iSN-104-E

Liquid Leak Detection Module

User Manual

Version: 1.0.0

Date: Dec. 2023

Edited by Jerry Tseng

Warranty

All products manufactured by ICP DAS are warranted against defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

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Service@icpdas.com

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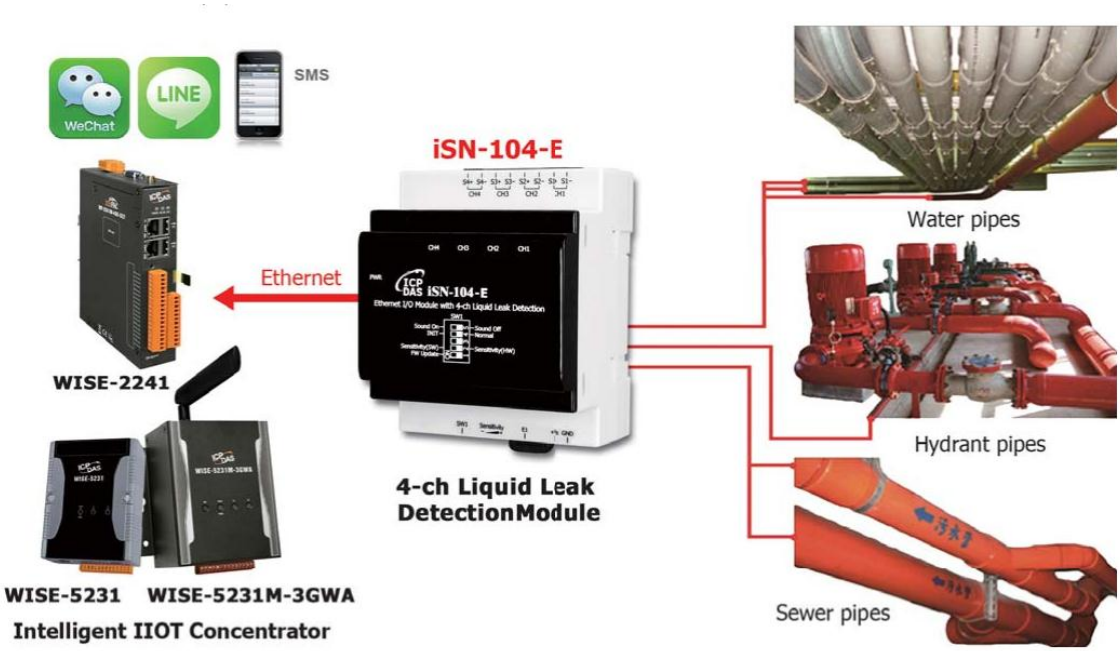
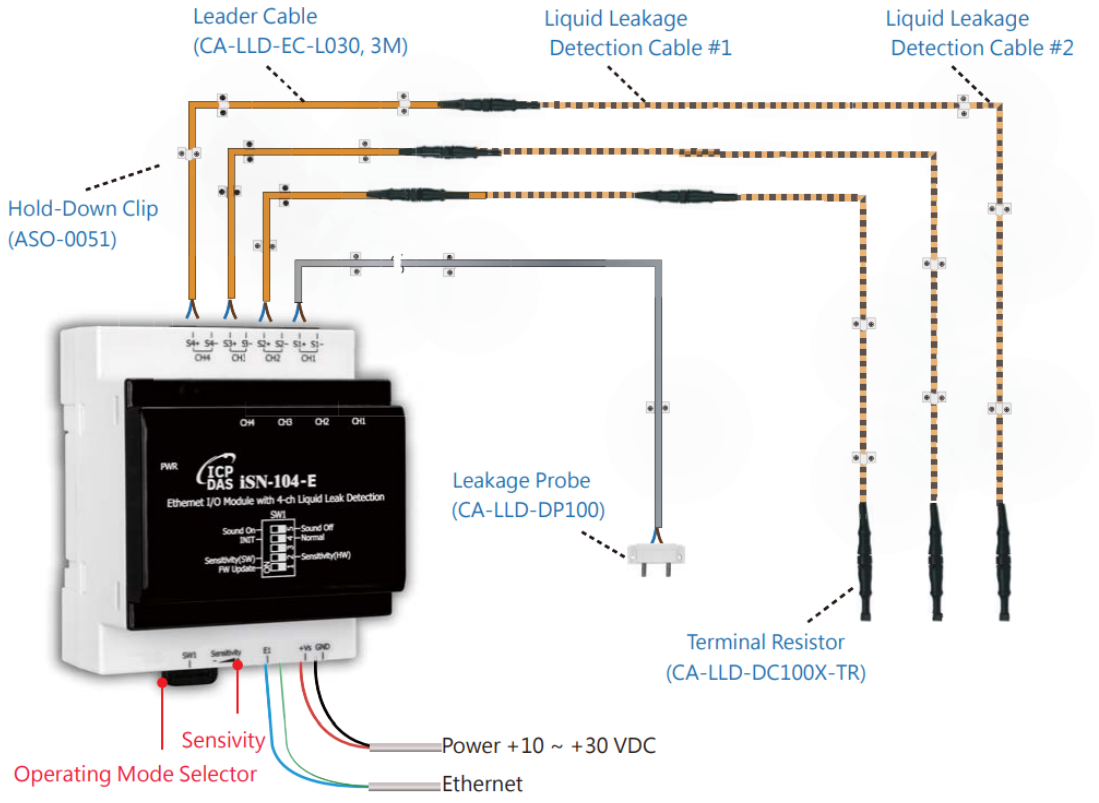
1. Introduction

The iSN-104-E Liquid Leak Detection Module is a low-cost intelligent liquid leak detection device. No additional conversion module is needed and the iSN-104-E can be easily integrated with a variety of monitoring systems to achieve remote alarm and remote device control. The iSN-104-E Liquid Leak Detection module can be used to monitor double-core leader cable lengths of up to 500 meters, and can be used with both the Liquid Leak Detection Cable and its included Leakage Probe. The module can be easily integrated with other collection hosts connected to the network. The iSN-104-E is suitable for real-time leak detection in critical locations, such as computer room base stations, warehouses, libraries, museums and industrial sites, and also for air handling equipment, refrigeration units, liquid containers, or pump tanks, etc., where there is a need to monitor any leakage of the equipment.

When required, communication with the iSN-104-E can be programmed based on the Modbus TCP/UDP, with the added benefit that different addresses can be configured via hardware to allow for Modbus TCP/UDP communication. iSN-104-E with Ethernet and PoE, meaning that the device can be easily integrated into existing HMI or SCADA systems, ensuring trouble-free maintenance in distributed control systems.



Wire Connections



Features

- **Leak detection triggers and audible alarm**
- **Open wire detection triggers and audible alarm**

  (used with CA-LLD-DC100X-Lxxx + CA-LLD-DC100X-TR to have Open wire detection)
- **A mute button to silence the alarm**
- **Five LED indicators to display the status of the power and the alarm**
- **Leader cables and Liquid Leak Detection Cable can be up to 500 meters.**
- **Adjustable detection sensitivity**
- **Supports Modbus TCP/UDP, MQTT**
- **Embedded Dual Watchdog**
- **Wide Operating Temperature Range: -25 to +75°C**
- **Includes Redundant Power Inputs: PoE and DC Input**

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2. Hardware

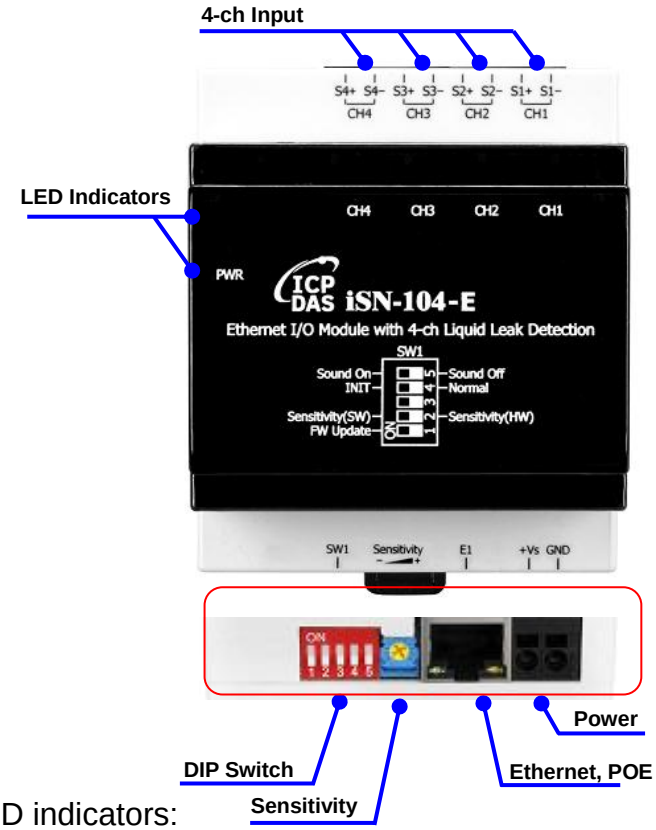
2.1 Specifications

Model	iSN-101	iSN-104	iSN-104-E
Analog Input			
Channels	1	4	4
Wiring Cables Length	500 meters(include Liquid Leak Detection Cable)		
Adjustment of the Detection Sensitivity	26KΩ~580KΩ		
Communication			
Interface	RS-485		Ethernet
Data Format	N,8,1 / O,8,1 / E,8,1 / N,8,2		-
Baud Rate	Software Configuration: 1200 ~ 115200 bps		-
Protocol	Modbus RTU or DCON		Modbus TCP
Node Addresses	96 ~ 127 for hardware configuration 0 ~ 255 for software configuration		-

Ethernet			
Ports	-		1 x RJ-45, 10/100 Base-TX
PoE	-		Yes
Security	-		ID, Password and IP Filter
Protocol	-		Modbus TCP/UDP, MQTT
LED Indicators			
Power	1 as Power Indicator(Green LED)	1 as Power Indicator (Red LED)	
Alarm	1 as Alarm Indicator (Red LED)	4 as Alarm Indicator (Red LED)	
Audible alarm			
Audible alarm	70 dB Audible alarm with silence button(switch)		
Relay Output			
Form C Relay	0.25A @ 250VAC 0.5 A @ 125 VAC 2 A @ 30 VDC	- -	
EMS Protection			
ESD (IEC 61000-4-2)	±8 kV Air for Random Point		
EFT (IEC 61000-4-4)	±4 kV for Power		
Power Requirements			
Reverse Polarity Protection	Yes		
Input Voltage Range	+10 ~ +30 VDC		+10 ~ +48 VDC
Consumption	1.5 W Max.	1.6 W Max.	1.2W
Mechanical			
Dimensions (L x W x H)	83 mm x 70 mm x 29	72 mm x 95 mm x 57mm	
Installation	Screw Mounting or DIN-Rail	DIN-Rail	
Environment			
Operating Temperature	0 ~ +50°C		
Storage Temperature	-30 ~ +75°C		
Humidity	10 ~ 90% RH, Non-condensing		

2.2 Appearance & Settings

Appearance



LED Indicators

The five LED indicators:

- Alarm: LED light leak alarm condition
  LED blinking for open wire alarm condition
- PWR: Power LED

Audible alarm

70 dB Audible alarm with silence button

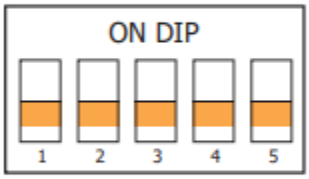
Sensitivity Adjustment

Sensitivity Adjustment Range: 26KΩ ~ 580KΩ

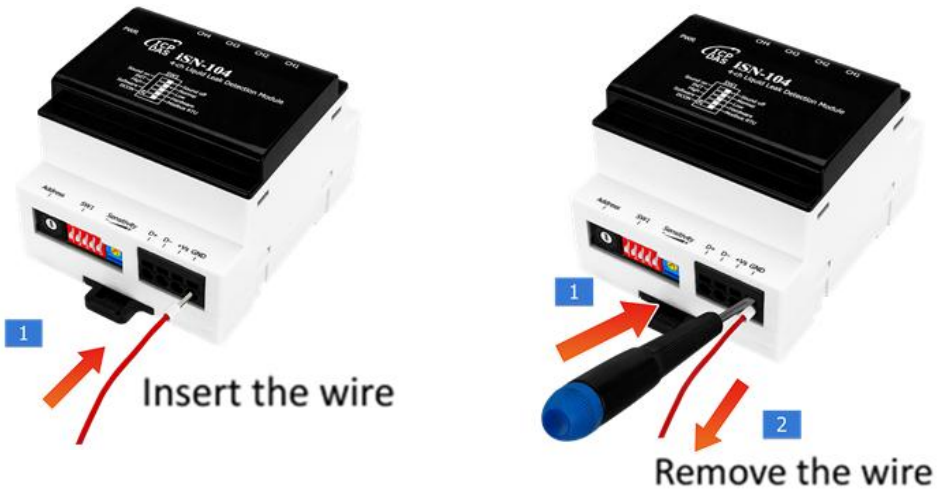
4-ch Input

Insert Leader Cable. As cable termination is not polarity conscious

iSN-104-E DIP Switch

DIP Switch Description			
	SW1	ON	FW Update
		OFF	-
	SW2	ON	Sensitivity(SW)
		OFF	Sensitivity(HW)
	SW3	ON	-
		OFF	-
	SW4	ON	INIT
		OFF	Normal
	SW5	ON	Sound On
		OFF	Sound Off

2.3 Connector for Power & Liquid Leak Detection Cable



Connect the Leader Plug to Liquid Leak Detection Plug

CA-LLD-DC100-Lxxx

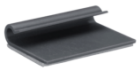
CA-LLD-DC100X-Lxxx

CA-LLD-EC-L030

CA-LLD-DC100X-TR

CA-LLD-DP100

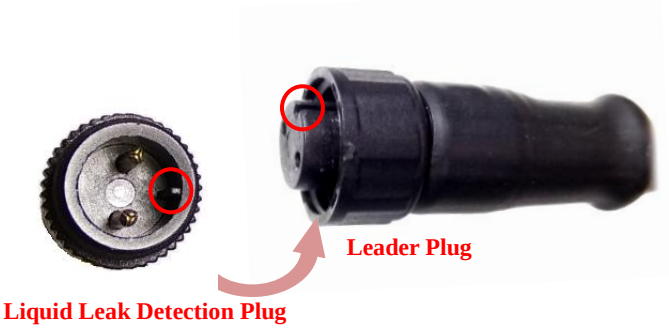
ASO-0051



ASO-0052

CA-LLD-DC100-Lxxx	Liquids Leak Detection Cable, w/o Position and cannot be connected in series
CA-LLD-DC100X-Lxxx	Liquids Leak Detection Cable, w/o Position and can be connected in series
CA-LLD-EC-L030	The leader cable can be extended with a shielded twiced pair cable, AWG 18~14. The total cable length that includes leader cable and Liquid Leak Detection Cables is 500 m max.
CA-LLD-DC100X-TR	Terminal Resistor, for CA-LLLD-DC100X-Lxxx
CA-LLD-DP100	Leakage Probe
ASO-0051	180 Hold-Down Clip (include 50 pcs)
ASO-0052	90 Hold-Down Clip (include 50 pcs)

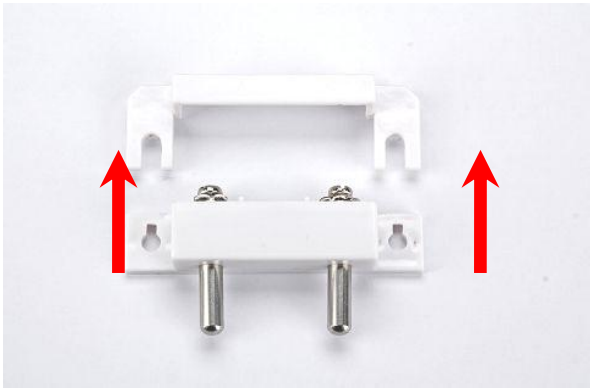
The fool-proofing groove (as red circle) is useful for easy connection of Liquid Leak Detection Plug and Leader Plug. Please make sure they are located in the same direction when connecting these two items.



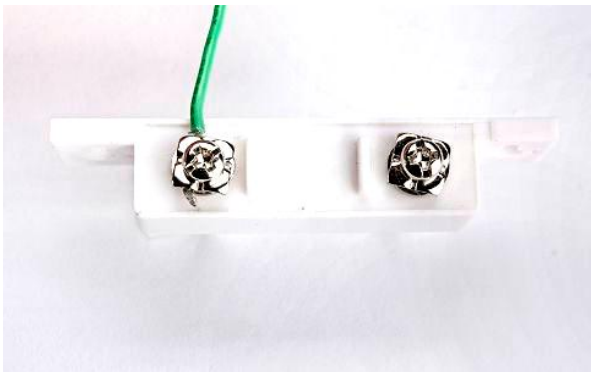
Make sure to tighten firmly

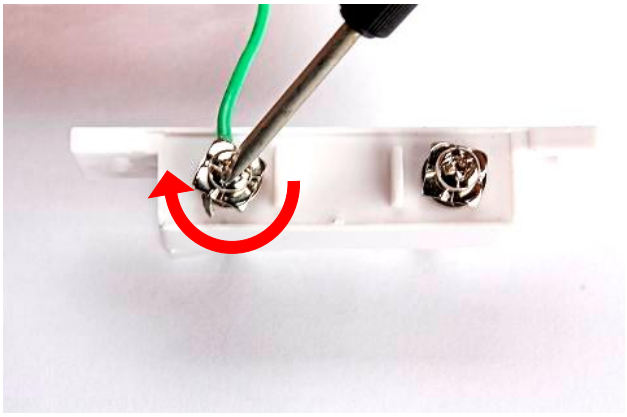
Connect the Leakage Probe with Wires

Take off cover

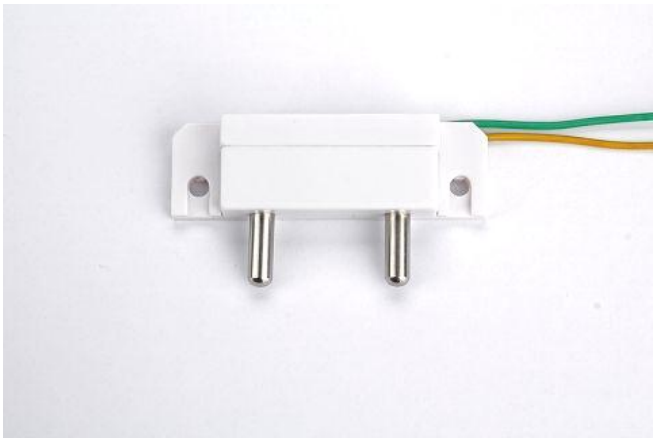


Put wire and tighten the screw down

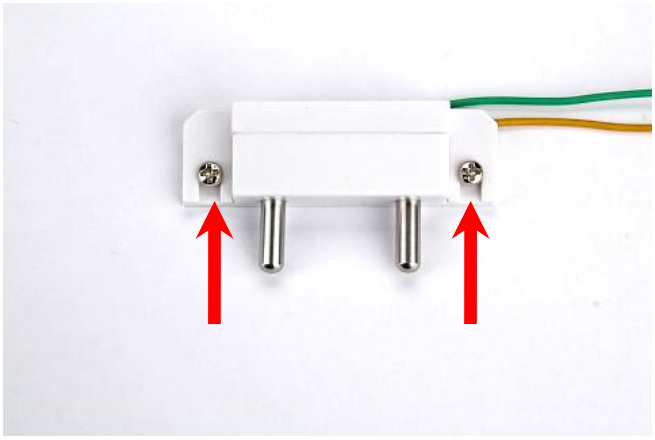




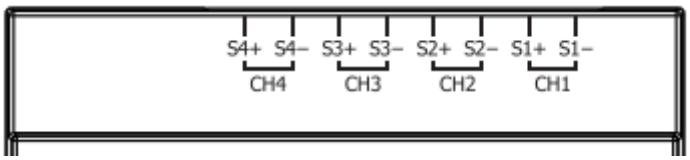
Put cover back

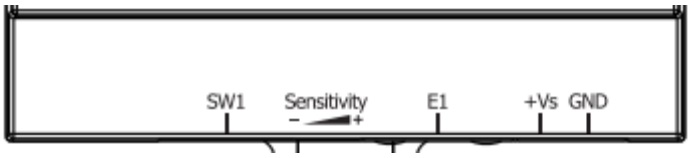


Install the two mounting screws into the 2 keyhole mounting holes.

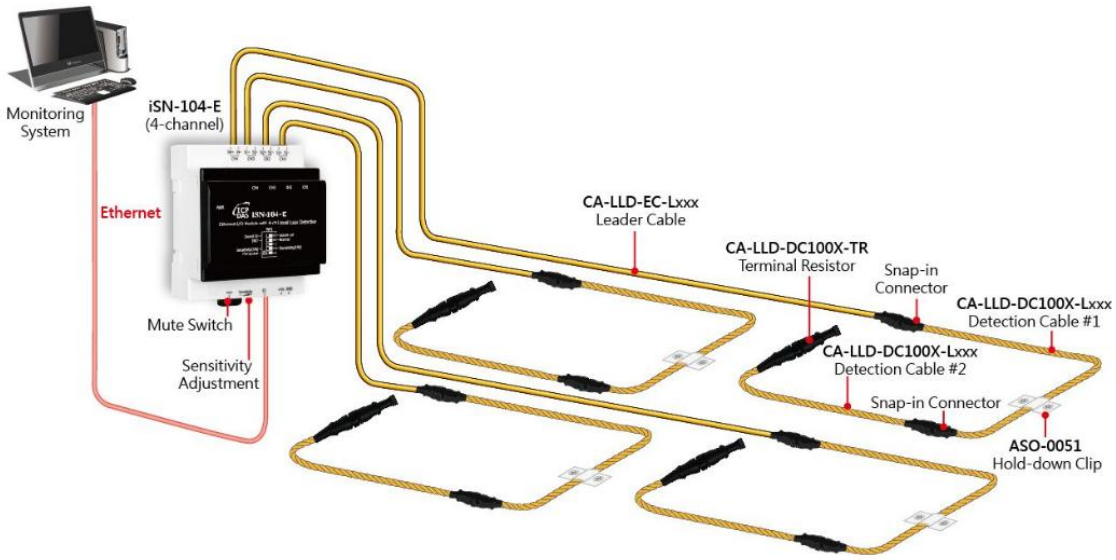


2.4 Pin Assignments

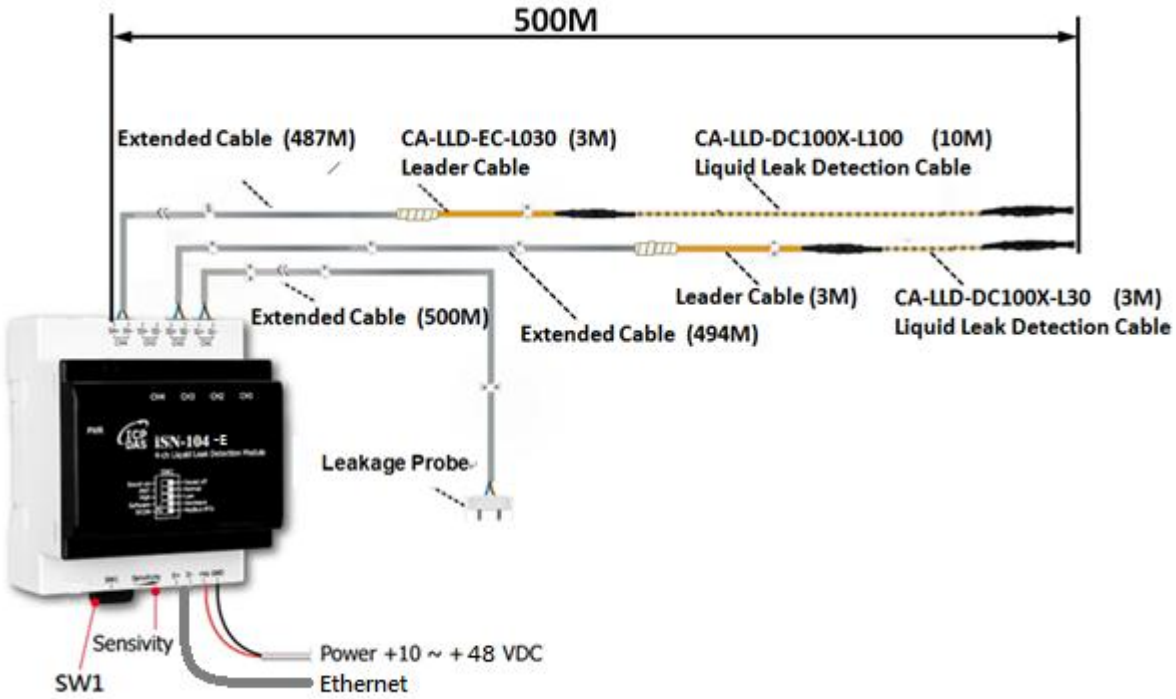




2.5 Wire Connections



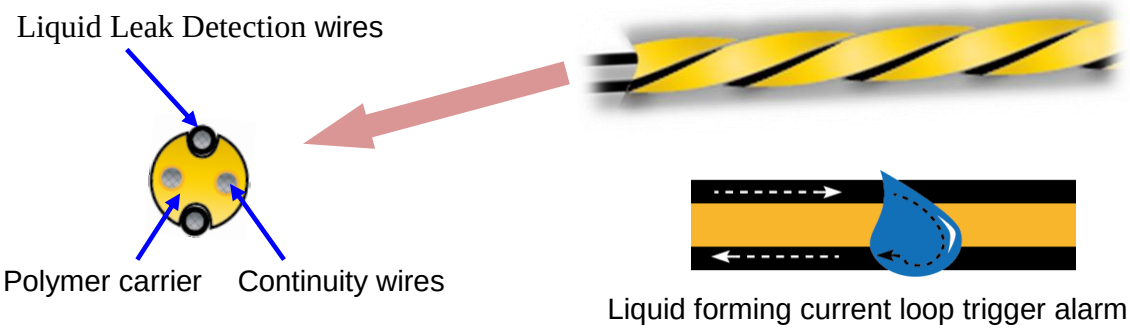
Extended Cable : We suggest to use twisted pair cable AWG18-14 with shielded, sectional area from 0.75 ~ 2.0mm2.. The Leader Cable can be increased in length with an extended cable, up to 500 meters including the Liquid leak Cable.

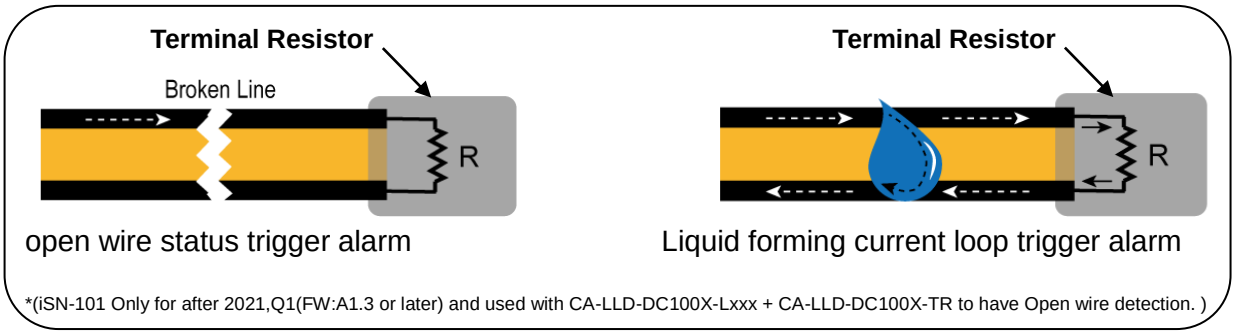


2.6 Application

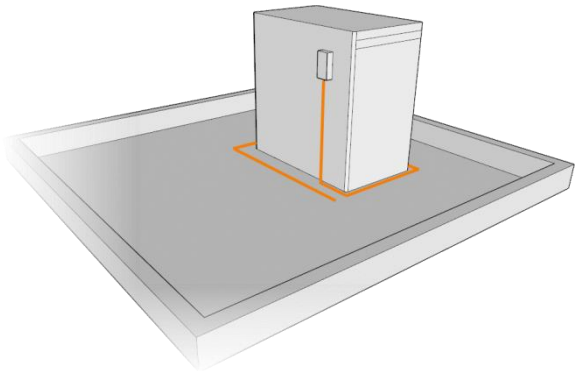
Liquid Leak Detection Cable

Liquid Leak Detection Cable is designed to detect leaks over a wider area, and the path of the leak is not easily predetermined. The Liquid Leak Detection Cable is ideal for open areas. The Liquid Leak Detection Cable can even be fixed directly to the water supply and return lines. Liquid Leak Detection Cable is suitable for larger surface areas with multiple leak points.

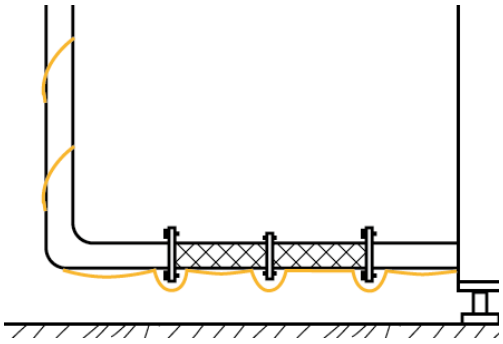




*(iSN-101 Only for after 2021,Q1(FW:A1.3 or later) and used with CA-LLD-DC100X-Lxxx + CA-LLD-DC100X-TR to have Open wire detection.)



Server Room Floor

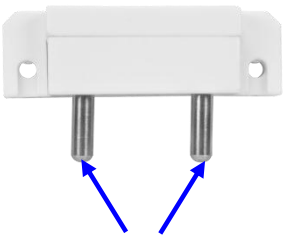


Water supply

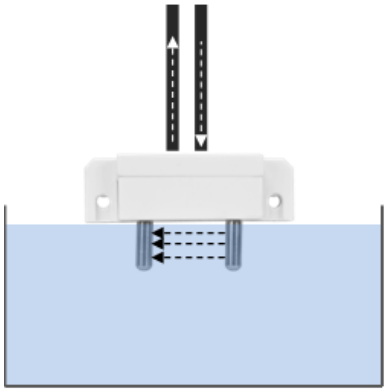
Leakage Probe

Leakage Probe are designed to detect leaks at specific locations and specific water levels.

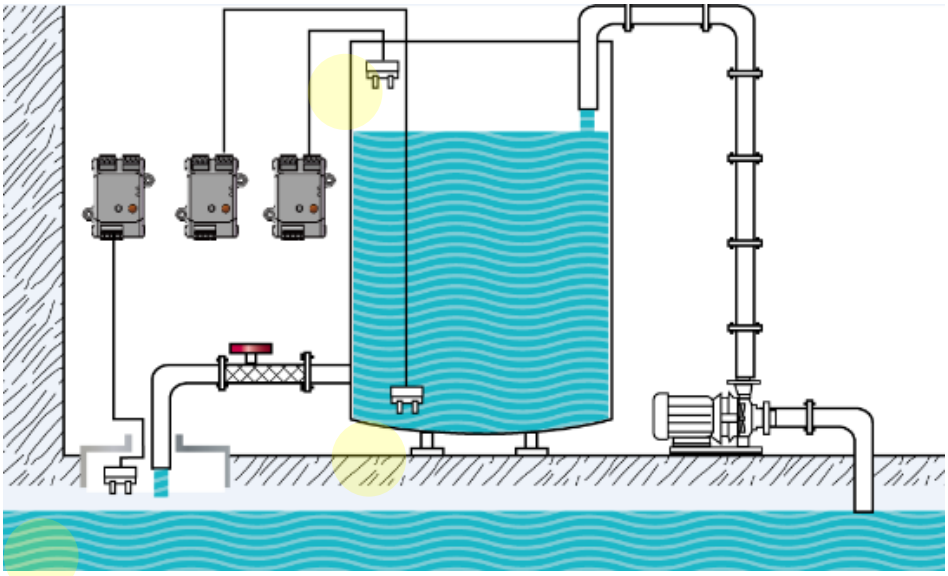
The base of the Leakage Probe has two probes. To detect a leak, the water must touch both probes at the same time, thus completing a circuit and triggering an alarm. Leakage Probe are ideal for drains, Water storage tank , containers and other restricted areas.



Stainless steel probes

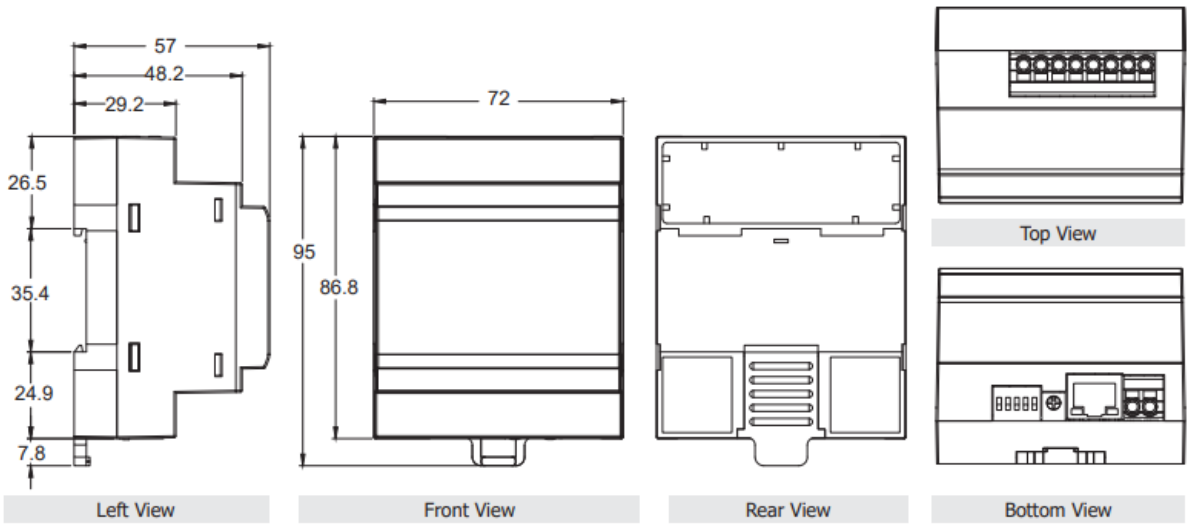


Liquid forming current loop trigger alarm



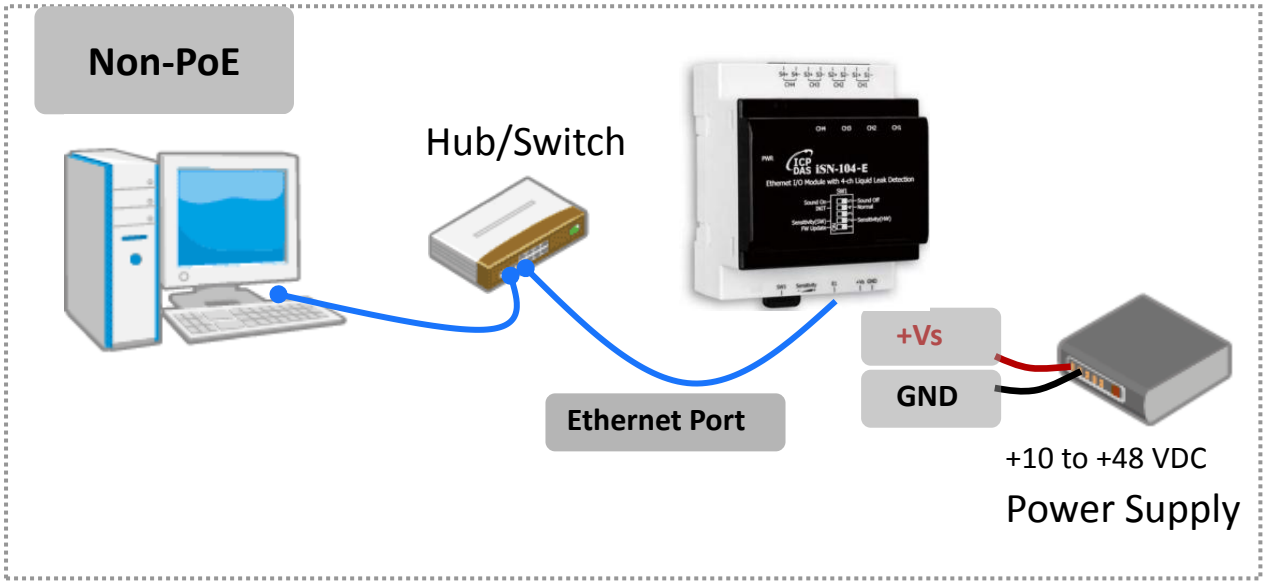
iSN-104-E senses various water levels through the Leakage Probe

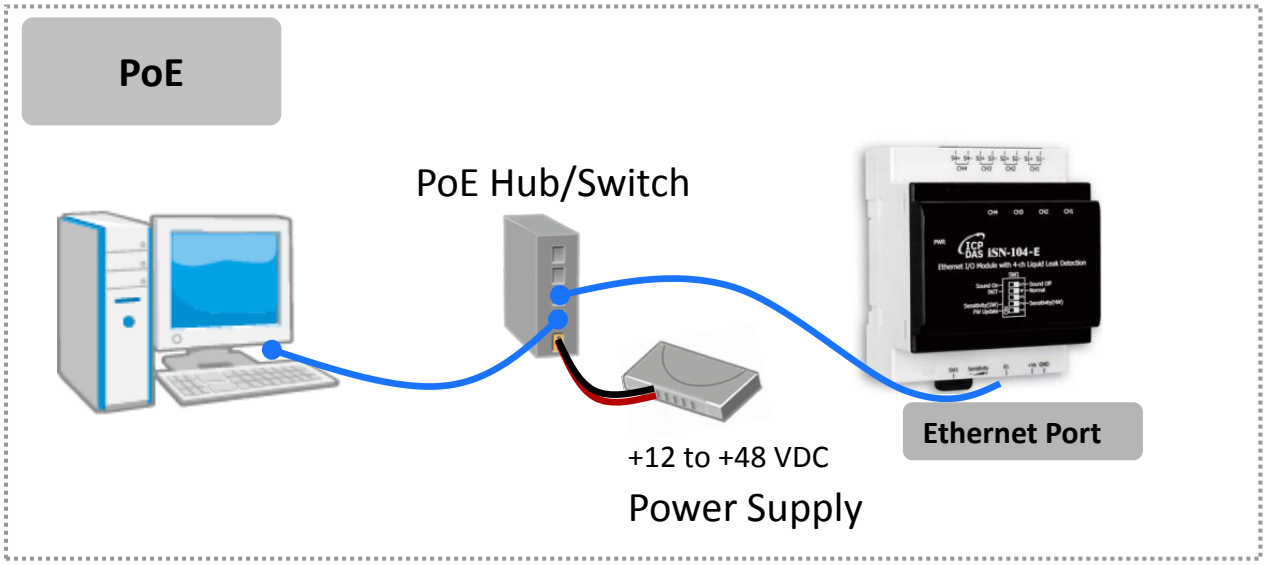
2.7 Dimensions (unit: mm)



3. Configuration via Web Browser

Connecting the Power and the Host PC





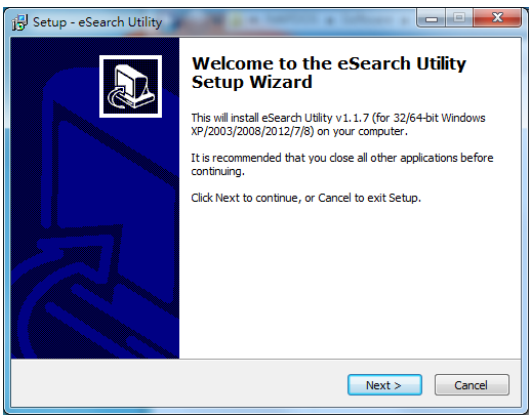
3.2. Network Configuration

Step 1: Get the eSearch Utility

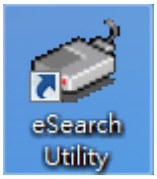
Download the eSearch Utility from

http://ftp.icpdas.com/pub/cd/iiot/utility/esearch/

Step 2: Install the eSearch utility

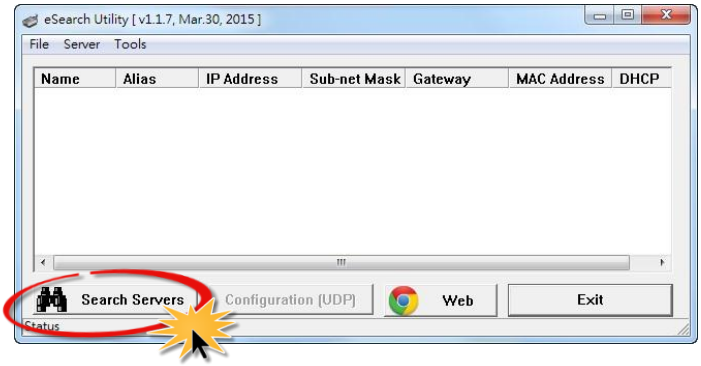


After the installation has been completed, a new short cut for the eSearch Utility will be displayed on your desktop.



Step 3: Search the ISN-104-E series module on the Ethernet

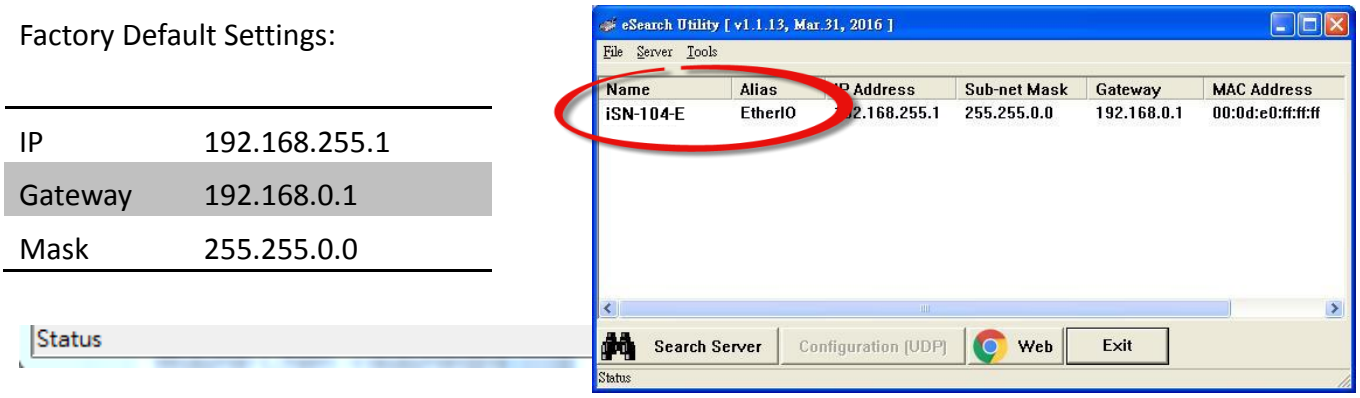
Launch eSearch Utility and click the “Search Servers” button to search for the ISN-104-E module



Step 4: Double-click the name of the module to open the “Configure Server (UDP)” dialog box

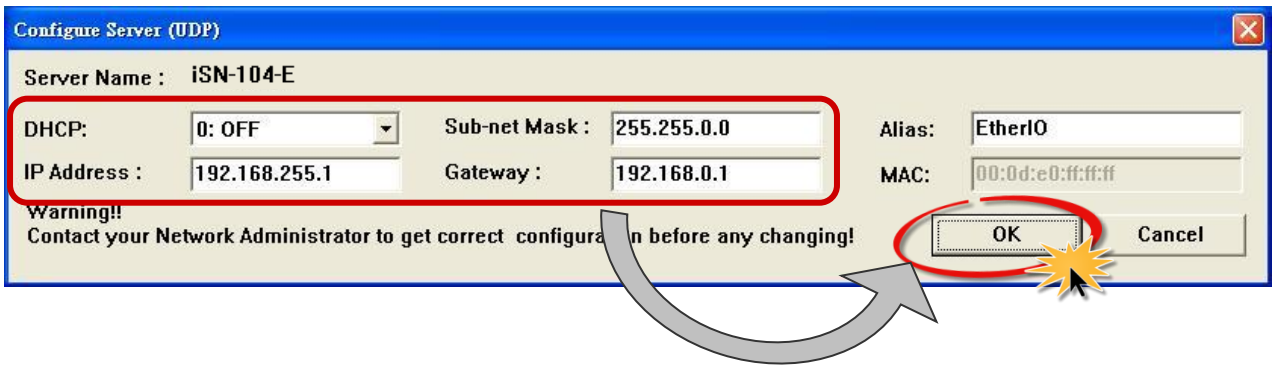
Factory Default Settings:

IP	192.168.255.1
Gateway	192.168.0.1
Mask	255.255.0.0

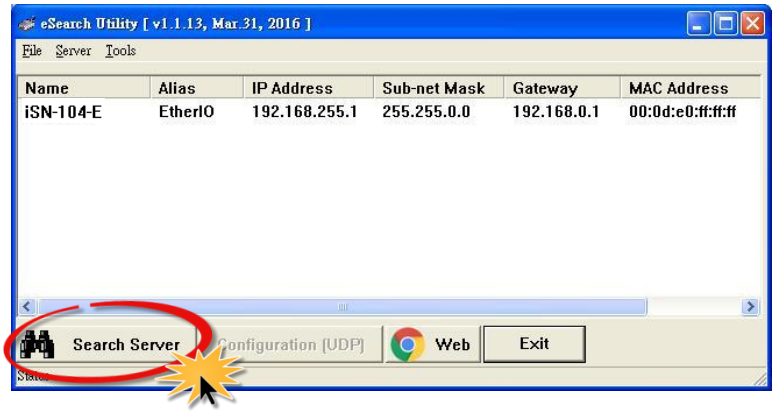


Step 5: Assign a new IP address

Enter valid **IP Address, Subnet Mask** and **Gateway** for your network, and then click the **“OK”** button. The new settings for the iSN-104-E module will take effect within 2 seconds. If the correct network configuration information is unknown, contact the Network Administrator to obtain the relevant details.



Step 6: Wait for 2 seconds and then click the "Search Servers" button again to ensure that the ISN-104-E module is operating correctly using the new configuration



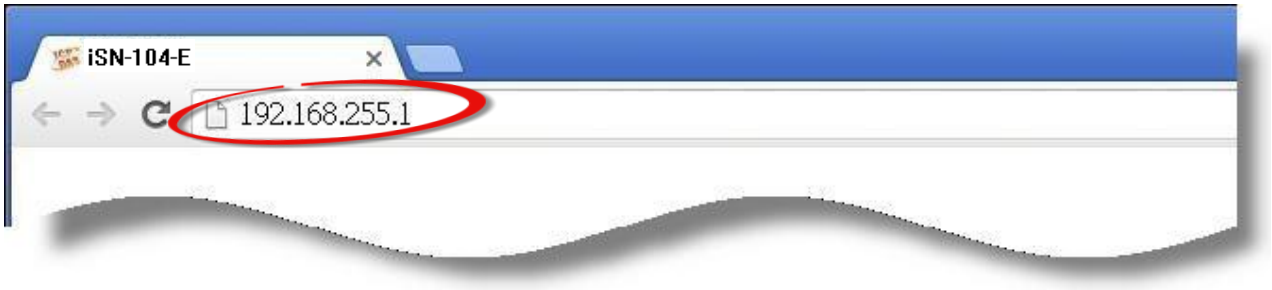
3.3. Logging into the iSN-104-E

Step 1: Open a new browser windows

Open a standard web browser. For example, Mozilla Firefox, Google Chrome and Internet Explorer are reliable and popular internet browsers that can be used to configure the ISN-104-E module.

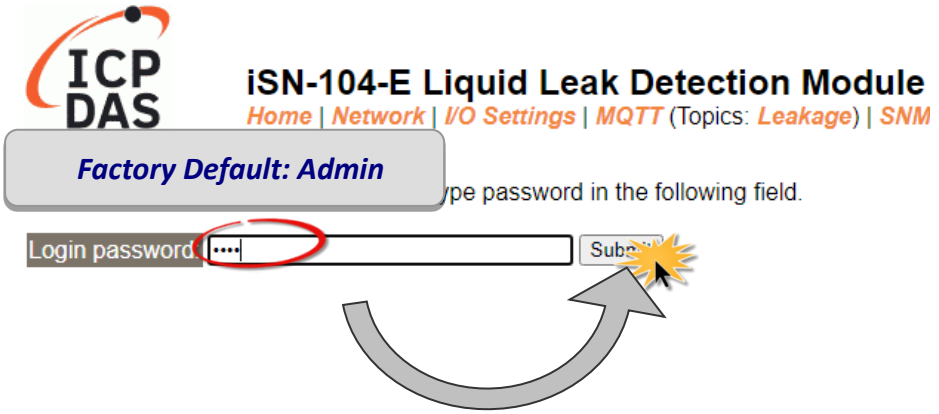
If you intend to use Internet Explorer, ensure that the cache to functions is disabled in order to avoid *browser access errors. Detailed information how to do this can be found in "FAQ_General_001: How to avoid a browser access error that causes a blank page to be displayed when using Internet Explorer".*

Step 2: Enter the new IP address for the iSN-104-E and press the Enter key



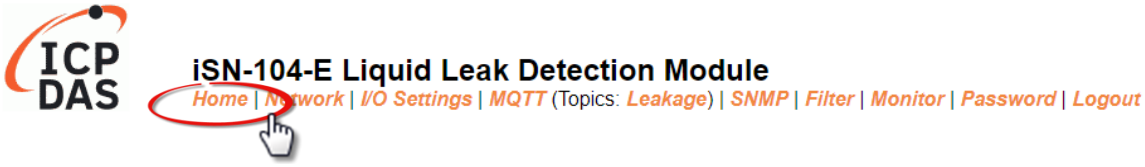
Step 3: Enter the password to login to the web interface

Enter the password in the login password field (default is "**Admin**"), and then click the **"Submit"** button to enter the configuration web page.



3.4. Home

The first page displayed is Home, it shows the main ***Status & Configuration*** page.



This section provides basic information related to the iSN-104-E module including the Model Name, Firmware version, IP Address, Initial Switch position, Alias Name, MAC Address, and the TCP Port and System Timeout values. If the firmware for the iSN-104-E module is updated, you can check the version information here.

Model Name	iSN-104-E	Alias Name	EtherIO
Firmware Version	v2.4.0 [Sep.21 2023]	MAC Address	00-0d-e0-ff-ff-ff
IP Address	10.0.8.122	Initial Switch	OFF
TCP Port Timeout (Socket Watchdog, Seconds)	180	System Timeout (Network Watchdog, Seconds)	0

Sensor Readings

Type	Value	Value In Index	Low Latched	High Latched
Channel 0 resistance	0	0	0	6553.5 kΩ
Channel 1 resistance	1950.6 kΩ	24	0.9 kΩ	6553.5 kΩ
Channel 2 resistance	6553.5 kΩ	24	6553.5 kΩ	6553.5 kΩ
Channel 3 resistance	583.7 kΩ	23	0	6553.5 kΩ
Leak threshold index	4			

Clear Low Latched Clear High Latched

In the **Sensor Readings** field is the real-time data of Channel 0~3 Value, the minimum value (Low Latched) and maximum value (High Latched) logged. Clicking on the Clear Low Latched button and the Clear High Latched button can reset the latched data to current value and latch new minimum or maximum value.

Alarm

Type	Open Wire Status	Leak Alarm Mode	Leak Alarm Status	Open Wire Alarm Mode	Open Wire Alarm Status
Channel 0	Off	Momentary	On	Disabled	Off
Channel 1	Off	Momentary	Off	Disabled	Off
Channel 2	Off	Momentary	Off	Disabled	Off
Channel 3	Off	Momentary	Off	Disabled	Off

Clear Latched Leak Alarm Clear Latched Open Wire Alarm

The Alarm table displays the settings of Open Wire Status, Leak Alarm Mode, Leak Alarm Status, Open Wire Alarm Mode, Open Wire Alarm Status, for each. Clicking on the Clear Latched Leak Alarm button can clear the Clear Latched Leak Alarm and Clear Latched Open Wire Alarm status. The Alarm table is only available to the iSN-104-E.

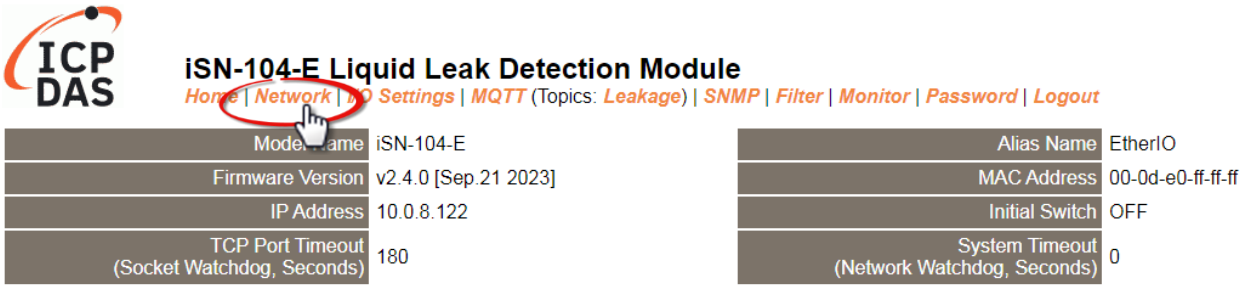
Time and device online time since powered on.

Device Online Time

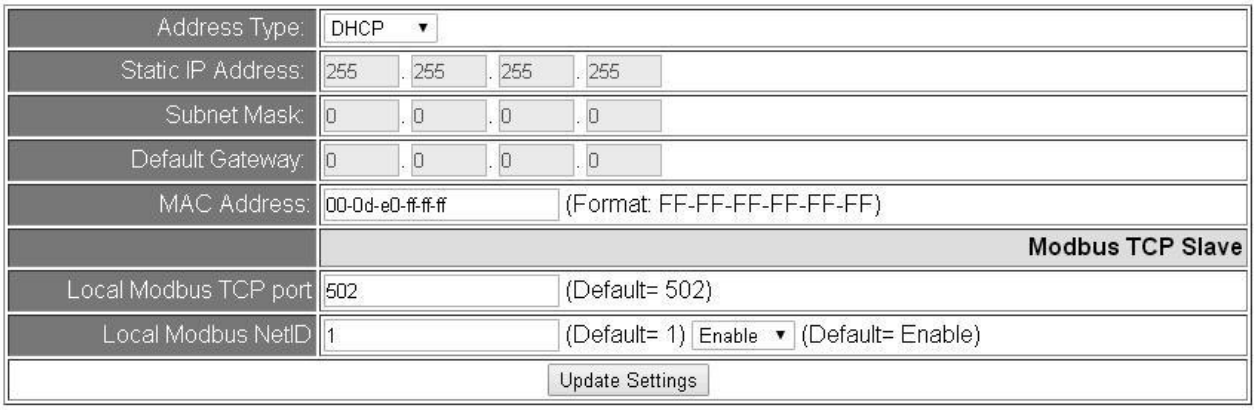
Device Online Time	0 Days, 02H:11M:15S

3.5. Network

Clicking the ***Network*** tab to go to the page allowing you to verify the current settings, configure the IP Address and general parameters, and restore the default settings for the iSN-104-E module, each of which will be described in more detail below.



3.5.1. IP Address Configuration



The following table provides an overview of the parameters contained in the ***IP Address Configuration*** section:

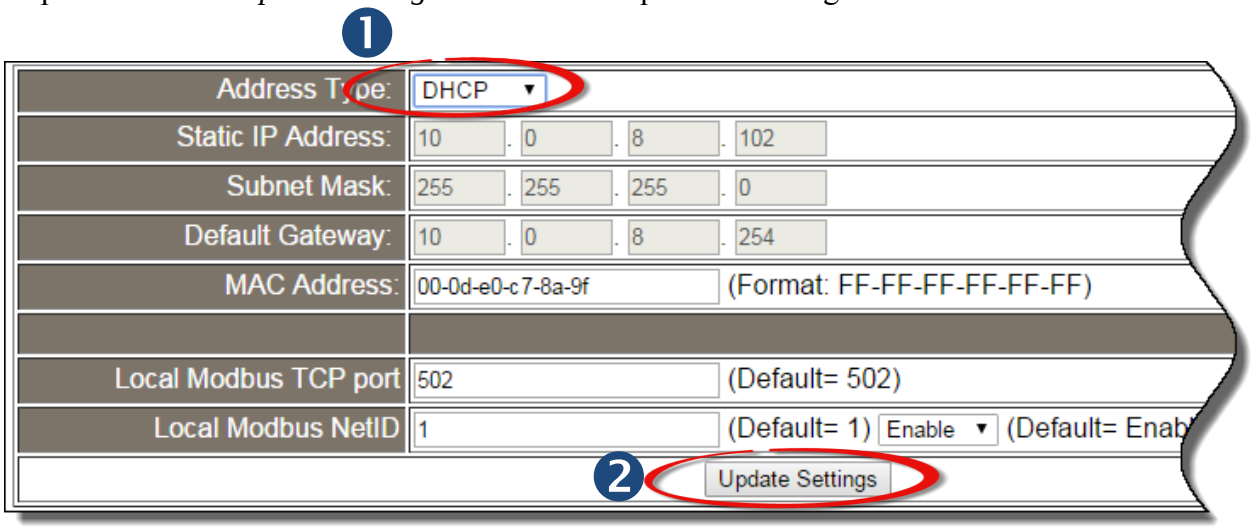
Item	Description
Address Type	**Static IP:** If there is no DHCP server installed in your network, you can configure the network settings manually. Refer to Section ***"Manual Configuration"*** below for more details.
	DHCP: Dynamic Host Configuration Protocol (DHCP) is a network application protocol that automatically assigns an IP address to each device. Refer to Section ***"DHCP Configuration"*** below for more details.
Static IP Address	Each ISN-104-E module connected to the network must have its own unique IP address. This parameter is used to assign a specific IP address if there is no DHCP server on the network.
Subnet Mask	This parameter is used to assign the subnet mask for the ISN-104-E module. The subnet mask indicates which portion of the IP address is used to identify the local network or subnet.
Default Gateway	This parameter is used to assign the IP Address of the Gateway to the ISN-104-E module. A Gateway (or router) is a device that is used to connect an individual network to one or more additional networks.
MAC Address	This parameter is used to set the User-defined MAC address, which must be in the format FF-FF-FF-FF-FF-FF.
Modbus TCP Slave	
Local Modbus TCP port	This parameter is used to set the local port for Modbus communication. The default value is 502.

Local Modbus NetID	This parameter is used to set the Network ID for Modbus communication. The default value is 1.
	Enable option: the NetID will be checked when the ISN-104-E module receives a Modbus command for identifying if to respond to this command. Disable option: the NetID will not be checked when the ISN-104-E module receives a Modbus command. The ISN-104-E module will respond to every command it receives.
Update Settings	Click this button to save the revised settings to the ISN-104-E module.

DHCP Configuration

DHCP configuration is very easy to perform. If a DHCP server is connected to you network, network addresses will be dynamically configured after the following setting:

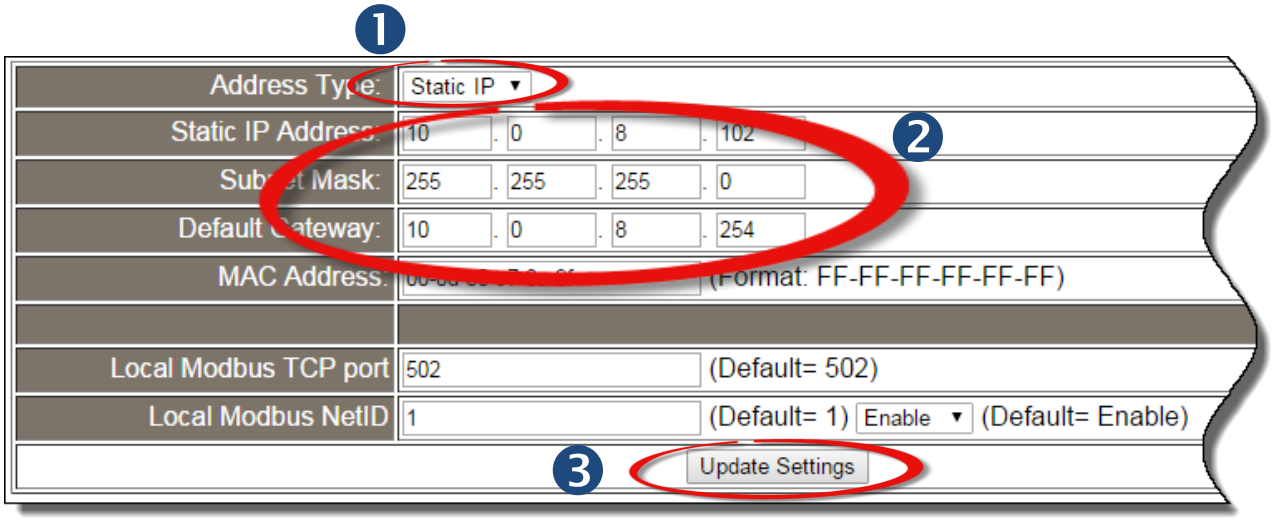
Step 1: Select "*DHCP*" from the *Address Type* drop-down menu
Step 2: Click the "*Update Settings*" button to complete the configuration



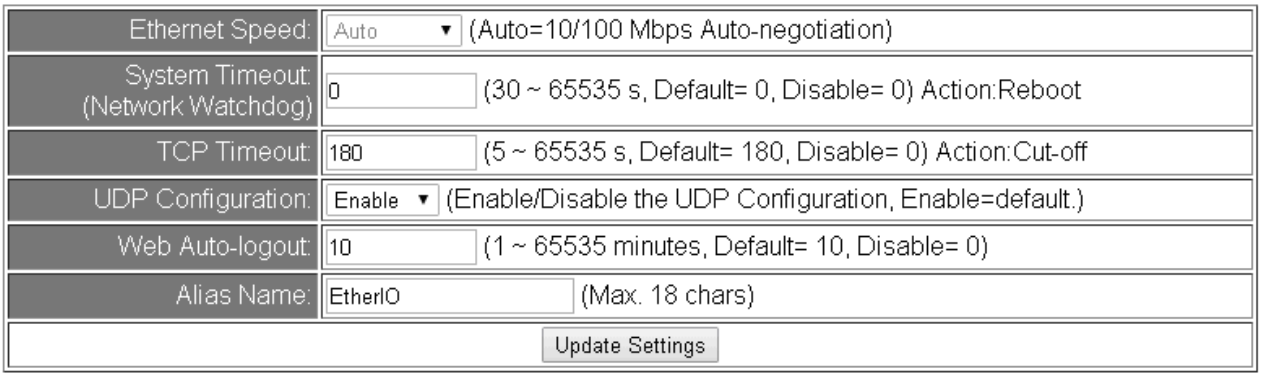
Manual Configuration

When using manual configuration, the network settings should be assigned as follows:

Step 1: Select "*Static IP*" from the *Address Type* drop-down menu
Step 2: Enter the relevant details in the respective network settings fields.
Step 3: Click the "*Update Settings*" button to complete the configuration



3.5.2. General Settings



The following table provides an overview of the parameters contained in the ***General Settings*** section:

Item	Description
Ethernet Speed	This parameter is used to set the Ethernet speed. The default value is Auto (Auto = 10/100 Mbps Auto-negotiation).
System Timeout (Network Watchdog)	This parameter is used to configure the system timeout value. If there is no activity on the network for a certain period of time, the system will be rebooted based on the configured system timeout value.
TCP Timeout (Seconds)	This parameter is used to configure the TCP timeout value. If Modbus TCP communication is idle for a certain period of time, the system will cut off the connection.
UDP Configuration	This parameter is used to enable or disable UDP configuration function.
Web Auto-logout	This parameter is used to configure the automatic logout value. If there is no activity on the web server for a certain period of time, the current user account will automatically logged out.
Alias Name	This parameter is used to assign an alias name for each ISN-104-E module to assist with easy identification.
Update Settings	Click this button to save the revised settings to the ISN-104-E module.

3.5.3. Restore Factory Defaults

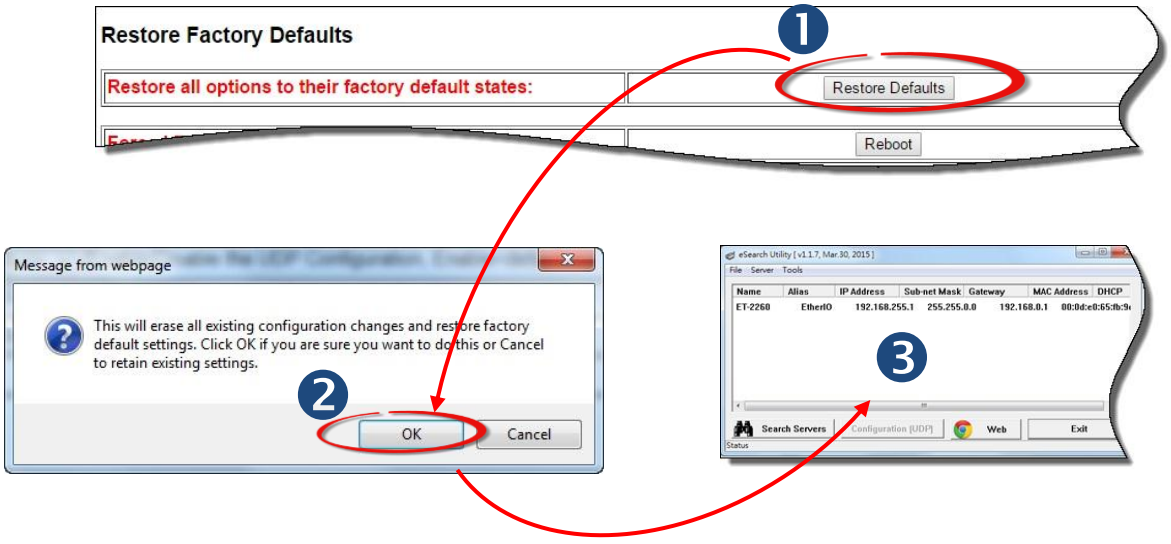
After performing the following operation, items will be restored to factory default settings as below:

Factory Default Settings	
IP Address	192.168.255.1
Gateway Address	192.168.0.1
Subnet Mask	255.255.0.0

Step 1: Click the **"*Restore Defaults*"** button to reset the configuration.

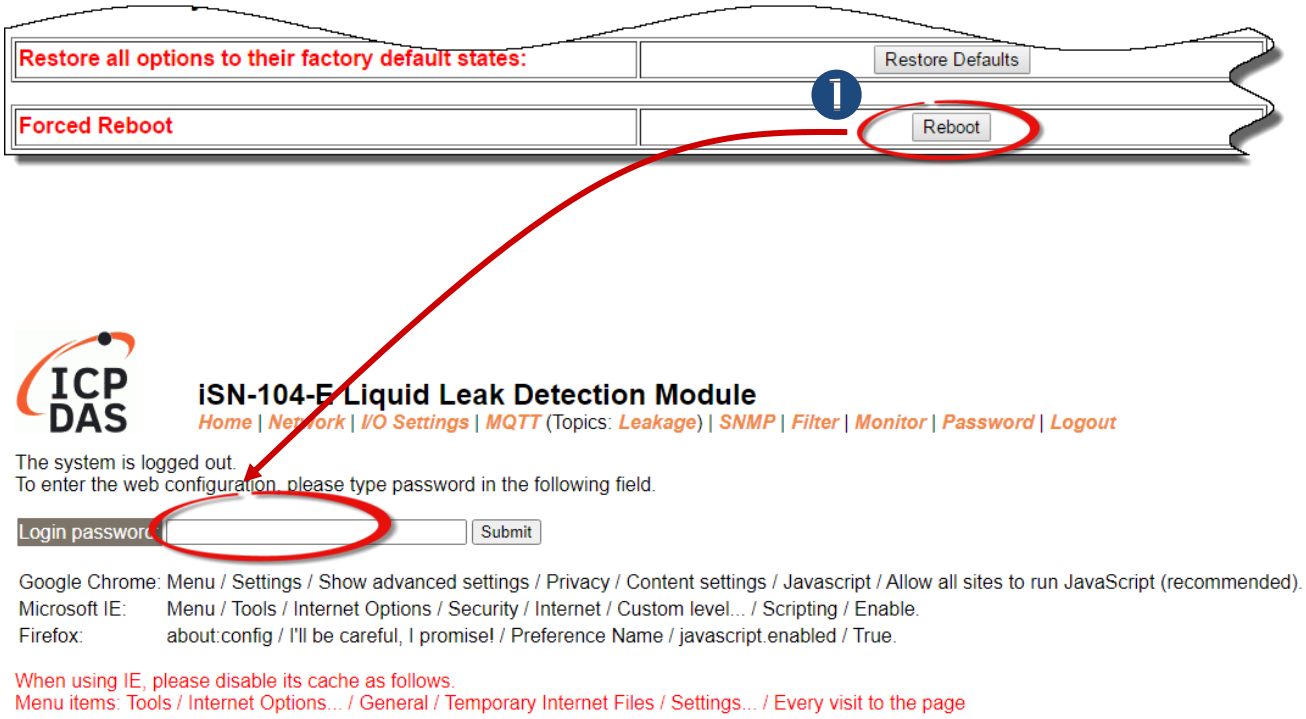
Step 2: Click the **"*OK*"** button in the message dialog box.

Step 3: Refer to step 3 and step 4 in Section "*3.2. Network Configuration*", to check whether the settings are restored to factory defaults.



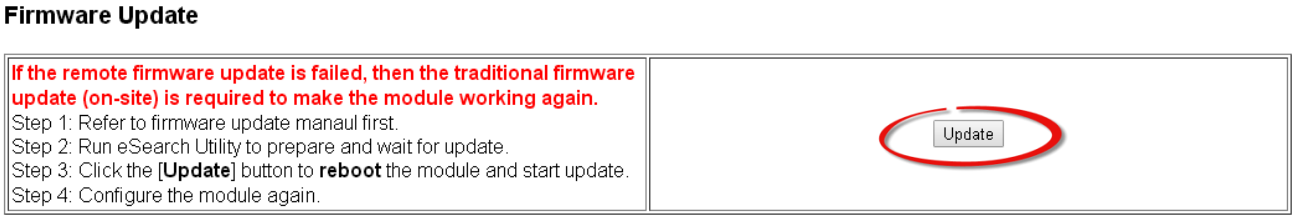
3.5.4. Forced Reboot

The **Forced Reboot** function can be used to force the iSN-104-E module to reboot or to remotely reboot the device. After the iSN-104-E module has rebooted, the original login screen will be displayed and your Login Password will be requested.



3.5.5. Firmware Update

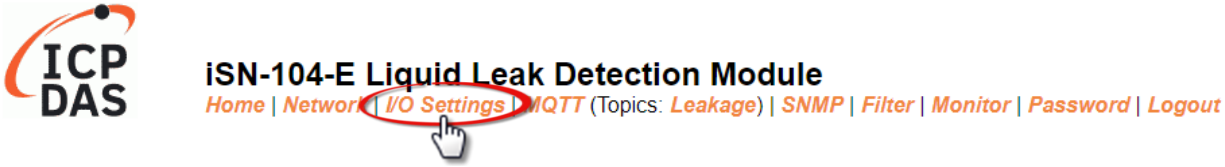
Click the Update button and then select the firmware file to update the firmware.



The firmware can be obtained from web site:

http://ftp.icpdas.com/pub/cd/iiot/isn/

3.6. I/O Settings



Clicking the I/O Settings tab to go to the I/O Settings page where you can configure the I/O settings and Alarm Configuration, which will be described in more detail below.

Leak Detection Setting

	Software Settings	Hardware Settings
Leak Threshold Index	20 (0 ~ 24)	4
Update Settings		

Users can software set the Leak Threshold Index and show Hardware Settings.

Alarm Configuration

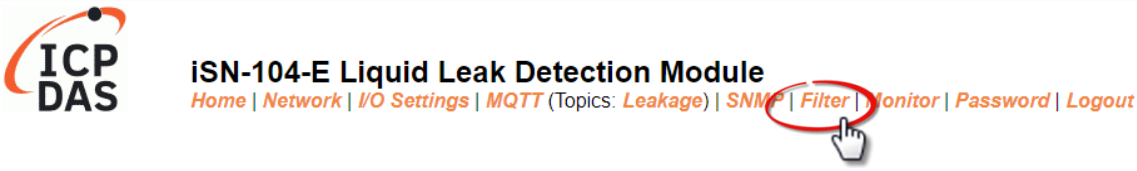
Channel	Leak Alarm Mode	Open Wire Alarm Mode
0	Momentary	Disabled
1	Momentary	Disabled
2	Momentary	Disabled
3	Momentary	Disabled
Beep On Alarm Time	251 (0: beep off, 1 to 250: beep on alarm time in seconds, 251: beep on alarm continuously)	
Update Settings		

All the settings take effect after clicking the Update Settings button

Item	Description
Leak Threshold Index	Set software leak threshold index 00 ~ 24 Read Hardware Settings leak threshold index by VR
Leak Alarm Mode Open Wire Alarm Mode	- Disabled: Disables alarm function. - Momentary: If a measurement value of a monitoring object is greater than its preset high alarm limit or less than the low alarm limit, an alarm event is activated until the measurement value returns within the limits. (Or lower than the high alarm limit only if low alarm is not available.) The Alarm LED turns red

	on during the alarm period. - Latched: If a measurement value is greater than its preset high alarm limit or less than the low alarm limit, the alarm is activated. The Alarm LED turns red for the alarm event. Even though the measurement value returns within the limits, the alarm stays on (latched); the Alarm LED keeps red until the alarm is manually cleared by an operator.
Beep On Alarm Time	0: disabled 1 ~ 250: beep on alarm time in seconds 251: beep on alarm continuously

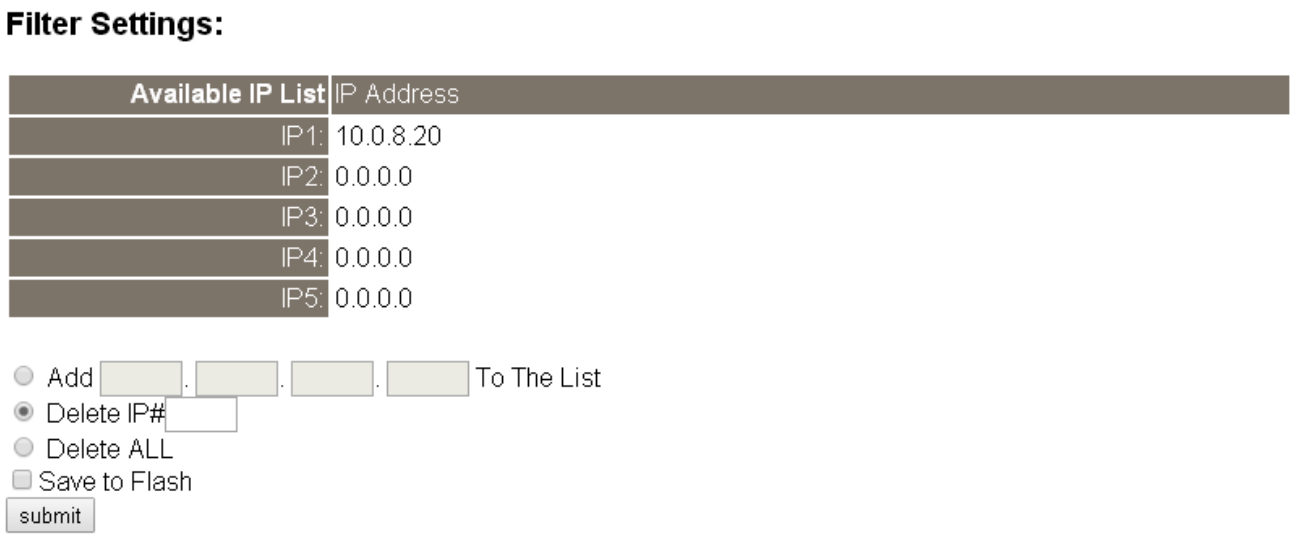
3.7 Filter



Clicking the **Filter** tab to go to the **Filter Settings** page where you can configure the IP Filter for the ISN-104-E module, which will be described in more detail below.

3.7.1. Filter Settings

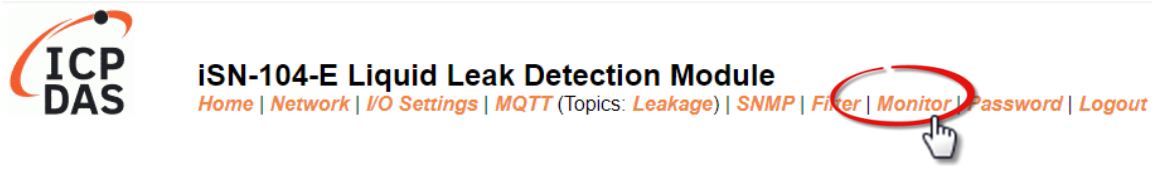
The ***Filter Settings*** page is used to query or edit the IP Filter List for the ISN-104-E module. The IP filter list restricts the access of incoming packets based on the IP header. If one or more IP addresses are saved to the IP Filter table, only Clients whose IP address is specified in the IP Filter List will be able to access the ISN-104-E module.



The following table provides an overview of the parameters contained in the IP Address Configuration section:

Item	Description
Add “IP” to the List	This parameter is used to add an IP address to the IP filter List.
Delete IP # “number”	This parameter is used to delete IP# address from the IP filter List.
Delete All	This parameter is used to delete all IP address current contained in the IP filter List.
Save to Flash	This parameter is used to save the updated IP filter List to the flash memory. Check the checkbox before clicking the Submit button of you wish to store the most recent list.
Submit	Click this button to save the revised settings to ISN-104-E module.

3.8. Monitor

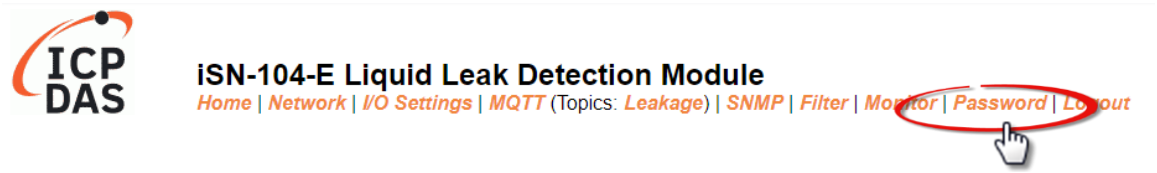


After clicking the ***Monitor*** tab, the Current Connection Status page will be displayed showing detailed information regarding the current status of the serial port connection settings for the ISN-104-E module.

Current Connection Status:

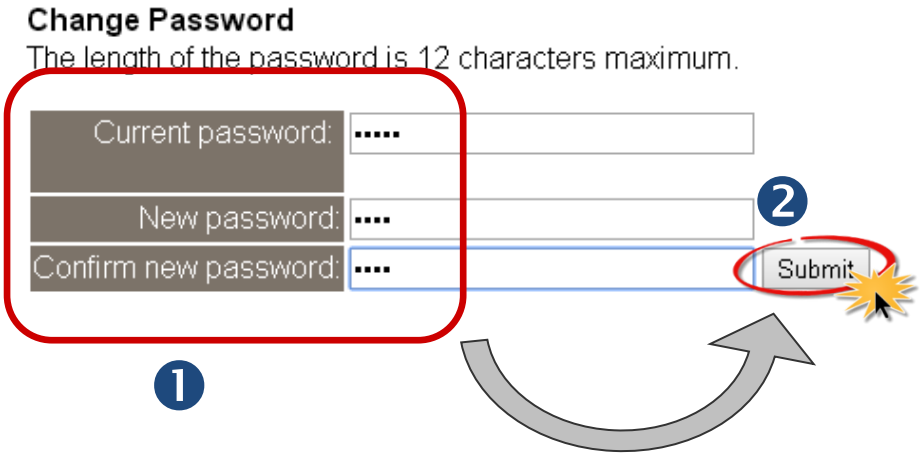
Server Mode	Connected IP	Server Mode	Connected IP
IP1	-	IP2	-
IP3	-	IP4	-
IP5	-	IP6	-
IP7	-	IP8	-
IP9	-	IP10	-
IP11	-	IP12	-
Available Connections	32		

3.9. Change Password

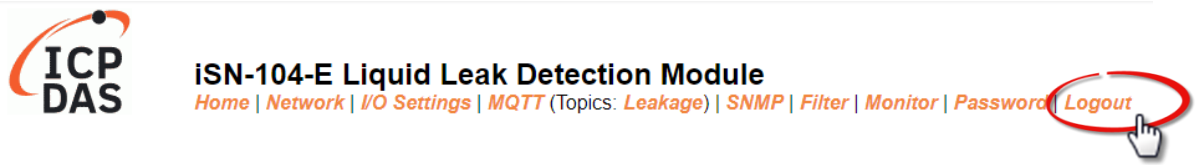


To change the p default password:

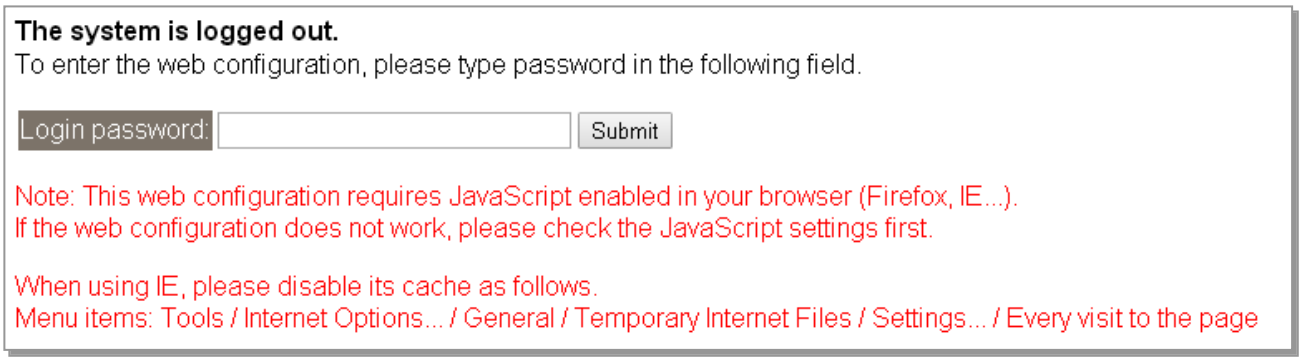
Step 1: Go to the ***Change Password*** page by clicking the ***Change Password*** tab.
Step 2: Enter the old password in the textbox next to **"Current password"**. (Default: **Admin**)
Step 3: Enter a new password in the textbox next to **"New password"**.
Step 4: Re-enter the new password in textbox next to **"Confirm new password"**.
Step 5: Click the "**Submit**" button to update the password.



3.10. Logout



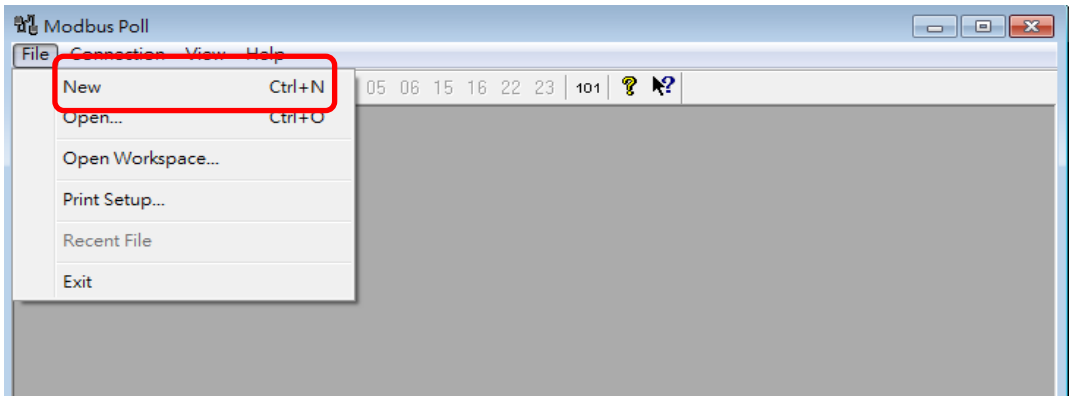
Clicking the ***Logout*** tab will immediately log you out from the system and return you to the login page.



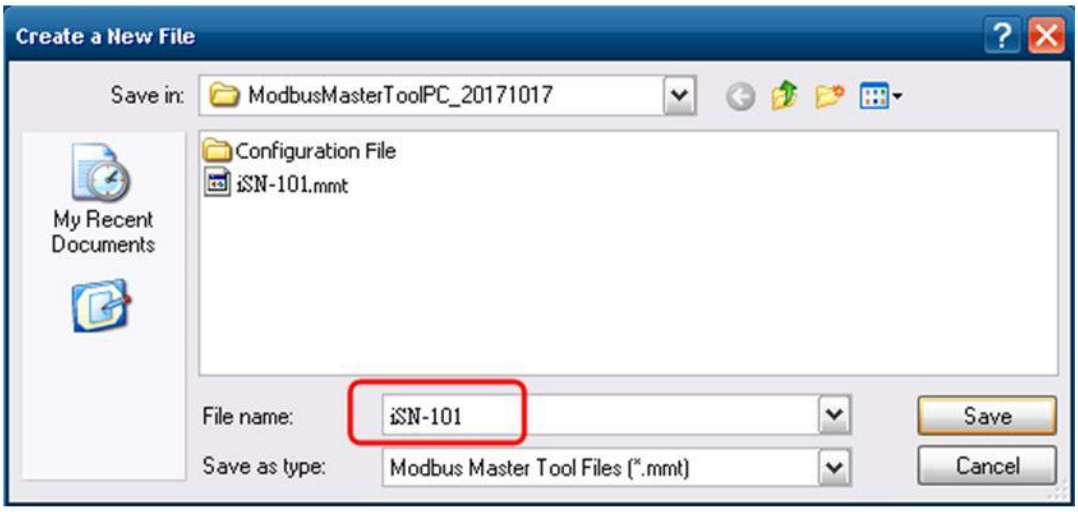
Appendix A: ModbusMasterToolPC

ModbusMasterToolPC is a free, easy-to-use tool for Modbus communication and diagnosing the wiring. It is located in the Web:
https://www.icpdas.com/tw/download/file.php?num=12895
This section intends to guide the steps for creating the Modbus communication with iSN-104-E logger.

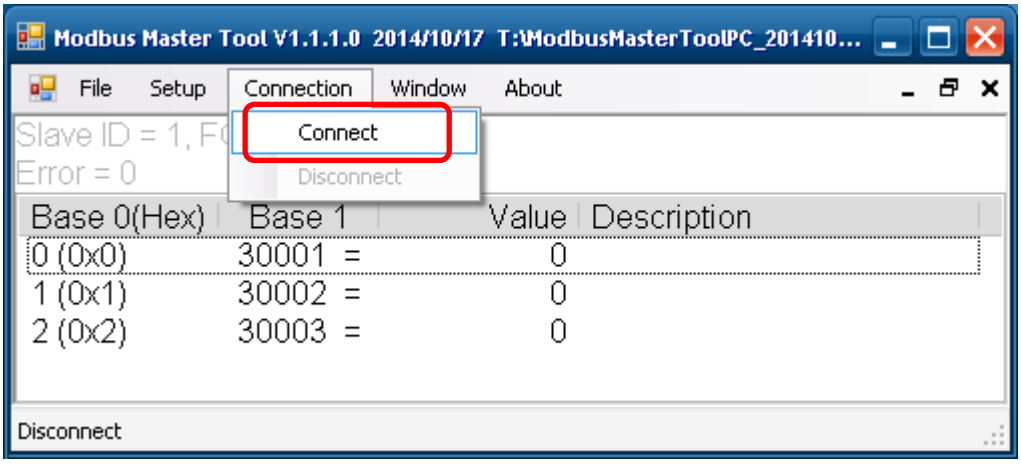
1. Launch the ModbusMasterToolPC.exe.
2. Select ***New*** in the File menu.



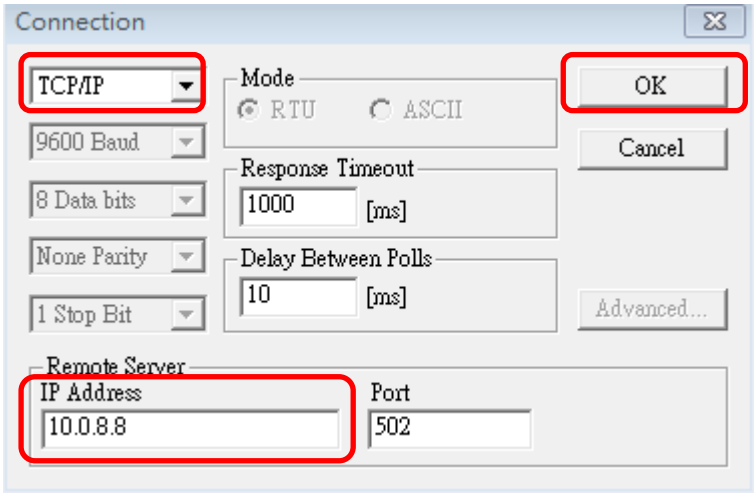
3. Input the file name and click on the ***Save*** button.



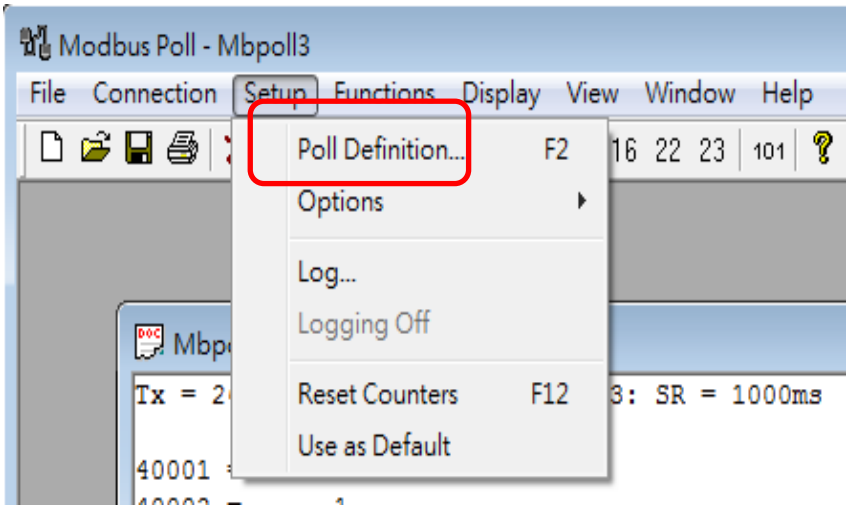
4. Select ***Connect*** in the *Connection* menu.



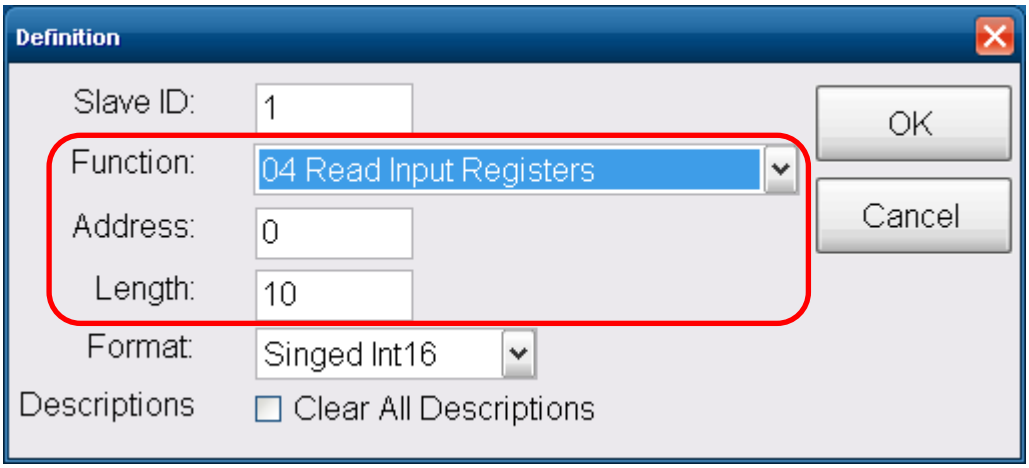
5. Select the communication interface. When using Ethernet as the interface, select the TCP/IP, check the RTU mode, input IP Address and click on the ***OK*** button.



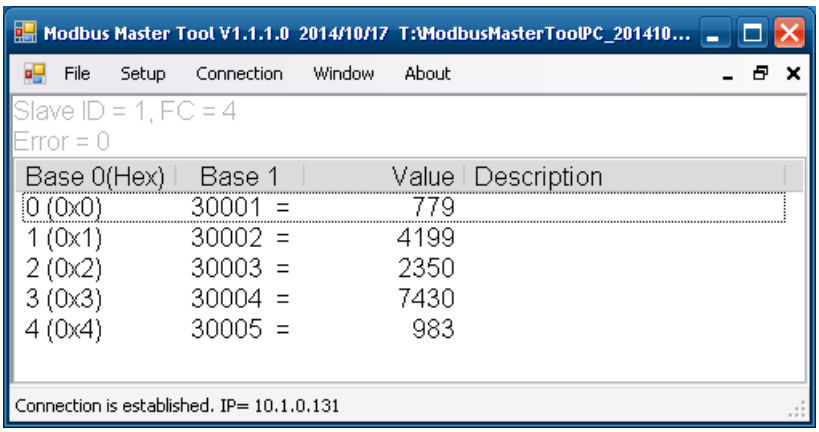
6. Select ***Poll Definition*** in the *Setup* menu.



7. Select the Modbus function code, input the start address and length, and click on the ***OK*** button.

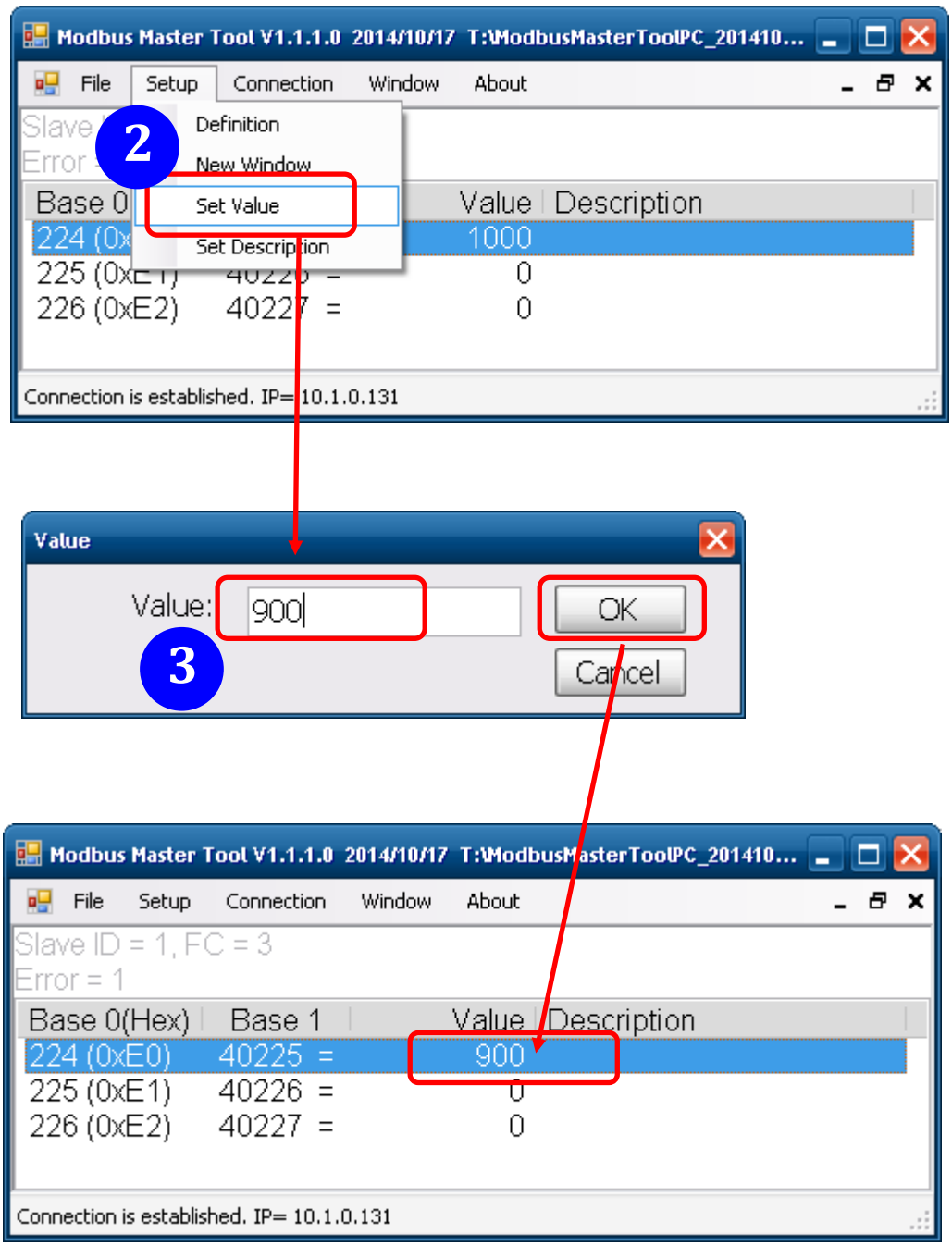


8. Read data.



9. Write data to Holding Register or Coil Status

1. Highlight the Modbus address in the Holding Register or Coil Status list
2. Select ***Set Value*** in the *Setup* menu.
3. Input the data in the Value box and click on the ***OK*** button



Appendix C: Modbus Address Table

C-1. iSN-104-E Modbus Address Mappings (Base 1)

Address	Description	Attribute
30001 ~ 30004 40001 ~ 40004	Resistance of sensor 0 to 3 in 100 ohms	R
30005 40005	Hardware leak threshold index, 0 to 24	R
30006 ~ 30009 40006 ~ 40009	Resistance of sensor 0 to 3 in index	R
40272	Modbus NetID	R/W
30301 40301	Number of the digital input channels	R
30311 40311	Number of the digital output channels	R
30321 40321	Number of the analog input channels	R
30331 40331	Number of the analog output channels	R
30352 40352	Firmware version	R
40481	Firmware version (low word hex)	R
40482	Firmware version (high word hex)	R
40483	Module name (low word), 0x0104	R
40484	Module name (high word), 0x534E	R
40496	Software leak threshold index, 0 to 24	R/W
40497	Beep on alarm, 0: disable, 1 to 250: beep on alarm time in seconds, 251: beep on alarm continuously	R/W
30513 ~ 30516 40513 ~ 40516	High latched analog input value of resistance of sensor 0 to 3 in 100 ohms	R

Address	Description	Attribute
30545 ~ 30548 40545 ~ 40548	Low latched analog input value of resistance of sensor 0 to 3 in 100 ohms	R
30560 40560	Module name, 0x0104	R
40564	TCP disconnection timeout value, 5 to 65000, in second, 0 to disable.	R/W
40565	Module reset timeout value, 30 to 65000, in second, 0 to disable.	R/W
00033 10033	Status of the sound switch	R
00128	Write 1 to reload default TCP settings	W
00134	Write 1 to reboot module	W
00225 ~ 00228 10225 ~ 10228	Open wire status of sensor 0 to 3	R
00262	Write 1 to play notification sound	W
00280	Write 1 to clear all high latched analog input values	W
00281	Write 1 to clear all low latched analog input values	W
00289 ~ 00292	Leak alarm status of leak sensor 0 to 3. Write 1 to clear low latched alarm.	R/W
00293 ~ 00296	Open wire alarm status of leak sensor 0 to 3. Write 1 to clear latched alarm.	R/W
00321 ~ 00324	Enable/disable leak alarm of leak sensor 0 to 3	R/W
00325 ~ 00328	Enable/disable open wire alarm of leak sensor 0 to 3	R/W
00337 ~ 00340	Leak alarm type, momentary or latched, of leak sensor 0 to 3	R/W
00341 ~ 00344	Open wire alarm type, momentary or latched, of leak sensor 0 to 3	R/W

Address	Description	Attribute
00385 ~ 00388	Write 1 to clear high latched analog input value of sensor 0 to 3	W
00417 ~ 00420	Write 1 to clear low latched analog input value of sensor 0 to 3	W

DIP Switch setting

1	Protocol	ON: FW Update, OFF: normal
2	Configuration	ON: by software, OFF: by hardware
3	Reserved	
4	INIT mode	ON: INIT, OFF: normal
5	Sound	ON: turn on, OFF: turn off

Revision History

Revision	Date	Description
1.0.0	2023/12	First released