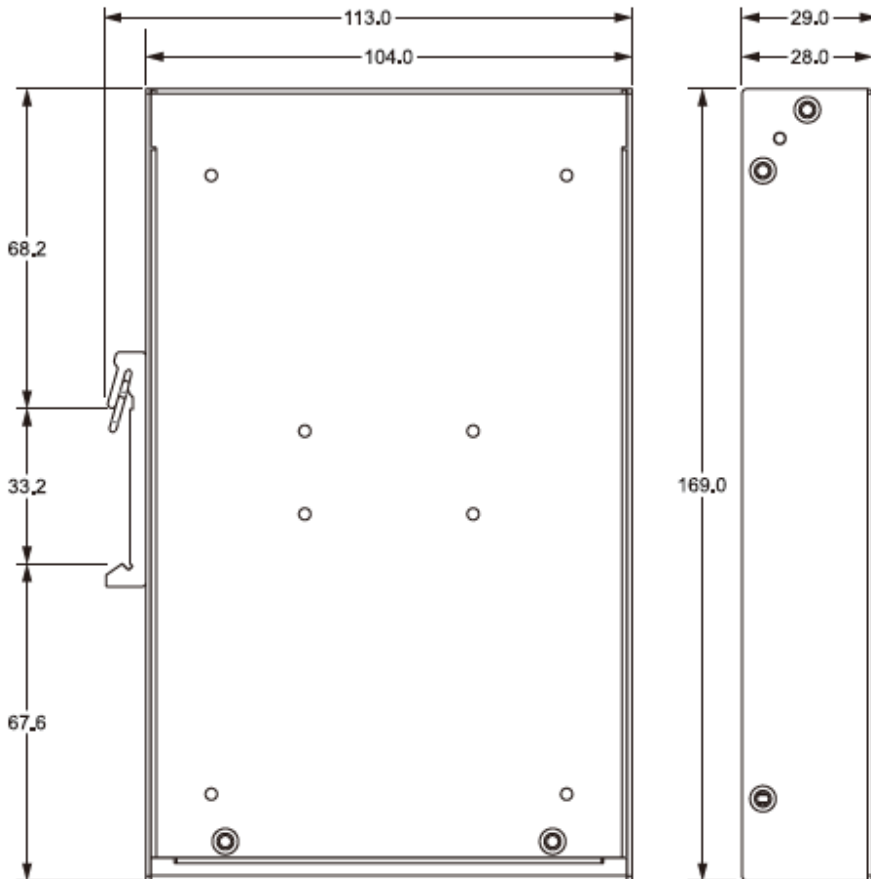
The USB-4018HS/USB-4018HS-16 provides 8/16 thermocouple socket connectors for quick connection.

## 2.3. Wiring Connections



## 2.4. Dimensions (Unit: mm)

USB-4018HS



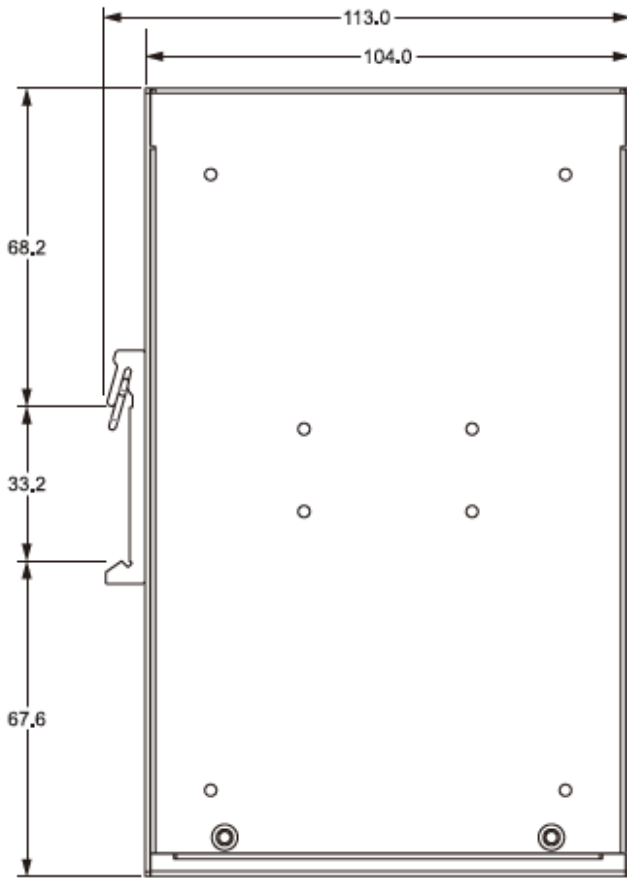
Side View

Front View



Bottom View

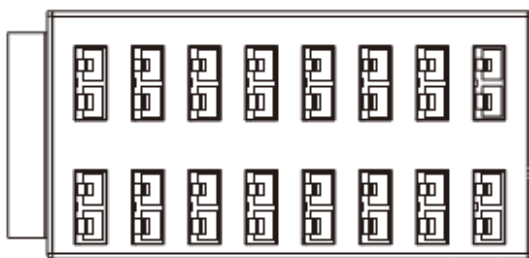
# USB-4018HS-16



**Side View**



**Front View**



**Bottom View**

## 2.5. Mounting

### DIN-rail Mounting



USB-4018HS/ USB-4018HS-16  
+ Standard accessories

### Wall Mounting – Combine



USB-4018HS x2+ ASO-0057(Optional)

### Wall Mounting – Upright



USB-4018HS  
+ ASO-0015 (Optional)  
USB-4018HS-16  
+ ASO-0023 (Optional)

### Wall Mounting – Lay Flat



USB-4018HS  
+ ASO-0059 (Optional)  
USB-4018HS-16  
+ ASO-0059 (Optional)

## 3. Setting up the Module

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It is recommended to install the **USB-4018 driver** before plugging the **module** into the USB port on the computer. Otherwise, the computer (Win10 or above) will install its default driver in advance, and the driver cannot be overwritten by the correct driver - USB\_4018H\_Installer.exe installed later. Then you will need to update the driver manually.


### 3.1. Installing Driver and Utility

---

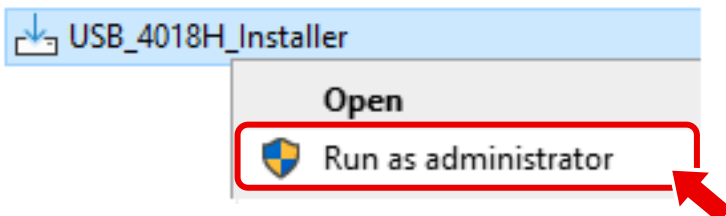
**Step1.** Download the USB-4018 utility installer (driver included) from

<https://www.icpdas.com/en/download/show.php?num=8627&model=USB-4018HS>

#### USB-4018 Utility Installer

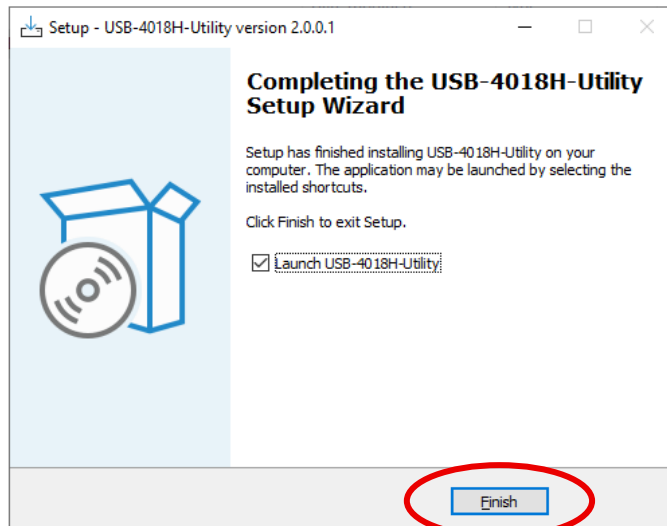
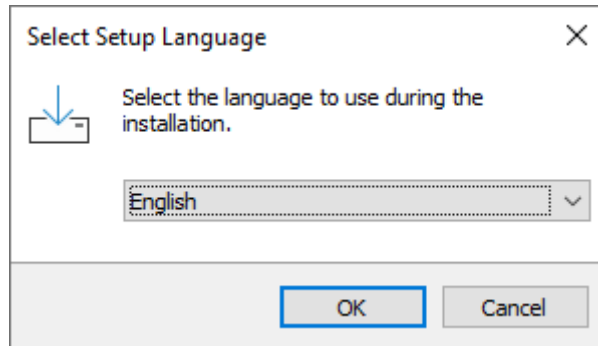
FILE NAME	VERSION	FILE DATE	SIZE	NOTE	
USB-4018-Utility-Installer		2023-05-03	3.1 MB		

**Step2.** Right-click the USB\_4018H\_Installer.exe file, and select “**Run as administrator**”.





**Step3.** Follow the prompts to complete the installation. After the installation is complete, the USB-4018H Utility will be installed into the default directory C:\ICPDAS\USB-4018H-Utility.



Installation successful message

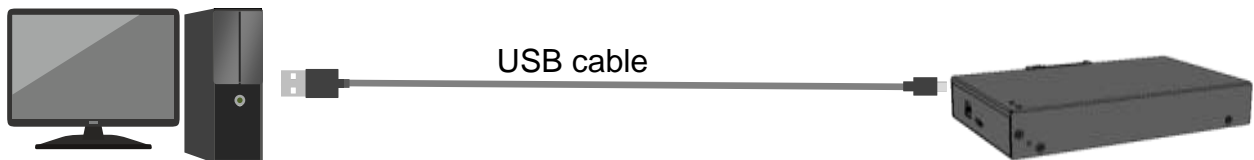
```
C:\ICPDAS\USB-4018H-Utility\driver>echo run InstInf.exe ICPDASUSB4018H.inf
run InstInf.exe ICPDASUSB4018H.inf

C:\ICPDAS\USB-4018H-Utility\driver>InstInf.exe ICPDASUSB4018H.inf
InstInf.exe Ver1.00.04 [Mar.30, 2010]
Inf file installed successfully.
Inf Source:ICPDASUSB4018H.inf
Press any key to continue . . .
```

## 3.2. Connecting the Host PC

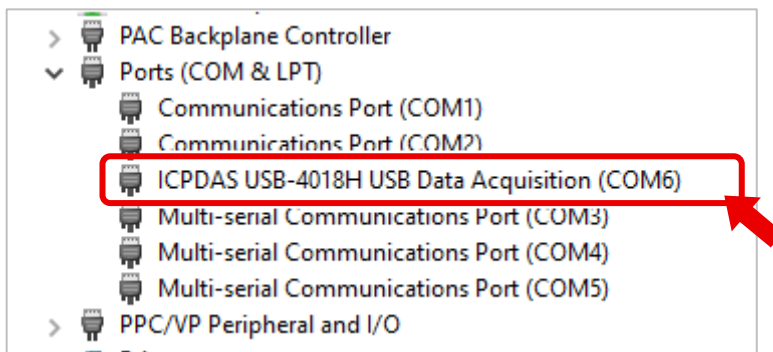
---

**Step1.** Connecting the USB-4018 series module to your powered-on computer, and then the module will be powered on by the USB cable.



**Step2.** Open **Device Manager** and connect the USB-4018 series module. View the driver for the module is shown as “**ICPDAS USB-4018H USB Data Acquisition (COMn)**”.

If there is only the COM Port name (COMn) displayed for your new device, it means that the system has automatically installed its default driver. Refer to the next section for instructions to remove the default driver automatically installed by the system.

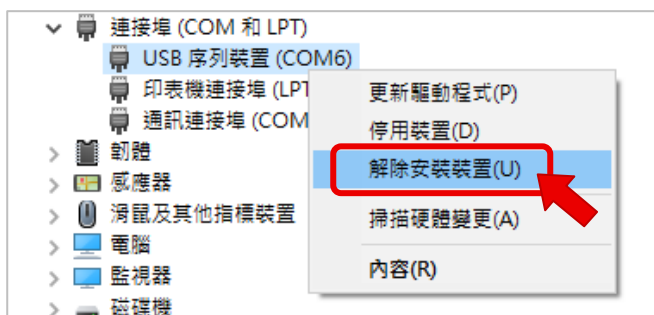


### 3.3. Uninstalling the system default driver

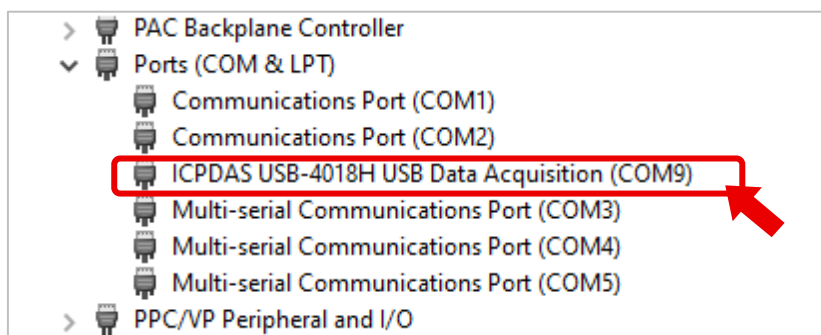
On a computer with an operating system of Win10 or above, the default driver will be installed in advance upon the USB-4018 series module is plugged into the USB port of the computer, if the specific driver is not installed yet. The default driver installed by the system cannot be overwritten while the USB\_4018H\_Installer.exe is executed to install the driver.

If there is only the COM Port name (COMn) displayed for your new device in Device Manager, follow the steps to uninstall the default driver.

**Step1.** Right-click the (COMn) item in the Device Manager tree and then click on the item “Uninstall Device”.



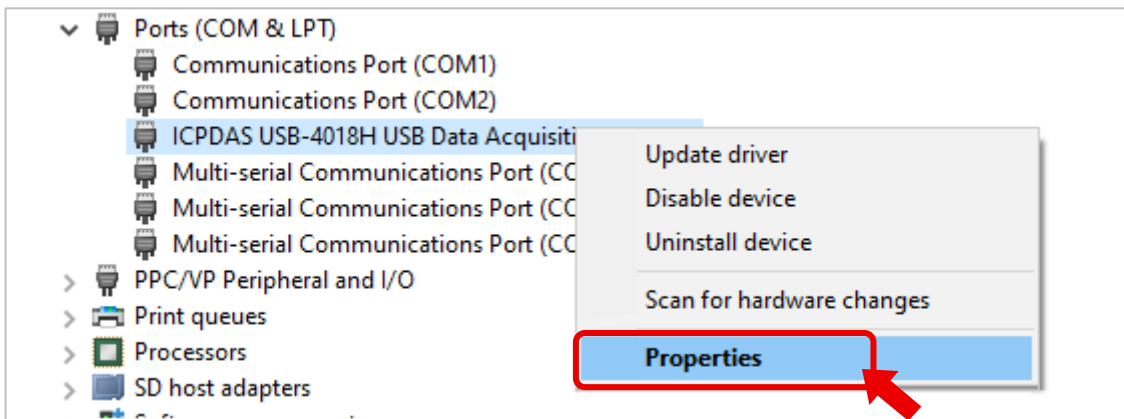
**Step2.** Unplug and replug the USB-4018 series device into the USB port, view the driver name for the device is shown as “**ICPDAS USB-4018H USB Data Acquisition (COMn)**”. Then you can access the module via the USB-4018H Utility or your application software.



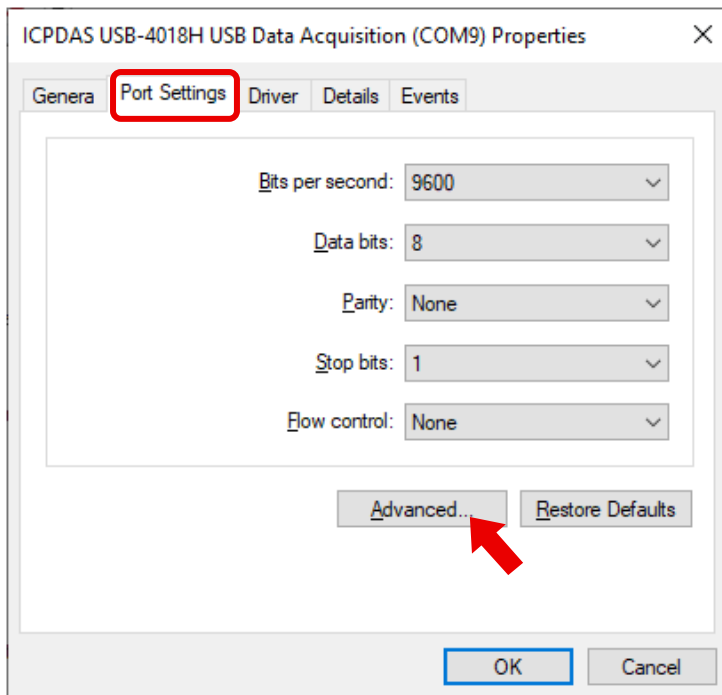
## 3.4. Changing COM Port number

Sometimes, the COM port number needs to be changed for an already-running application software, you can do so by taking the following steps.

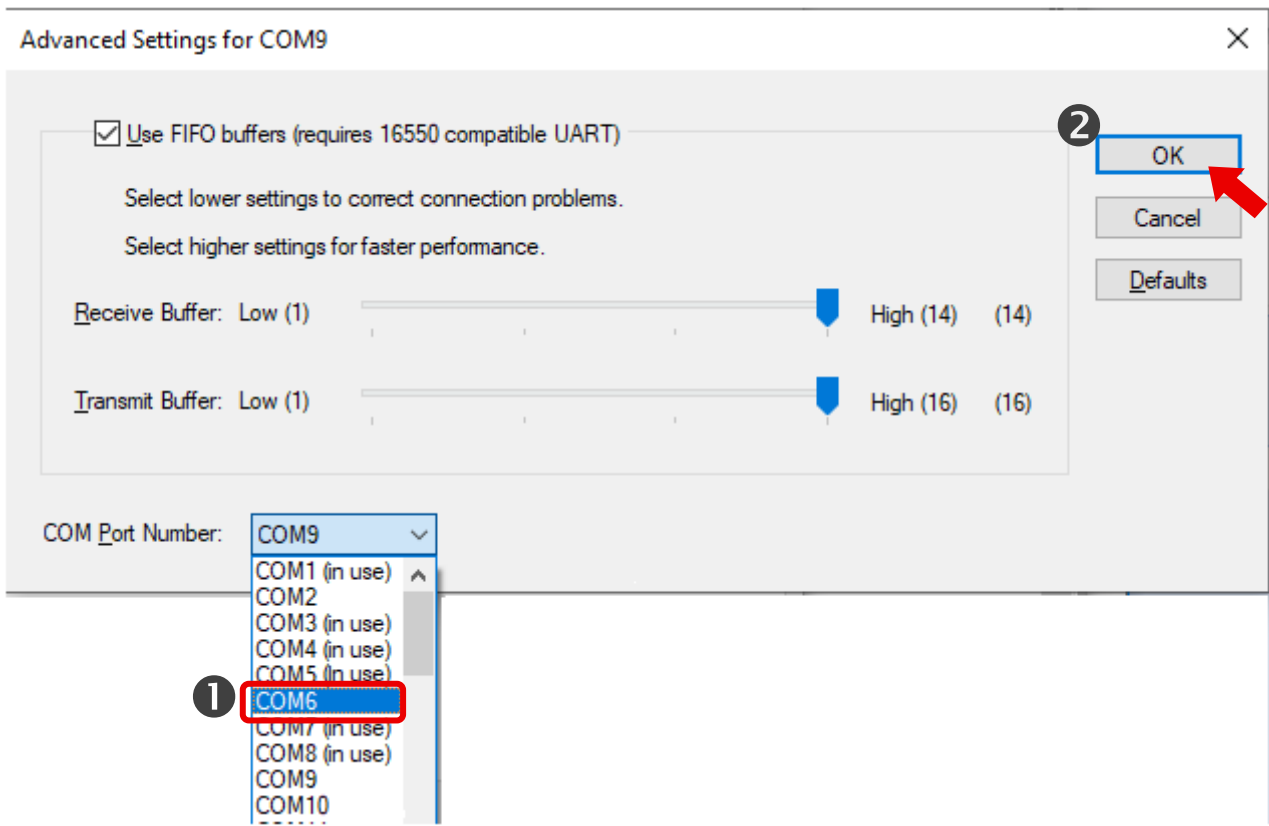
**Step1.** Right click on the driver name for the USB-4018 series module in Device Manager, select **“Properties”** option on the right-click menu.



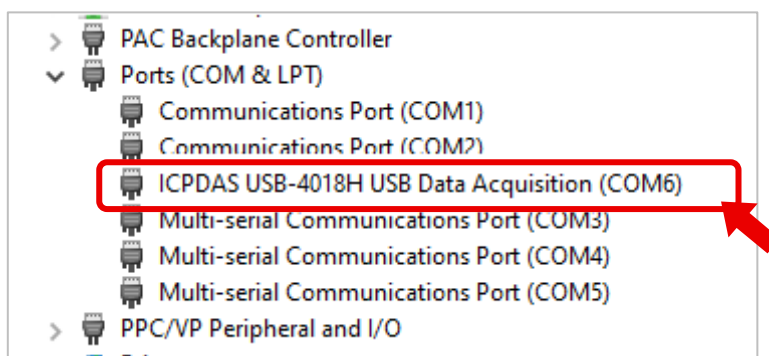
**Step2.** Click the **“Advanced...”** button on the Port Settings tab.



**Step3.** Select the desired COM Port number **which is not in use** from the COM Port Number drop-down menu, and click **OK**.



The new COM port number is displayed immediately in the Device Manager.



## 3.5. Module Configuration

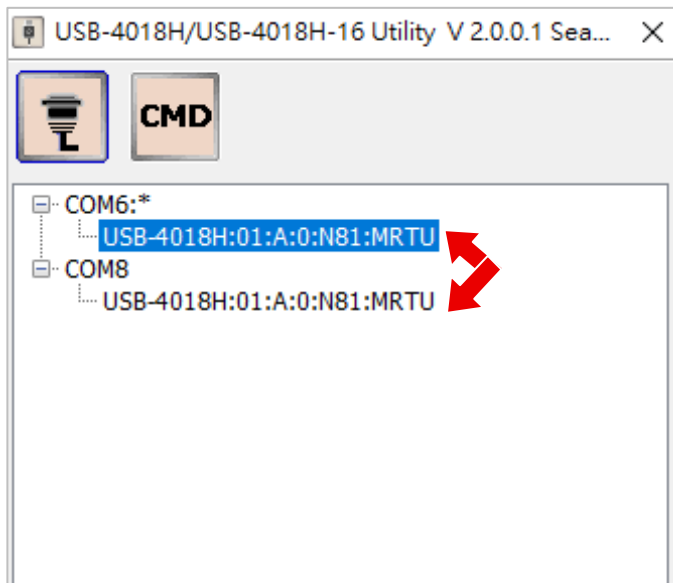
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Before starting to use a new USB-4018 series module, you need to launch the USB-4018H Utility to configure the module and check whether the measured values are correct. If there is a temperature deviation, it can be adjusted through CJC offset.

USB-4018H Utility can be applied on PC or WES PAC. After downloading and executing USB\_4018H\_Installer.exe, the USB-4018H Utility will be installed to the path C:\ICPDAS\USB-4018H-Utility\.

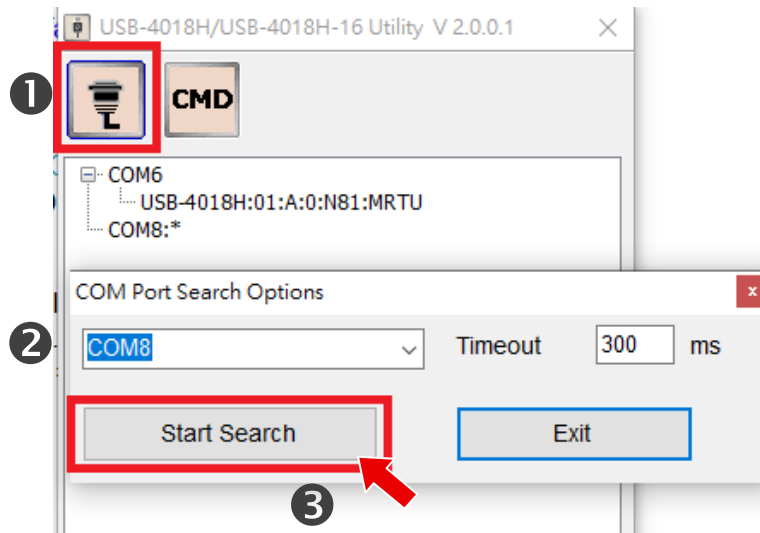
The following instructions assume that the USB-4018 utility installer and driver have been installed by performing those steps in section 3.1 and section 3.2.

**Step1.** Launch the USB4018H\_Utility\_Vxxx.exe, the main window shows all the USB-4018 series modules on the system. If not, unplug and replug the module to trigger the re-search action.

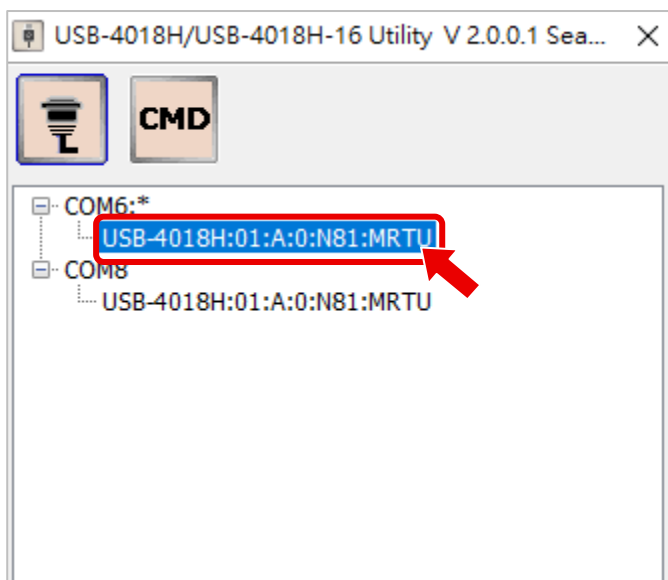


You can also start the search process by specifying a COM port number.

1. Click the “**Connection Options**” icon.
2. Selection a COM port number
3. Click the “**Start Search**” button.



**Step2.** Click the module name.



### Step3.

1. Set the correct thermocouple type for each channel.
2. Confirm the correctness of the temperature. If there is a deviation in the temperature, use CJC Offset to correct the temperature.
3. Increase the Moving Average to reduce the fluctuation of the measured temperature.

USB-4018H Firmware[A203]

AI Commands Log Summary

Moving Average: 32 (1 ~ 128) [Set]

Channel	Type Code	Temperature	CJC Temperature	CJC Offset (0.1 C)
<input checked="" type="checkbox"/> CH:00	[0F] T/C K-type	255 [+25.5]	26.5	0.0
<input checked="" type="checkbox"/> CH:01	[0F] T/C K-type	253 [+25.3]	26.4	0.0
<input checked="" type="checkbox"/> CH:02	[0F] T/C K-type	255 [+25.5]	26.4	0.0
<input checked="" type="checkbox"/> CH:03	[0F] T/C K-type	256 [+25.6]	26.4	0.0
<input checked="" type="checkbox"/> CH:04	[0F] T/C K-type	255 [+25.5]	26.4	0.0
<input checked="" type="checkbox"/> CH:05	[0F] T/C K-type	256 [+25.6]	26.4	0.0
<input checked="" type="checkbox"/> CH:06	[0F] T/C K-type	32767	26.3	0.0
<input checked="" type="checkbox"/> CH:07	[0F] T/C K-type	32767	26.4	0.0
<input type="checkbox"/> CH:08		-	-	+00.0
<input type="checkbox"/> CH:09		-	-	+00.0
<input type="checkbox"/> CH:10		-	-	+00.0
<input type="checkbox"/> CH:11		-	-	+00.0
<input type="checkbox"/> CH:12		-	-	+00.0
<input type="checkbox"/> CH:13		-	-	+00.0
<input type="checkbox"/> CH:14		-	-	+00.0
<input type="checkbox"/> CH:15		-	-	+00.0

[Set All Channel Type Code as CH:00]

[Exit]

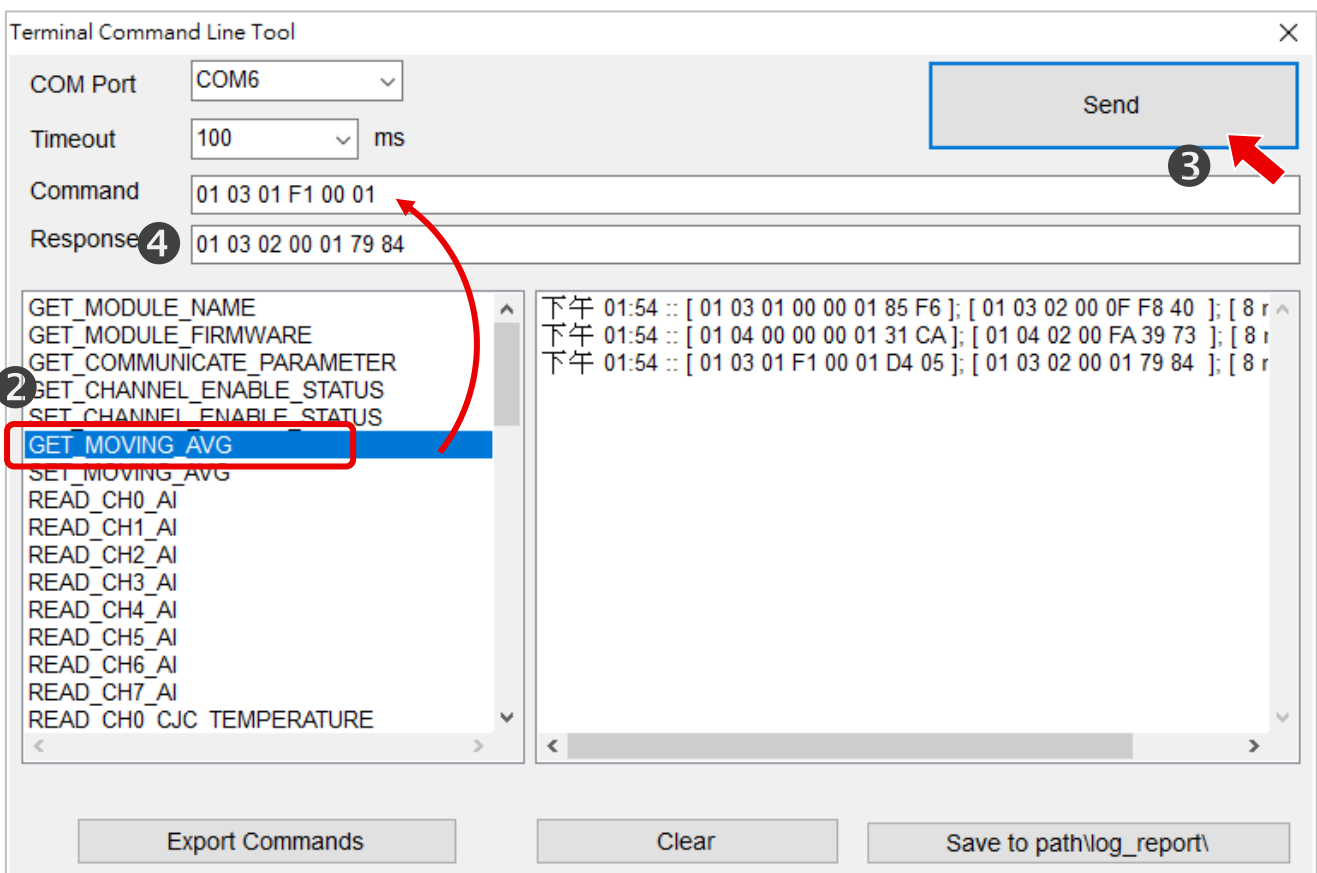
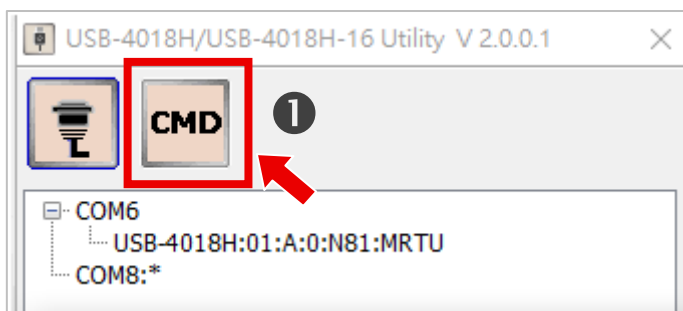
Analog Input Exceed Range==>Please check CH:7 input connector



## 3.6. Command Line Tool

The **Command Line** function can be used as a tool for module testing and debugging, and the built-in Modbus RTU protocol commands used by the module.

1. Click the “**Command Line**” icon.
2. Click a command name directly; the corresponding command string will appear in the **Command** column.
3. Press the “**Send**” button to test the response status of the command.
4. Any response from the module will be displayed in the **Response** column.



5. Clicking the “**Export Commands**” button can export the Modbus command table used for the module, which is very convenient for subsequent program development.

```
*****[AI_Registers]***  
30000 = READ_CH0_AI  
30001 = READ_CH1_AI  
30002 = READ_CH2_AI  
30003 = READ_CH3_AI  
30004 = READ_CH4_AI  
30005 = READ_CH5_AI  
30006 = READ_CH6_AI  
30007 = READ_CH7_AI  
30128 = READ_CH0_CJC_TEMPERATURE  
30129 = READ_CH1_CJC_TEMPERATURE  
30130 = READ_CH2_CJC_TEMPERATURE  
30131 = READ_CH3_CJC_TEMPERATURE  
30132 = READ_CH4_CJC_TEMPERATURE  
30133 = READ_CH5_CJC_TEMPERATURE  
30134 = READ_CH6_CJC_TEMPERATURE  
30135 = READ_CH7_CJC_TEMPERATURE
```

6. Clicking the “**Save to path\logger\_report\**” button can save the test results into the “log\_report” folder under the installation path of USB-4018H Utility, and the file name is Command\_Line\_Result\_Log\_mm\_dd\_xx.txt.

```
下午 02:01:38-> 下午 01:54 :: [ 01 03 01 00 00 01 85 F6 ]; [ 01 03 02 00 0F F8 40 ]; [ 8 ms ]=>OK  
下午 02:01:38-> 下午 01:54 :: [ 01 04 00 00 00 01 31 CA ]; [ 01 04 02 00 FA 39 73 ]; [ 8 ms ]=>OK  
下午 02:01:38-> 下午 01:54 :: [ 01 03 01 F1 00 01 D4 05 ]; [ 01 03 02 00 01 79 84 ]; [ 8 ms ]=>OK  
下午 02:08:43-> 下午 02:08 :: [ 01 03 01 F1 00 01 D4 05 ]; [ 01 03 02 00 20 B9 9C ]; [ 8 ms ]=>OK  
下午 02:08:43-> 下午 02:08 :: [ 01 04 00 00 00 01 31 CA ]; [ 01 04 02 7F FF D9 40 ]; [ 8 ms ]=>OK  
下午 02:08:43-> 下午 02:08 :: [ 01 04 00 01 00 01 60 0A ]; [ 01 04 02 7F FF D9 40 ]; [ 8 ms ]=>OK
```

## 4. Modbus Master Tool

Modbus Master Tool is a free Modbus communication tool developed by ICP DAS with supporting of Modbus TCP and Modbus RTU/ACSII. It can be used to simulate or test I/O modules on a computer or PAC controller. When the data obtained is different from what is expected, the Modbus Master Tool can be used to distinguish whether the error is caused by the module or the control software.



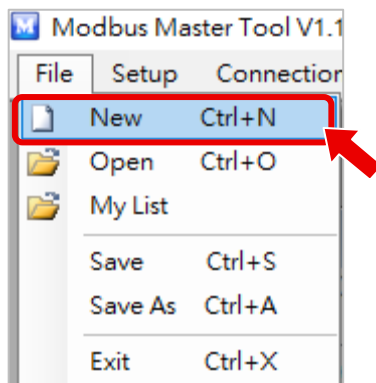
Download Modbus Master Tool and user manual:

[https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=Modbus\\_Master\\_Tool](https://www.icpdas.com/en/download/index.php?nation=US&kind1=&model=&kw=Modbus_Master_Tool)

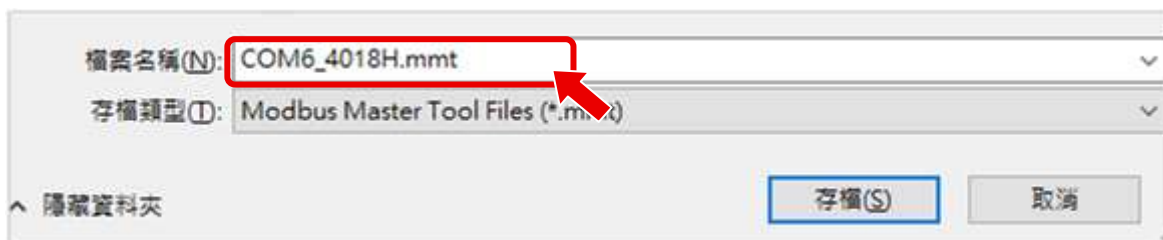
The following section describes how to access channel values on the USB-4018 series modules with Modbus Master Tool.

**Step1.** Decompress the downloaded file, and launch MdbusMasterToolPC.exe.

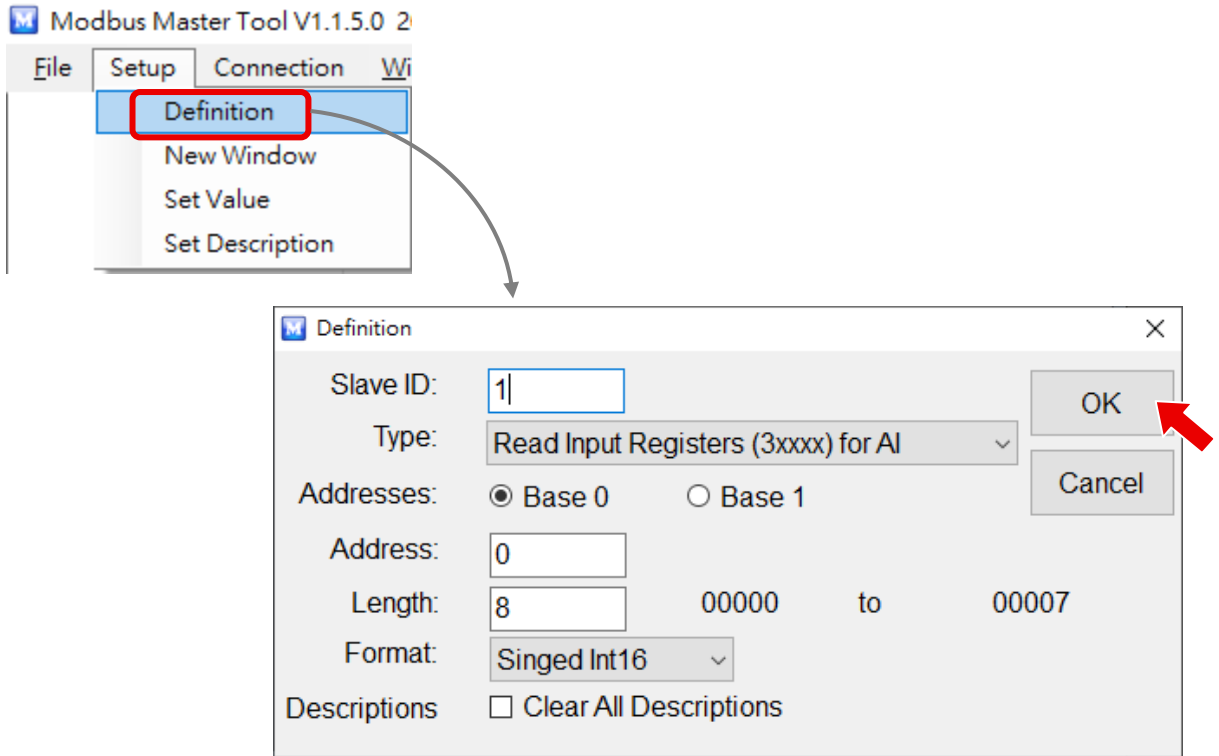
**Step2.** Click "File" >> "New " to create a new file.



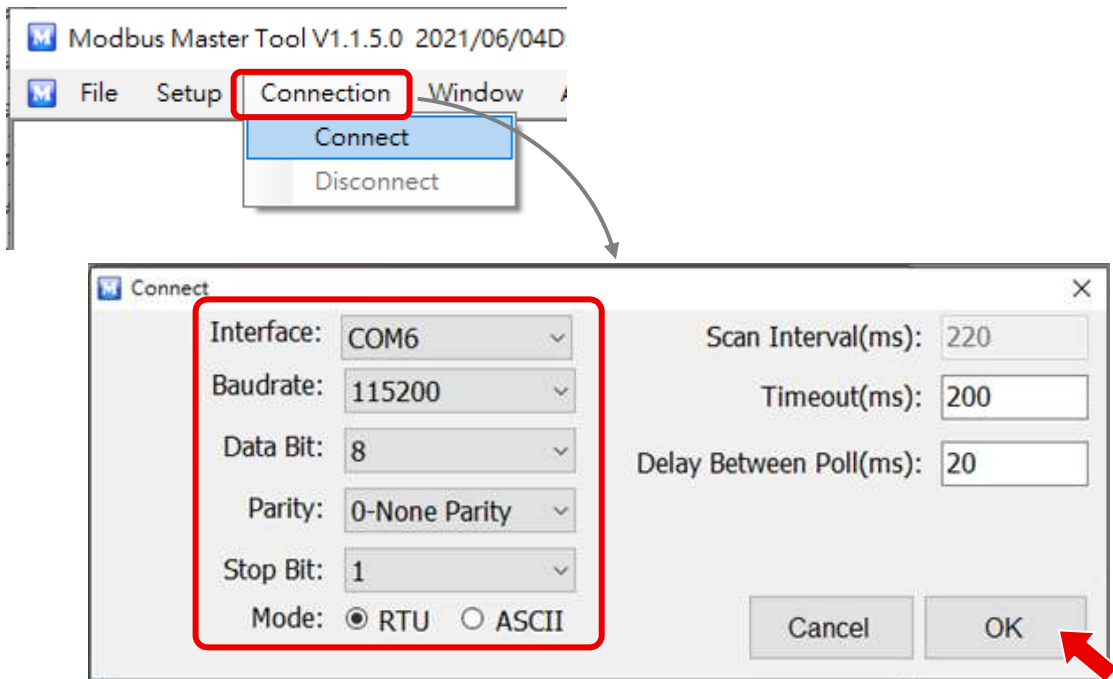
**Step3.** Enter a file name.



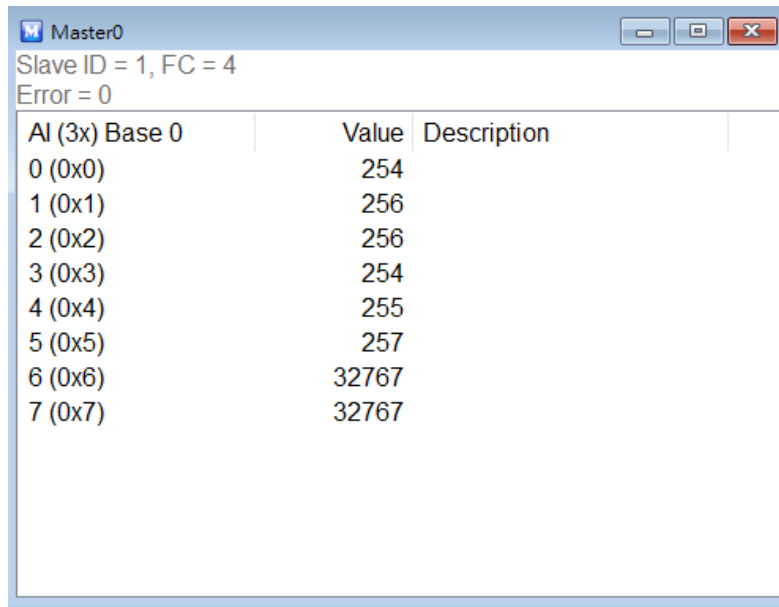
**Step4.** Click “**Setup**” > “**Definition**” to set the Modbus data scan range. The default station number (Slave ID) is fixed to 1, select the Addresses Base, input Start address number, fill **8** into the Length field for 8-channel AI module, and then click **OK**.



**Step5.** Click “**Connection**” > “**Connect**”, select COM Port for connecting the USB-4018 series module, set parameters as 115200, N.8.1, Modbus RTU, and then click **OK**.



**Step6.** Read the values (in Modbus Engineering format). Dividing the data by 10 equals the real temperature measured on a USB-4018 series module. A value of 32767 (0x7FFF) means that this channel is not connected to a thermocouple thermometer.



AI (3x) Base 0	Value	Description
0 (0x0)	254	
1 (0x1)	256	
2 (0x2)	256	
3 (0x3)	254	
4 (0x4)	255	
5 (0x5)	257	
6 (0x6)	32767	
7 (0x7)	32767	

# 5. EZ Data Logger / eLogger HMI

**Note:** EZ Data Logger no longer provides a new function since July 2019.

It is recommended to use eLogger HMI.

Support Items	EZ Data Logger	eLogger
Hardware platform	PC	PC, XPAC, WinPAC, ViewPAC, iPPC Win-GRAF series PAC
OS	Windows XP, 7, 10	Windows XP, 7, 10, WinCE 6, 7
HMI	Yes	Yes
Web HMI	No	Yes
Data Logger	Access, MS SQL, MySQL	CSV, MS SQL, MySQL
Protocol	Modbus RTU, Modbus TCP, and DCON	Modbus RTU, Modbus TCP, and I-8K/I-87K on slot
3rd Party Driver Support	No	Driver develops tool to add plug-in 3rd party driver

**eLogger** is a free and easy HMI development platform designed by ICP DAS. eLogger can not only be used to design local and Web Server HMI but can also achieve remote PAC control via a Web browser on PC or smartphone. With Win-GRAF, it is easy to create a professional monitoring application without any advanced programming background.

Website: <https://www.icpdas.com/en/product/guide+Software+eLogger+eLogger>

## eLogger Features:

- **Support Modbus RTU/ASCII and Modbus TCP Protocols**

- **Support Real-time Data Trend**

The maximum of five lines in one plot.

- **Support Local HMI:**

Support a variety of HMI elements and a maximum of 32 pages.

- **Support Web Server HMI:**

Support administrator login.

- **Support Account Management (for Local HMI):**

3-level operating management: Admin, Power User, User.

- **Support Remote Maintenance:**

eLogger is not only supported to upload a program or web pages and execute (or stop) the program through the Internet.

- **Support Data Logging**

Local database: Support CSV files.

Remote database: Support Microsoft SQL Server 2005 or later.

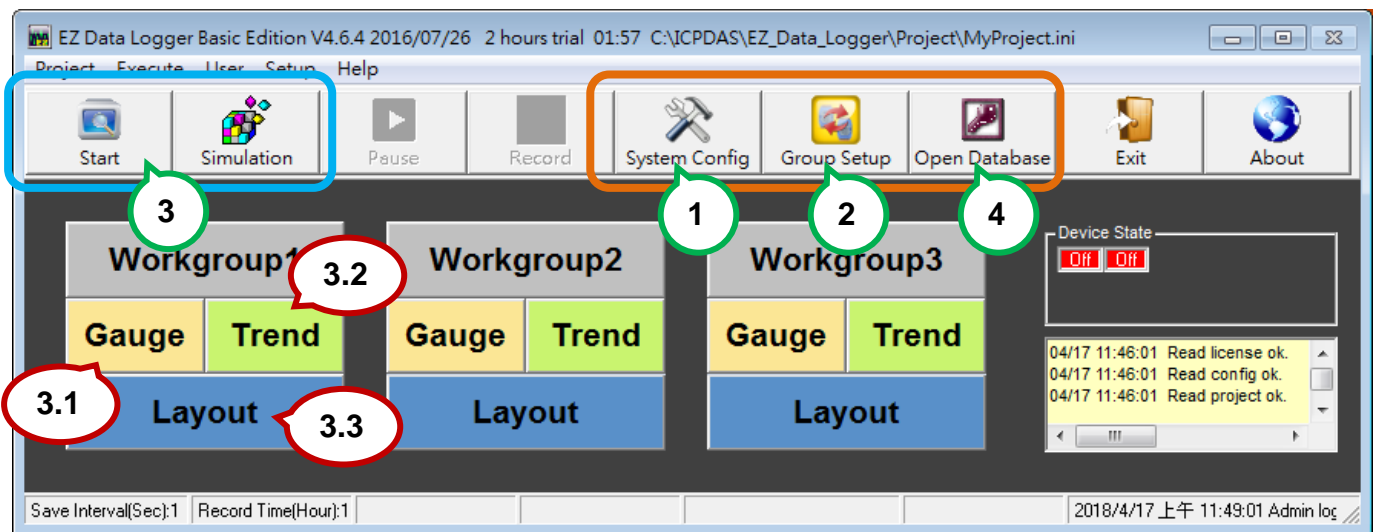


**EZ Data Logger** is a small data logger software. It supports DCON and Modbus RTU/ASCII protocols, and users can quickly and easily build a data logger software without any programming skill.

Download the software and the user manual (.chm) on the website.

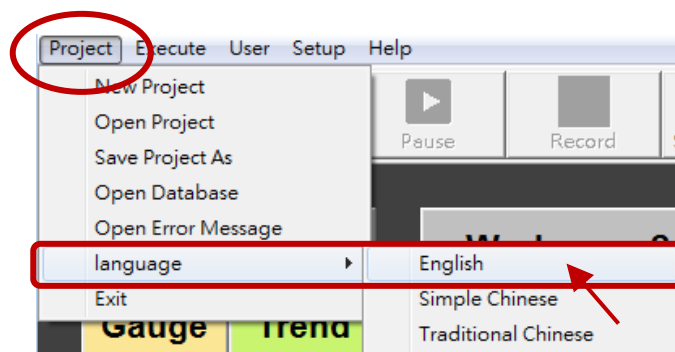
[https://www.icpdas.com/en/product/guide+Software+EZ\\_Data\\_Logger+EZ\\_Data\\_Logger](https://www.icpdas.com/en/product/guide+Software+EZ_Data_Logger+EZ_Data_Logger)

Install and run EZ Data Logger. The software provides four major steps and will be described in the following content.



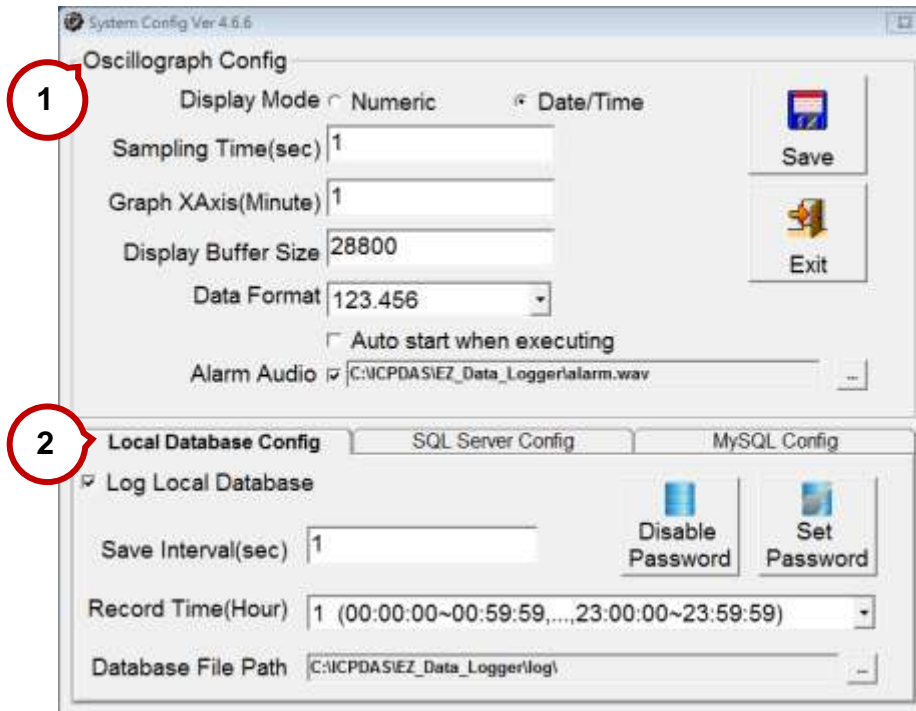
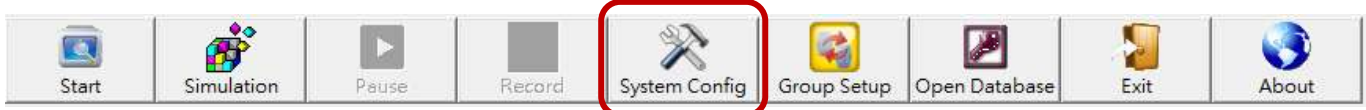
- Step1.** [System Configuration](#)
- Step2.** [Group setting](#)
- Step3.** [Start to Run \(or Simulation\)](#)
  - 3.1. [Gauge](#)
  - 3.2. [Trend Line](#)
  - 3.3. [Layout](#)
- Step4.** [Open Database](#)

First, choose a preferred display language from the Project menu for the software.



## 5.1. System Config

Click the **System Config** icon to set the trend line and database.



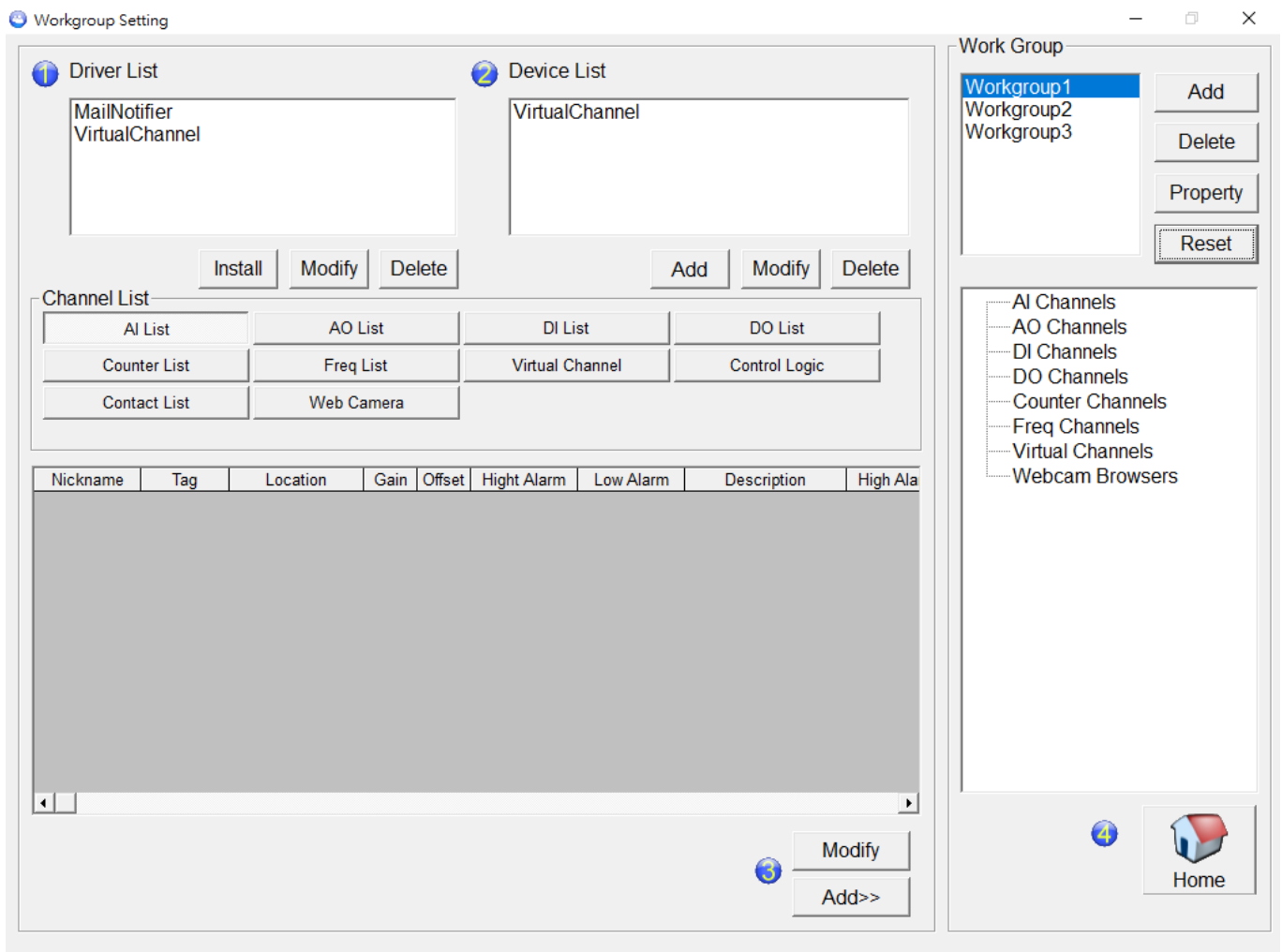
Oscillograph Config	
Display Mode	Numeric: Log data by list. The minimum sampling time is 0.01 sec. Date/Time: Log data by time. The minimum sampling time is 1 sec.
Sampling Time (sec.)	The time interval for scanning IO channels, updating database, and display values.
Graph X Axis (Minute)	The span of the trend display.
Display Buffer Size	Maximum points of each trend line.
Data Format	The format of the display values.
Auto start when executing	Check the box to automatically log data when the program is launched.
Local Database Config	
Save Interval (sec.)	Time interval of saving data in a database (a multiple of sampling time).
Record Time (Hour)	EZ Data Logger will create a new database when the record time is up.
Database File Path	Auto renamed by Datayyyyymmdd_hh.mdb when record time is up (yyyy: year mm: month dd: day hh: hour). The database will be saved in the path.



## 5.2. Group Setup

The “Group Setting” window can be divided into four major steps.

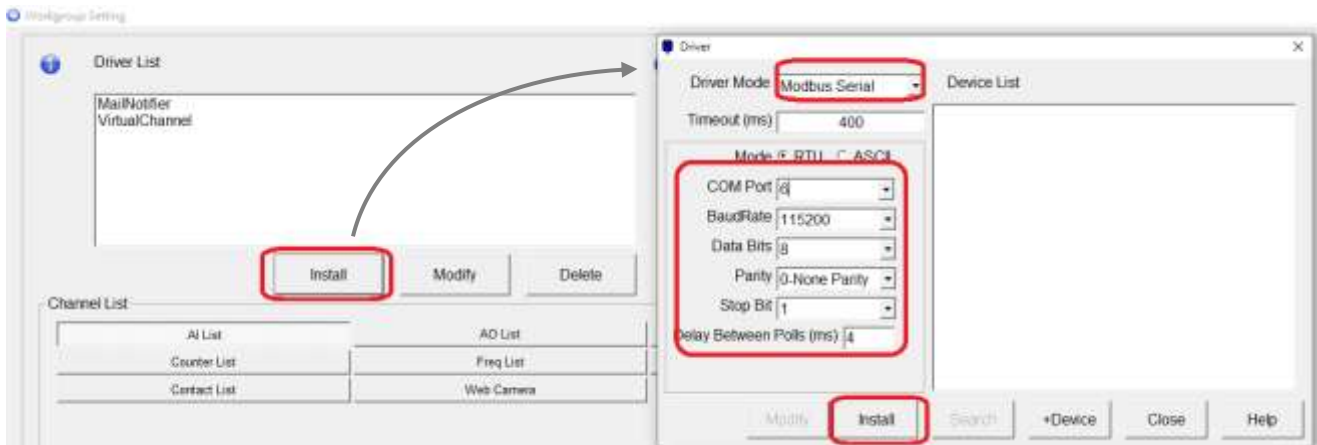
1. [Install driver](#)
2. [Add a device and its channels](#)
3. [Modify channel settings](#)
4. [Configure Workgroup](#)



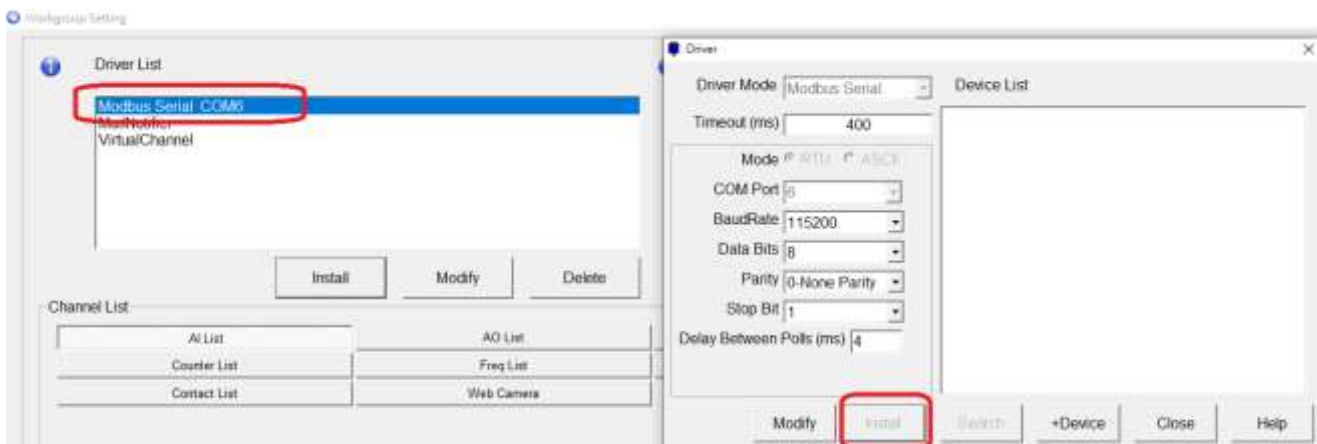
**Note:** For more information about the Virtual Channel, Control Logic, Web Camera, Mail Notifier, and User Level, refer to [EZ Data Logger User Manual](#) (.chm).

## 5.2.1. Installing Driver

**Step1.** Click the "Install" button, select **Modbus Serial** from the Driver Mode drop down menu, correct COM Port number, BaudRate 115200, N/8/1, and then click **"Install"**.

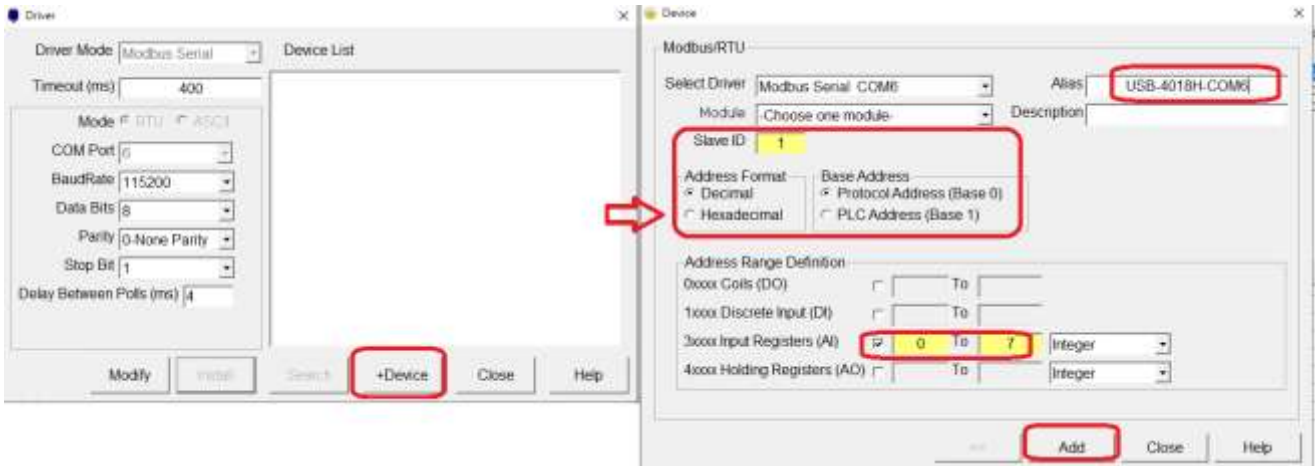


The driver installed is shown as **Modbus Serial COM6**, indicating that COM6 will use the Modbus RTU protocol.

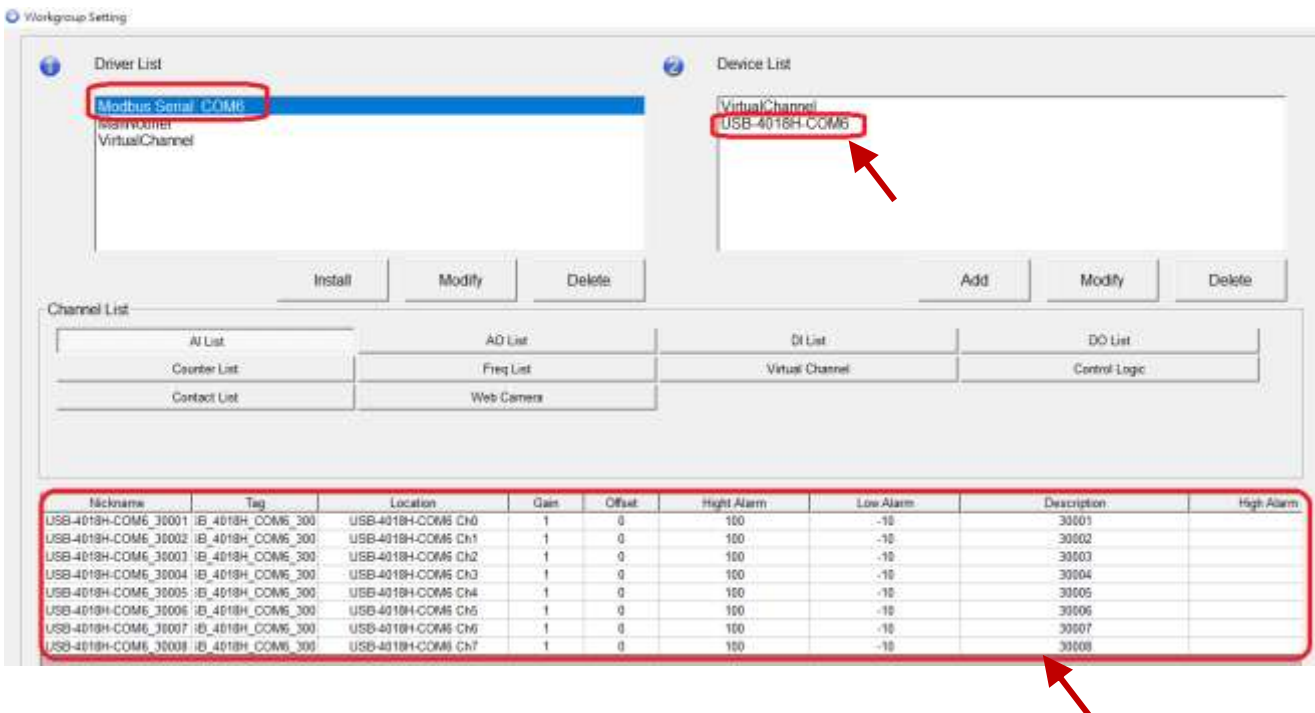


## 5.2.2. Adding a Device and its Channels

**Step2.** Click the "+Device" button to add the USB-4018 series module, set the Slave ID to 1, input Registers (AI) range 0~7 for 8-channel AI module. And then click the "Add" button to complete the "+Device" action.

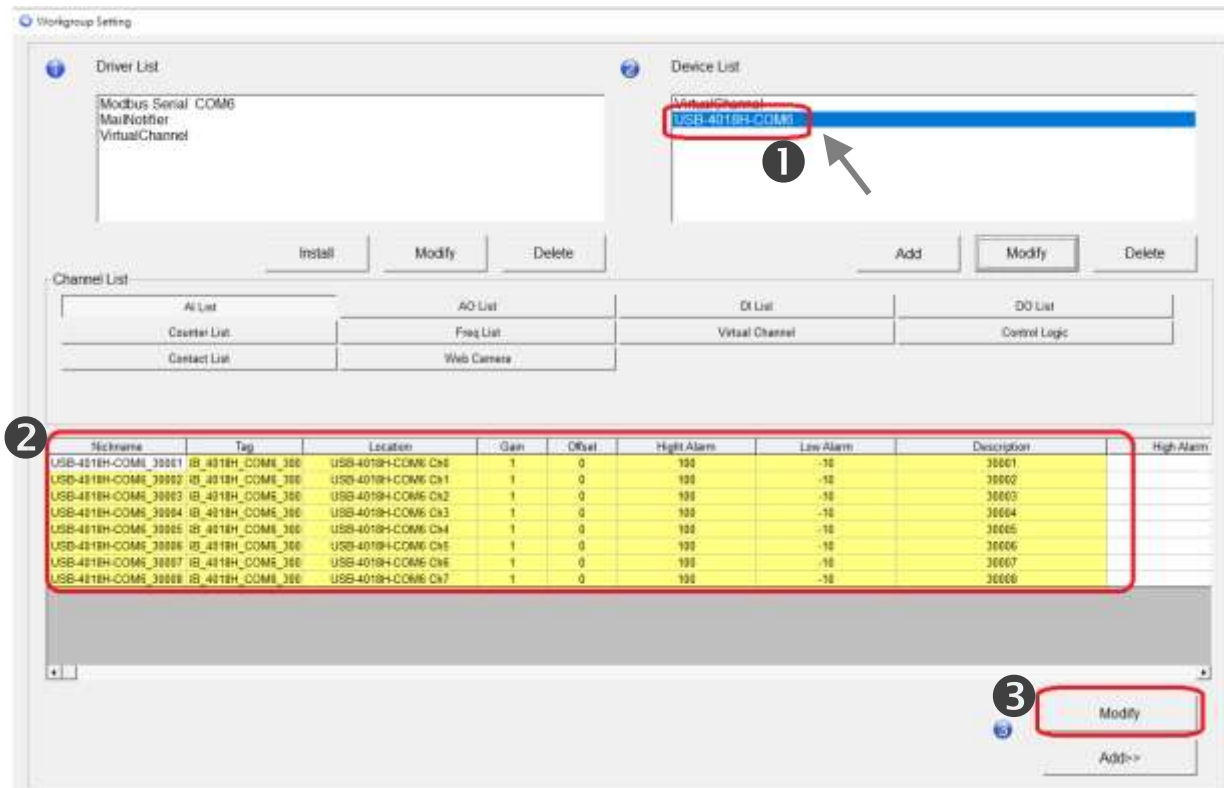


The new device name is added into the **Device List** field, and its AI channels are displayed in the table at the bottom of the window.

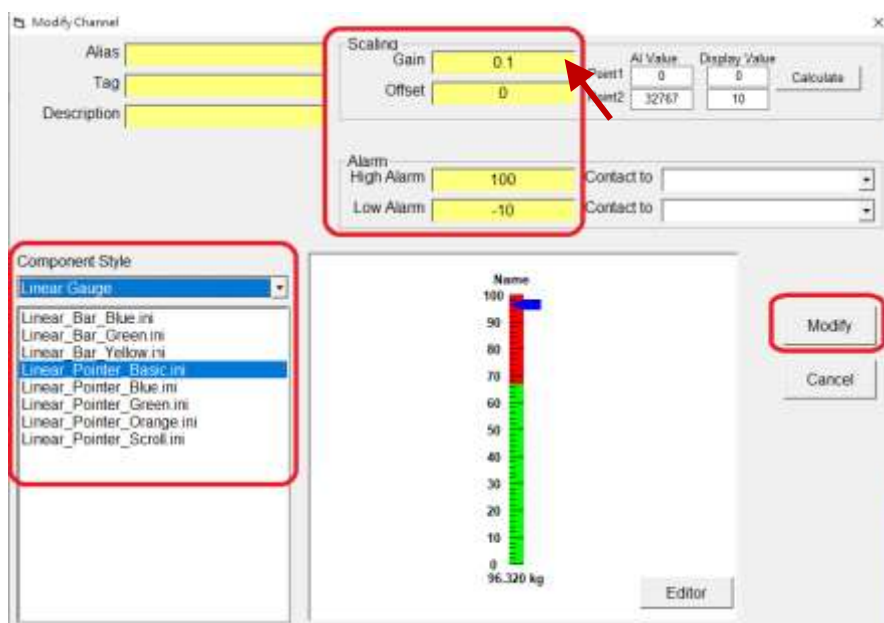


### 5.2.3. Modifying Channel Settings

**Step3.** In the **Device List** pane, click the new device name (e.g. USB-4018H-COM6) to select all I/O channels, and then click the **“Modify”** button.



**Step4.** Dividing the data read from the USB-4018 series module by 10 equals the real temperature values, so it needs to change the **“Gain”** from 1 to 0.1.

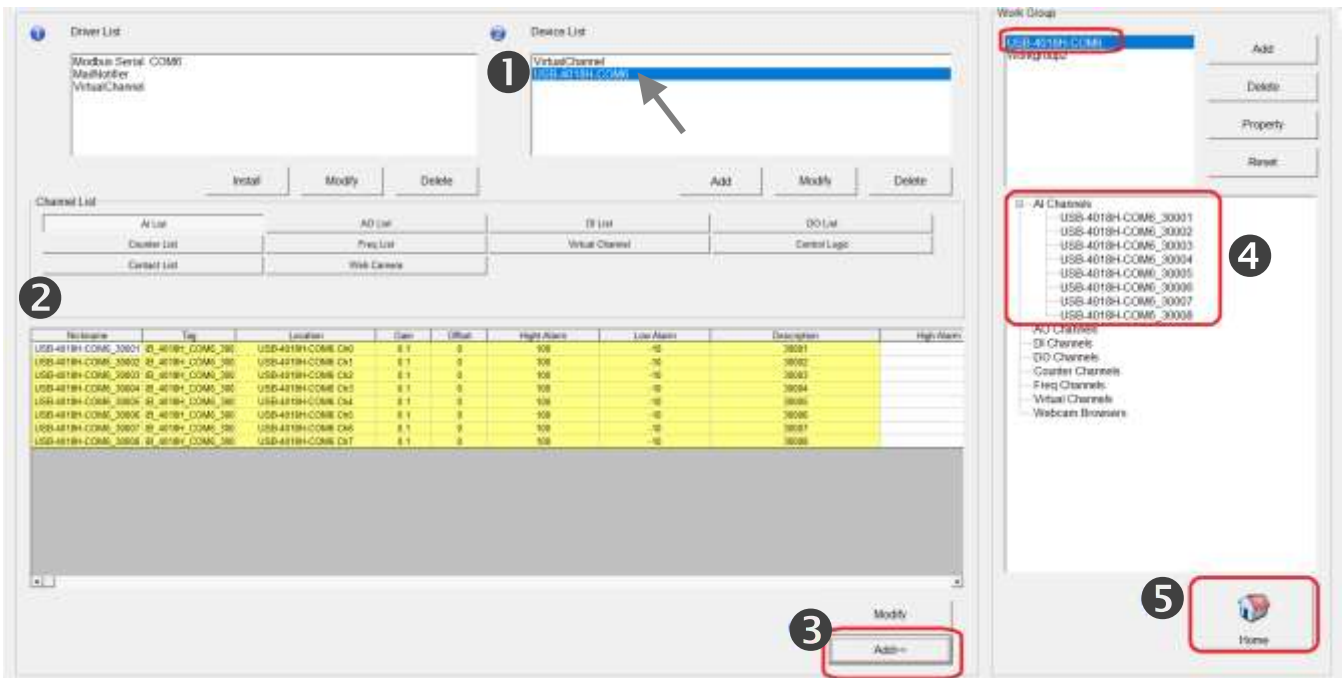


## 5.2.4. Configuring Workgroup

**Step5.** Select a Workgroup and enter a new name.

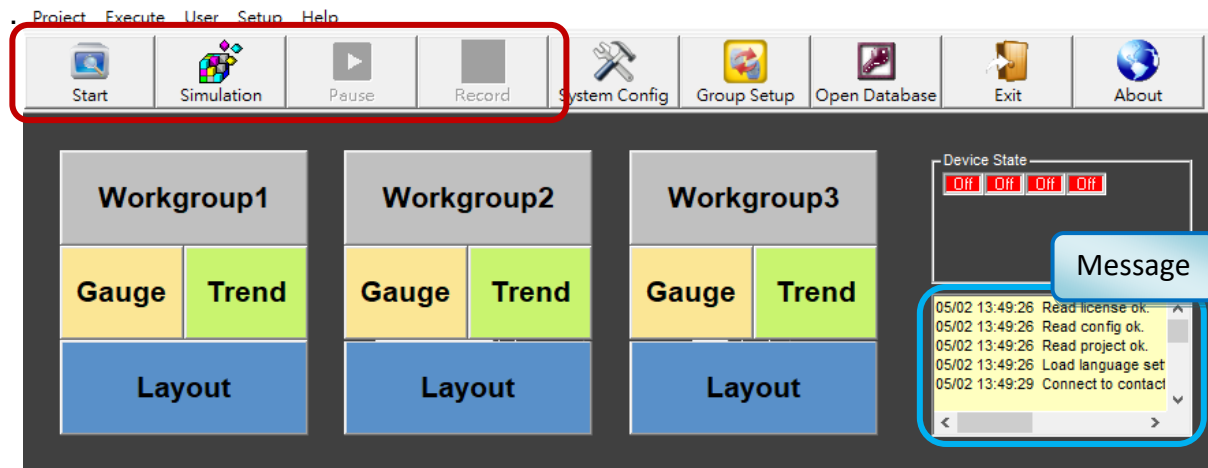


**Step6.** Click the Device name to select all its channels, click the “**Add >>**” button to add these selected I/O channels into the specified workgroup. Each workgroup can contain up to 32 channels.



## 5.3. Starting to Run (or Simulation)

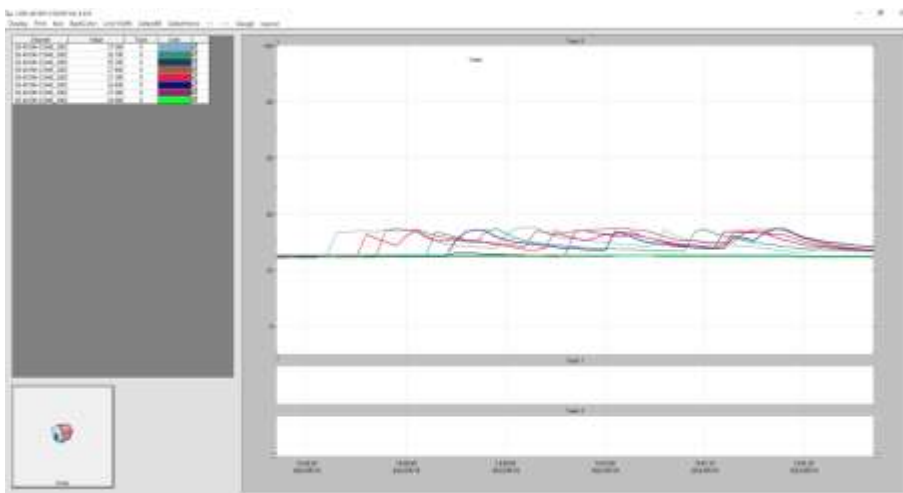
After configuring I/O channels and Workgroups, simply click the “**Start**” button to log data or Simulation button to execute the simulation.



Click the **Gauge** box to view the status of AI channels.



Click the **Trend** box to monitor trend chart for data reading from channels in the workgroup.

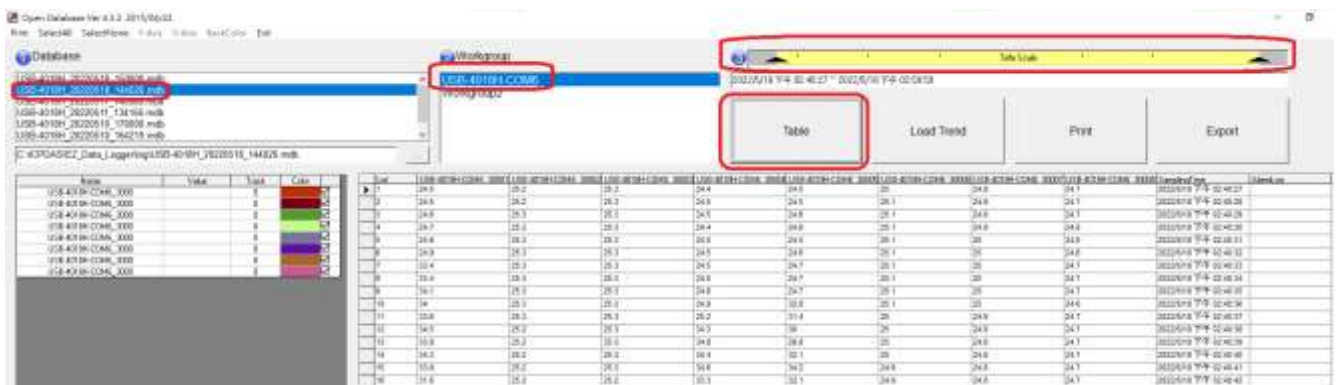


## 5.4. Database

1. **Open database:** click the “Open Database” icon to open the database interface.



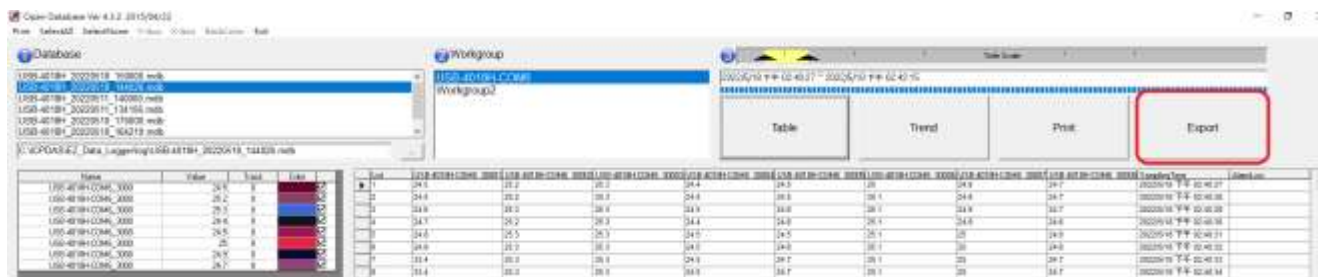
2. **Load Table:** click the file name in Database field, and then click the “Table” button to load data in the file.



3. **Load Trend Chart:** click the file name in Database field and then click the “Trend” button to view the trend chart. Ticking or unticking the checkbox next to the color column for a channel can display or hide its data curve in the trend chart.



4. **Export Data:** click the “Export” button can export data to an Excel or CSV file.



The screenshot shows an Excel spreadsheet with the following data:

	A	B	C	D	E	F	G	H	I	J	K
1	List	B-4018H.COM6_3005B.4018H.COM6_3005B.4018H.COM6_3005B.4018H.COM6_30018H.COM6)18H.COM6)18H.COM6)18H.COM6)mpingTir AlarmLog									
2	1	24.9	24.90	25.00	24.80	24.80	25.10	24.90	25.10	13.41.58	
3	2	24.8	25.00	25.00	24.90	24.80	25.10	24.90	25.10	13.41.59	
4	3	24.8	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.00	
5	4	24.8	24.90	25.00	24.80	24.80	25.20	25.00	25.10	13.42.01	
6	5	24.8	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.02	
7	6	24.8	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.03	
8	7	24.8	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.04	
9	8	24.9	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.05	
10	9	24.8	25.00	25.10	24.80	24.80	25.20	25.00	25.10	13.42.06	
11	10	24.80	25.00	25.10	24.80	24.80	25.20	25.00	25.10	13.42.07	
12	11	24.90	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.08	
13	12	24.80	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.09	
14	13	24.90	25.00	25.00	24.80	24.80	25.20	25.00	25.10	13.42.10	
15	14	24.90	25.00	25.10	24.80	24.80	25.20	25.00	25.10	13.42.11	
16	15	25.00	25.00	25.10	35.20	24.80	25.10	25.10	25.10	13.42.12	
17	16	24.90	25.00	25.10	35.70	24.90	25.10	25.00	25.20	13.42.13	
18	17	24.90	25.00	25.10	36.00	24.90	25.10	25.00	25.10	13.42.14	
19	18	24.90	25.00	25.10	33.40	25.00	25.10	25.00	25.20	13.42.15	
20	19	25.00	25.20	25.20	31.40	25.10	25.20	25.10	31.00	13.42.16	
21	20	25.00	25.30	25.20	30.60	25.30	25.40	25.20	34.90	13.42.17	
22	21	25.00	25.30	25.20	30.20	25.30	25.40	25.20	35.30	13.42.18	
23	22	25.00	25.30	25.30	29.70	25.30	25.40	25.20	35.20	13.42.19	
24	23	25.00	25.20	25.30	34.70	25.20	25.40	25.20	35.30	13.42.20	
25	24	25.00	25.30	25.30	35.00	25.20	25.30	25.20	35.20	13.42.21	
26	24	24.90	24.90	24.90	24.90	24.90	24.90	24.90	24.90	13.42.22	



# 6. Software Support

## 6.1. OPC DA Server and UA Series Product

NAPOPC DA Server is a free OPC DA Server for ICP DAS products, it can be used to integrate data from ICP DAS remote I/O modules, PAC I/O, and other equipments. Also, NAPOPC DA Server allows the SCADA/HMI/Database software that supports OPC DA Client, to access I/O data to achieve the process control and manufacturing automation applications.



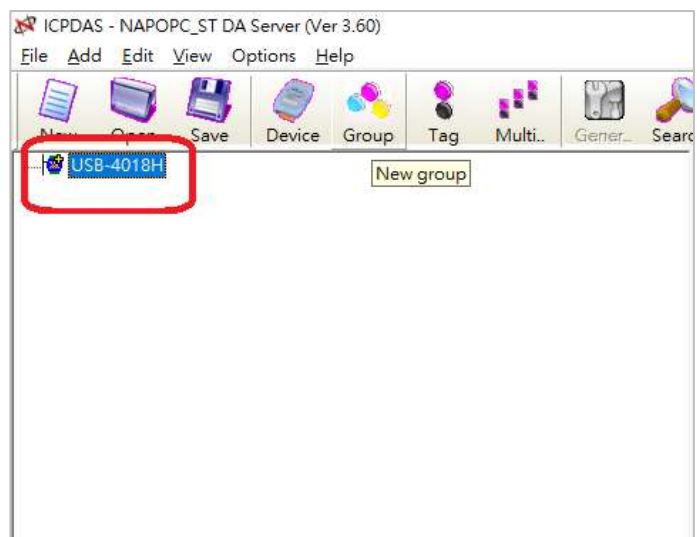
Also, users can choose an optional license of the Modbus protocol for the NAPOPC\_ST DA Server (PC) to work with the third-party Modbus equipment.

Visit the NAPOPC DA Server page for more information:

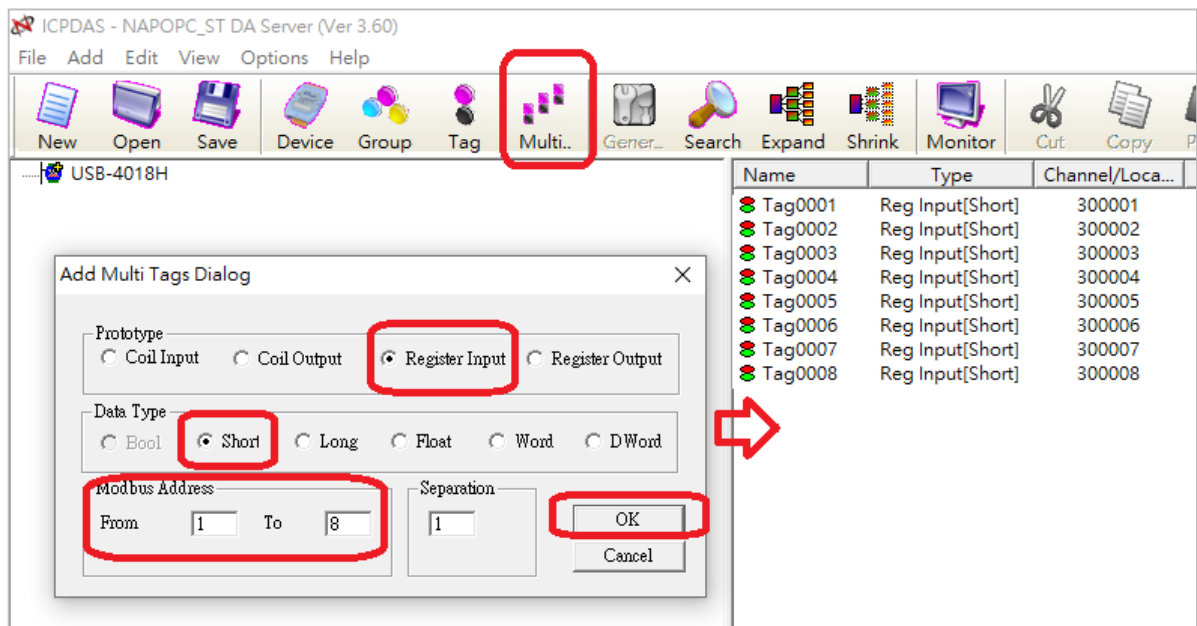
[https://www.icpdas.com/en/product/guide+Software+Applications+NAPOPC\\_DA\\_Server](https://www.icpdas.com/en/product/guide+Software+Applications+NAPOPC_DA_Server)

**Step1.** Click the “**Device**” button to add a device.

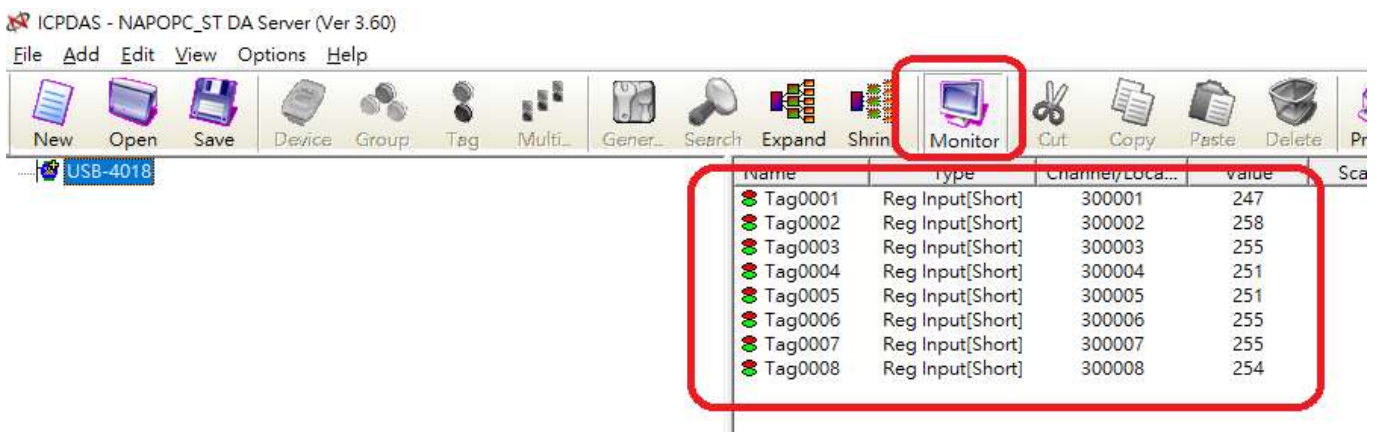
**Step2.** Enter the device name and Address (1), select COM Port number, set Baud Rate to 115200, Parity to None, Data Bits to 8, Stop Bits to 1, and click the “**OK**” button.



**Step3.** Click the “**Multi-Tag**” icon to add monitor Tags. For reading temperature inputs from the USB-4018 series module, set Prototype as **Register Input**, Data Type as **Short**, Modbus Address ranged from 1 to 8, and then click the “**OK**” button.



**Step4.** Click the “**Monitor**” icon to display data read from the module and check whether the temperature values are correct. Dividing the temperature values by 10 equals the real physical quantity.



## 6.2. nModbus



**nModbus** is a C# 3.0 implementation of the Modbus protocol. It is developed and maintained voluntarily and provided free of charge. ICP DAS verified and improved the DLL based on the official released [NModbus\\_net-2.0\\_1.11.0.0-source.zip](https://www.icpdas.com/en/download/show.php?num=1024).

Programmers can use the DLL released by ICP DAS to develop a Modbus application for regular Windows-based PCs or WinCE based devices.

Download the DLL, nModbus API manual, and demos on the nModbus website:

[https://www.icpdas.com/en/product/guide+Software+Development\\_Tools+Modbus\\_Tool](https://www.icpdas.com/en/product/guide+Software+Development_Tools+Modbus_Tool)

nModbus API Manual:

<https://www.icpdas.com/en/download/show.php?num=1024>

Demo:

<https://www.icpdas.com/en/download/show.php?num=1025>

Double click “modbusrtu\_master\_tm.exe” in the path “...\modbusrtu\_master\_tm\bin\Debug” on PC. Next, enter the communication parameters of a module, and click the “Open Com” button to connect.

Before using the module, please use the USB-4018H Utility to make settings.

A screenshot of the 'Modbus RTU\_Master' software window. The window title is 'Modbus RTU\_Master'. It features several configuration fields: 'Com' set to 'COM6', 'Baud.' set to '115200', 'Data Bit' set to '8', 'Parity' set to 'None', and 'Stop Bit' set to '1'. Below these are four colored squares for 'DI' (dark blue, light blue, dark blue, light blue) and four colored squares for 'DO' (dark red, red, dark red, red). At the bottom, there are two rows of input fields: 'AI' and 'AO'. Each row has four input boxes with values: '331', '254', '254', and '250'. A red oval highlights the 'AI' row. On the right side, there are two buttons: 'Open COM' and 'Close COM'.

## 6.3. LabVIEW

Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is a system-design platform and development environment for a visual programming language from National Instruments. LabVIEW provides an easy-to-use graphical interface and supports a variety of hardware drivers and software analysis tools that help users to speed up the amount of time to develop applications. LabVIEW has been widely used for the test, measurement, and automated control in various laboratories or industries.

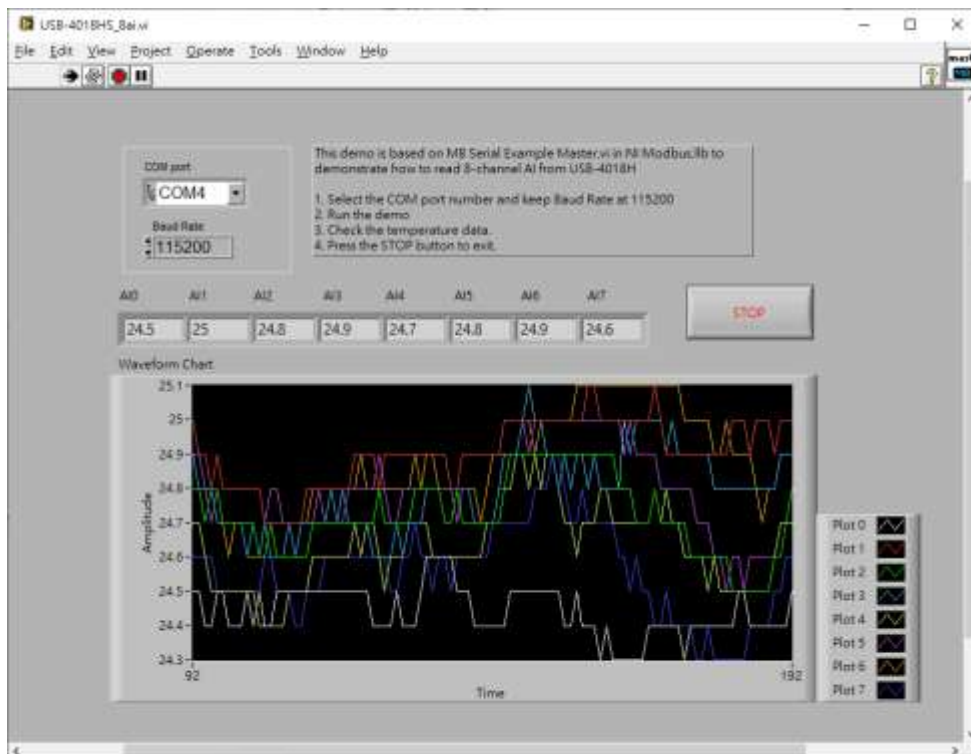
Download the Modbus RTU demo programs.

<http://www.icpdas.com/en/download/show.php?num=1029>

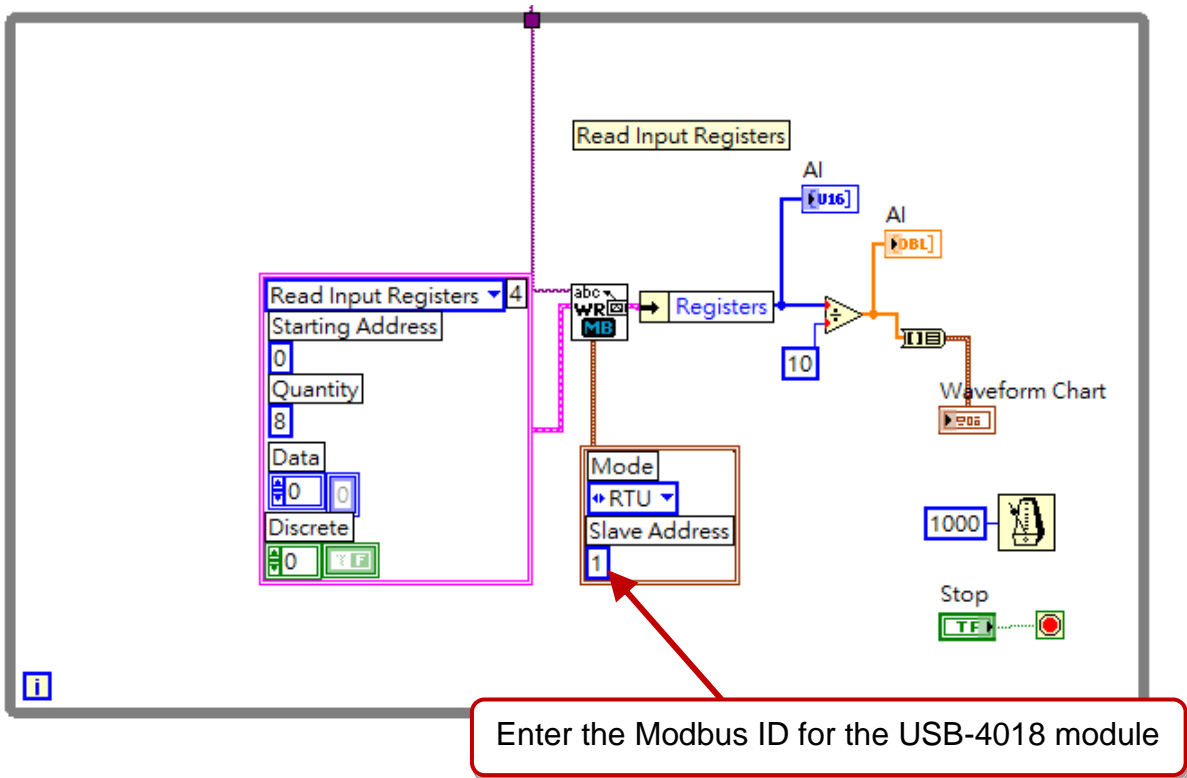
**Note:** Before communicating with the USB-4018 series module, refer to [Chapter3](#) to configure the module, and note down the COM port number, Modbus ID and baud rate settings for the module.

**Step1.** Download the ModbusRTU.zip and unzip the file.

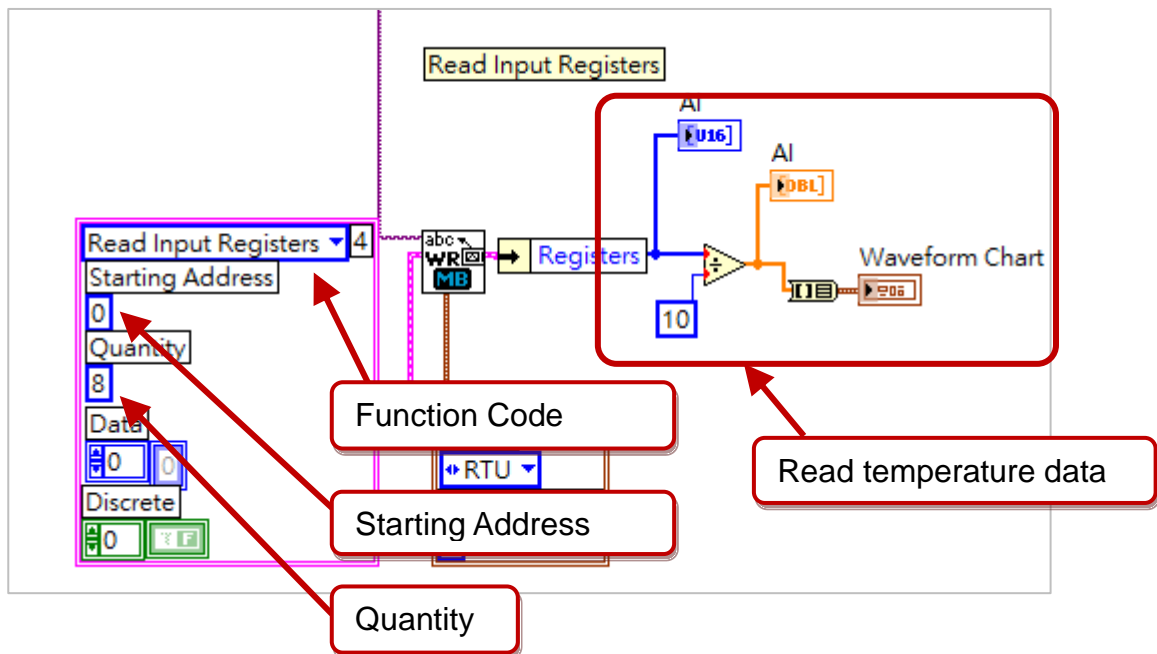
**Step2.** Choose USB-4018HS\_8ai.vi for reading temperature from the USB-4018, select the proper COM port number and keep baud rate at 115200 (bps).



**Step3.** Enter the Modbus ID of the module.



**Step4.** To read data from the module, set the function code, starting address, and the length of data.



## 6.4. InduSoft

InduSoft Web Studio is a powerful, integrated collection of automation tools that includes all the building blocks needed to develop modern Human Machine Interfaces (HMI), Supervisory Control and Data Acquisition (SCADA) systems, and embedded instrumentation and control applications.

InduSoft Web Studio supports all Windows runtime platforms, ranging from 10 / 8 / 7 (32-bit/64-bit), Windows XP/ Vista, and Windows Server Editions, along with built-in support for local or remote (web) based visualization. InduSoft also conforms to industry standards such as Microsoft .NET, OPC, DDE, ODBC, XML, and ActiveX.

### **Note:**

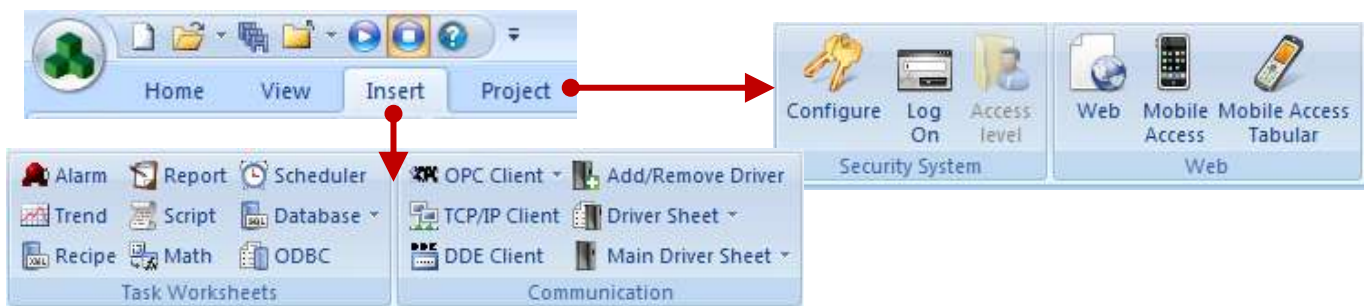
ICP DAS Co., Ltd. has released InduSoft v8.1 license for Hardkey. Visit the website for the new features:

<https://www.icpdas.com/en/product/guide+Software+InduSoft+InduSoft>



### **Software Features:**

- ✧ Graphics and Animation design tools
- ✧ Connect to any SQL database (MS SQL, MySQL, Sybase, Oracle), MS Access, or Excel, and ERP/MES systems
- ✧ Alarms, Events, Trends, Recipes, and Reports management tools
- ✧ Provides over 240 native communication drivers
- ✧ Supports web server, database, and overall system redundancy
- ✧ Two powerful scripting languages are supported; built-in InduSoft functions and standard VBScript.
- ✧ Remotely view screens as web pages using IE browser or InduSoft Secure Viewer
- ✧ Compare any configuration file or merge changes from multiple developers.
- ✧ Monitoring and interacting with process values on any browser (e.g., iOS Safari, Google Chrome, etc.) that supports HTML5.



## 6.5. Linux Modbus Development Tool

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Linux OS can be used to control USB-4018H series via Modbus protocols. This section illustrates Modbus software tools “libmodbus” for users to develop applications.

### 6.5.1. Modbus tool for Linux

Linux OS had provided software package “libmodbus” to support the Modbus protocols. Linux users can download the “libmodbus” source to install or use the package handling utility (such as the Ubuntu’s apt-get) to install the package “libmodbus”. In this case, using the Ubuntu OS and “USB-4018H” module for testing. Please follow below steps to get the temperature data from USB-4018 series module:

**Step1.** Install the Linux driver for the USB-4018 series module.

After the USB-401H series module connecting to the USB port, the Ubuntu will install the Linux driver “cdc\_acm” automatically. The users can check the hardware status via the command “lsmod” and “dmesg”.

```
# lsmod | grep cdc_acm //The Ubuntu OS install the Linux Driver “cdc_acm” correctly.
cdc_acm                40960  0

# dmesg | tail -10 //The user can find the USB-4018’s device name “ttyACM0”
[ 8403.319173] usb 2-1.5: new full-speed USB device number 3 using ehci-pci
[ 8403.429046] usb 2-1.5: New USB device found, idVendor=1b5c, idProduct=0405, bcdDevice=
3.00
[ 8403.429049] usb 2-1.5: New USB device strings: Mfr=1, Product=2, SerialNumber=3
[ 8403.429051] usb 2-1.5: Product: USB4018H USB DAQ
[ 8403.429053] usb 2-1.5: Manufacturer: ICP DAS Co., Ltd.
[ 8403.429054] usb 2-1.5: SerialNumber: BOARDID-00
[ 8403.430434] hid-generic 0003:1B5C:0405.0006: hiddev0,hidraw3: USB HID v1.10 Device [ICP
DAS Co., Ltd. USB4018H USB DAQ] on usb-0000:00:1d.0-1.5/input2
[ 8403.496261] cdc_acm 2-1.5:1.0: ttyACM0: USB ACM device
[ 8403.496660] usbcore: registered new interface driver cdc_acm
[ 8403.496661] cdc_acm: USB Abstract Control Model driver for USB modems and ISDN
adapters
```

**Step2.** Install the software package “libmodbus5”and “libmodbus-dev”.

```
# apt-get install libmodbus5 libmodbus-dev //Using “apt-get” to install software package
```

**Step3.** Create the demo “test.c” to read the temperature data. Refer to source code below:

```
#include <stdio.h>
#include <unistd.h>
#include <string.h>
#include <stdlib.h>
#include <errno.h>
#include <modbus.h>
int main(int argc, char *argv[]){
    uint16_t  temperature[8] = {0} ;
    modbus_t *ctx = NULL;
    int rc, i;

    ctx = modbus_new_rtu("/dev/ttyACM0", 9600, 'N', 8, 1);

    if (ctx == NULL) {
        fprintf(stderr, "Unable to allocate libmodbus contex\n");
        return -1;
    }

    modbus_set_slave(ctx, 1);

    if (modbus_connect(ctx) == -1) {
        fprintf(stderr, "Connection failed:%s\n", modbus_strerror(errno));
        return -1;
    }
}
```



```

while (1) {
    // reading holding register addr 40001 ~ 40008
    printf("\n----- Reading Temperature of channel 0 to 7 ----- \n");
    rc = modbus_read_registers(ctx, 0, 8, temperature);
    if (rc == -1) {
        fprintf(stderr, "%s\n", modbus_strerror(errno));
        return -1;
    }

    for(i = 0; i < 8; i++) {
        printf("Temperature of channel %d = %d(%3.1f°C)\n", i,
temperature[i], (float)temperature[i]/10);
    }
    sleep(1);
}
modbus_close(ctx);
modbus_free(ctx);
return 0;
}

```

**Step4.** Compile the demo "test.c".

```
# gcc -o test test.c -I/usr/include/modbus/ -lmodbus
```

**Step5.** Execute the demo “test.c” to read the temperature data from USB-4018 module.

```
# ./test
----- Reading Temperature of channel 0 to 7 -----
Temperature of channel 0 = 260(26.0°C)
Temperature of channel 1 = 259(25.9°C)
Temperature of channel 2 = 259(25.9°C)
Temperature of channel 3 = 258(25.8°C)
Temperature of channel 4 = 259(25.9°C)
Temperature of channel 5 = 258(25.8°C)
Temperature of channel 6 = 258(25.8°C)
Temperature of channel 7 = 258(25.8°C)

----- Reading Temperature of channel 0 to 7 -----
Temperature of channel 0 = 261(26.1°C)
Temperature of channel 1 = 259(25.9°C)
Temperature of channel 2 = 259(25.9°C)
Temperature of channel 3 = 258(25.8°C)
Temperature of channel 4 = 259(25.9°C)
Temperature of channel 5 = 258(25.8°C)
Temperature of channel 6 = 259(25.9°C)
Temperature of channel 7 = 258(25.8°C)
```

**Note:** The user can refer to the **Appendix “USB-4018 Modbus Address Mappings (Base 1)”** to access other USB-4018’s address.

# Appendix

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## USB-4018 Modbus Address Mappings (Base 1)

Address	Description	Attribute
40001 - 40008	Temperature of channel 0 to 7  Refer to the <a href="#">Thermocouple Type Code Table</a> (page 53) to get details about the range of reading values and the measured temperature range for each thermocouple type.	R
40129 - 40136	CJC temperature of channel 0 to 7 in 0.1C	R
40257 - 40264	Type code of channel 0 to 7	R/W
40353 - 40360	CJC offset of channel 0 to 7 in 0.1C	R/W
40481	Firmware version (low word)	R
40482	Firmware version (high word)	R
40483	Module name (low word) 0x1800	R
40484	Module name (high word) 0x5540	R
40490	Disable/enable channels, bit 0 for channel 0, bit 1 for channel 1, etc. 0 to disable and 1 to enable Sampling time = 2ms + number of enabled channels * 0.85ms	R/W
40498	Number of moving averaging, 1 to 128, default is 1	R/W
00129 - 00136	Open wire status of channel 0 to 7, 1 for open wire.  When a thermocouple is open or not connected, the reading value is fixed at +65535.	R

## Modbus function 04 (0x04) Read Input Channels

Function 0x04 is used to read from contiguous analog input channels.

### Request

00	Address	1 Byte	1
01	Function code	1 Byte	0x04
02 ~ 03	Starting channel	2 Bytes	0 to 7 for reading temperature inputs
04 ~ 05	Number of input channels (N)	2 Bytes	1 to 8 for reading temperature inputs.
06 ~ 07	Check sum	2 Bytes	Check sum of data 00 to 05

### Response

00	Address	1 Byte	1 to 247
01	Function code	1 Byte	0x04
02	Byte count	1 Byte	2 x N
03 ~	Data of input channels	2 x N Bytes	2 bytes for each channel
03+2N ~ 04+2N	Check sum	2 Bytes	Check sum of data 00 to (02+2N)

### Error Response

00	Address	1 Byte	1 to 247
01	Function code	1 Byte	0x84
02	Exception code	1 Byte	02: starting channel out of range 03: (starting channel + number of input channels) out of range, incorrect number of bytes received
03 ~ 04	Check sum	2 Bytes	Check sum of data 00 to 02

**Note:** for the two-byte data, the data are arranged as high byte first then the low byte.

## Thermocouple Type Code Table

Type Code	Input Type	Min.	Max.
14	Type J Thermocouple -210 ~ 760°C	-2100	7600
15	Type K Thermocouple -270 ~ 1372°C	-2700	13720
16	Type T Thermocouple -270 ~ 400°C	-2700	4000
17	Type E Thermocouple -270 ~ 1000°C	-2700	10000
18	Type R Thermocouple 0 ~ 1768°C	0	17680
19	Type S Thermocouple 0 ~ 1768°C	0	17680
20	Type B Thermocouple 0 ~ 1820°C	0	18200
21	Type N Thermocouple -270 ~ 1300°C	-2700	13000
22	Type C Thermocouple 0 ~ 2320°C	0	23200
23	Type L Thermocouple -200 ~ 800°C	-2000	8000
24	Type M Thermocouple -200 ~ 100°C	-20000	10000
25	Type L <sub>DIN43710</sub> Thermocouple -200 ~ 900°C	-2000	9000

The reading value of +65535 indicates that the thermocouple is open or not connected.

# Revision History

Revision	Date	Description
1.0.0	2023/03	First released.