

iSN-301 Series User Manual



Warranty

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service@icpdas.com.

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1. Introduction

The iSN-301 is a Time-of-Flight sensing module that is designed specifically for non-contact distance measurement that can be used to directly control Relay Output. It can measure distance up to 4 meters. The module can be configured to trigger LED alarm when the distance is too short or too long. It is possible to program the size and position of the ROI to adjust the sensor FoV. The module can be easily integrated with the host controller connected in the same RS-485 network via DCON or Modbus RTU protocol.



2. Hardware Information

2.1. Specifications

Model	iSN-301H	iSN-301H/DIN	iSN-301V	iSN-301V/DIN
Distance	Measurement			
Accuracy	±5% (±20 cm)			
Range	5 cm ~ 4 m			
Resolution	1mm			
Update time	160~6000ms, programmable			
Detection	Field of View 27°; Diameter 0.8 meters Max.			
Sensor Direction	Horizontal	Horizontal	Vertical	Vertical
Relay Output				
Type	Signal Relay, Form A x1, SPST 0.25 A @ 250 VAC			

	0.5 A @ 125 VAC 2 A @ 30 VDC			
Communication				
Ports	1 x RS-485			
Baud Rate	Software Configurable:1200 ~ 115200 bps			
Data Format	N,8,1 / O,8,1 / E,8,1 / N,8,2			
Protocol	Modbus RTU or DCON			
Node Addresses	0 ~ 255 for software configuration 96 ~ 127 for hardware configuration			
LED Indicators				
Status	1 as Power Indicator. 1 as Alarm Indicator.			
EMS Protection				
EFT (IEC 61000-4-4)	±4 kV for Power			
ESD (IEC 61000-4-2)	±8 kV Air for Random Point			
Power				
Reverse Polarity Protection	Yes			
Input Range	10 to 30 VDC			
Consumption	1W Max.			
Mechanical				
Dimensions (W x L x H) (mm)	70 x 78 x 24	52 x 84 x 27	70 x 78 x 24	52 x 84 x 27
Installation	Wall Mounting	DIN-Rail	Wall Mounting	DIN-Rail
Environment				
Operating Temperature	-25 to +75°C			
Storage Temperature	-40 to +80°C			
Humidity	10 to 90% RH, Non-condensing			

Performances in partial ROI in dark conditions

Test conditions are:

Ambient light = dark

Target covers partial FoV

ROI centered on optical center

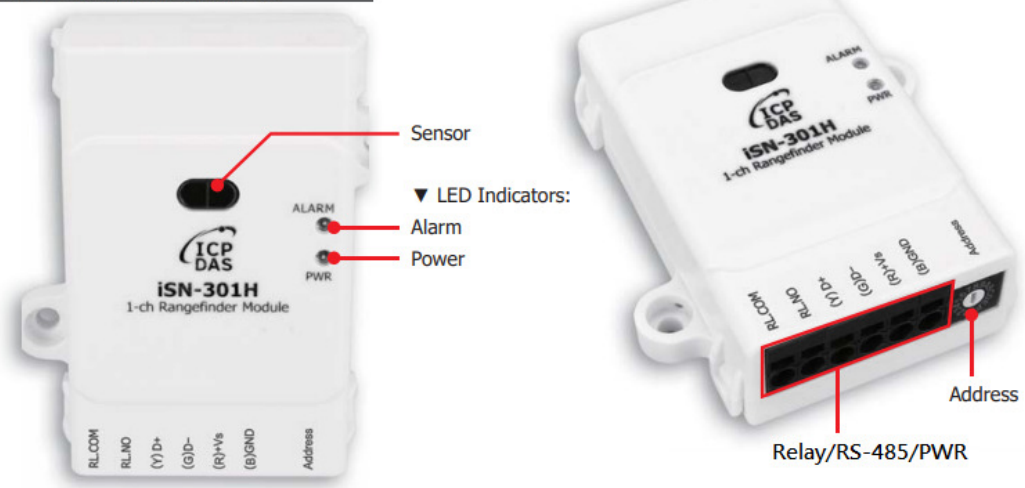
Long distance mode

Parameter	Target reflectance	16x16	8x8	4x4
Max. distance (cm)	White 88%	360	308	170
	Grey 54%	340	254	143
	Grey 17%	170	119	45
Diagonal FoV (degrees)		27	20	15
Ranging error (mm)		±20	±20	±20

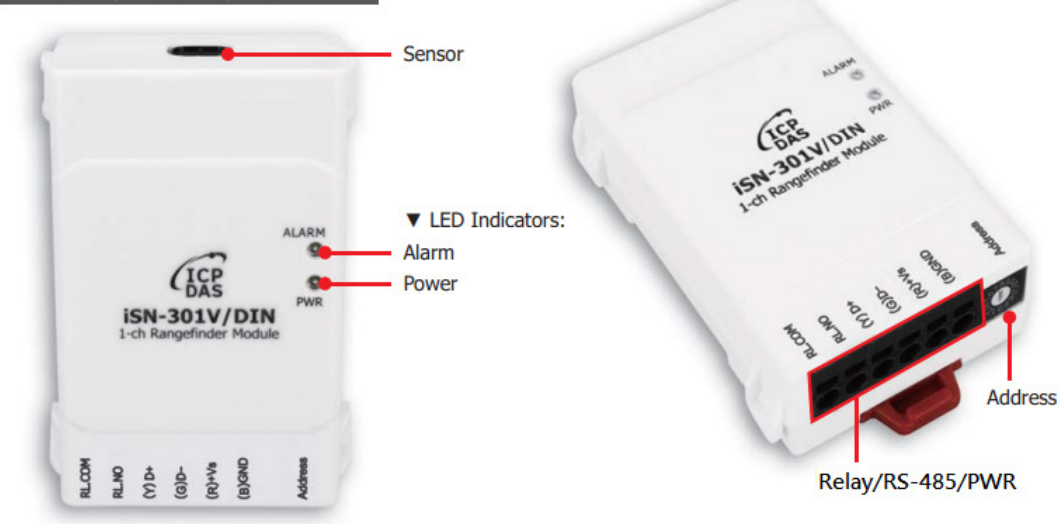
2.2. Appearance

Front

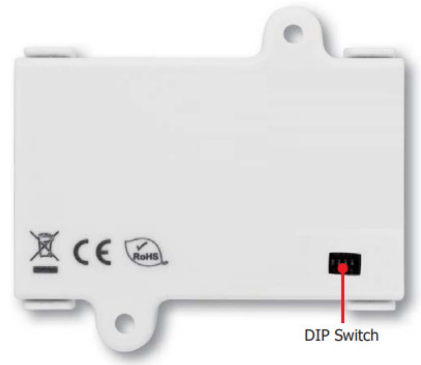
iSN-301H / iSN-301H/DIN



iSN-301V / iSN-301V/DIN

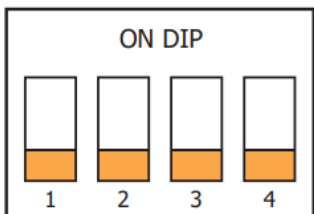


Rear



2.3. Hardware Configuration


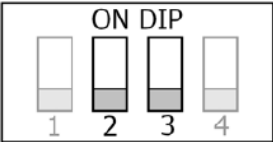
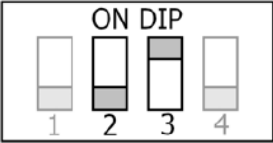
DIP Switch

DIP Switch Description			
 <p>ON DIP</p>	SW1	ON	DCON Protocol
		OFF	Modbus RTU Protocol
	SW2	ON	Software Configuration
		OFF	Hardware Configuration
	SW3	ON	High Node Address
		OFF	Low Node Address
	SW4	ON	INIT Mode
		OFF	Normal Mode

DIP [1]	<p>Protocol:</p> <p>Used to specify the communication protocol to be used by the module</p> <p>ON: DCON</p> <p>OFF: Modbus RTU (default)</p>
DIP [2]	<p>Configuration:</p> <p>Used to specify the configuration settings for the module</p> <p>ON: Configure the module using DCON/Modbus commands (Software)</p> <p>OFF: Configure the module via DIP switch (Hardware, default)</p>
DIP [3]	<p>Address:</p> <p>Used to specify the module address when DIP [2] is set to OFF</p> <p>ON: Use rotary switch positions 0 to F for node addresses 96 to 111</p> <p>OFF: Use rotary switch positions 0 to F for node addresses 112 to 127 (default)</p>
DIP [4]	<p>Mode:</p> <p>Used to specify the operating mode</p> <p>ON: Operating in INIT mode</p> <p>OFF: Operating in Normal mode (default)</p>

Address

Address Settings via Hardware Configuration

	 <p>ON DIP</p>	0 ~ F for Addresses 96 ~ 111 (Low Node Address)
	 <p>ON DIP</p>	0 ~ F for Addresses 112 ~ 127 (High Node Address)

2.6. Hardware Installation

Installation Instructions

Connector for Relay / RS-485 / Power

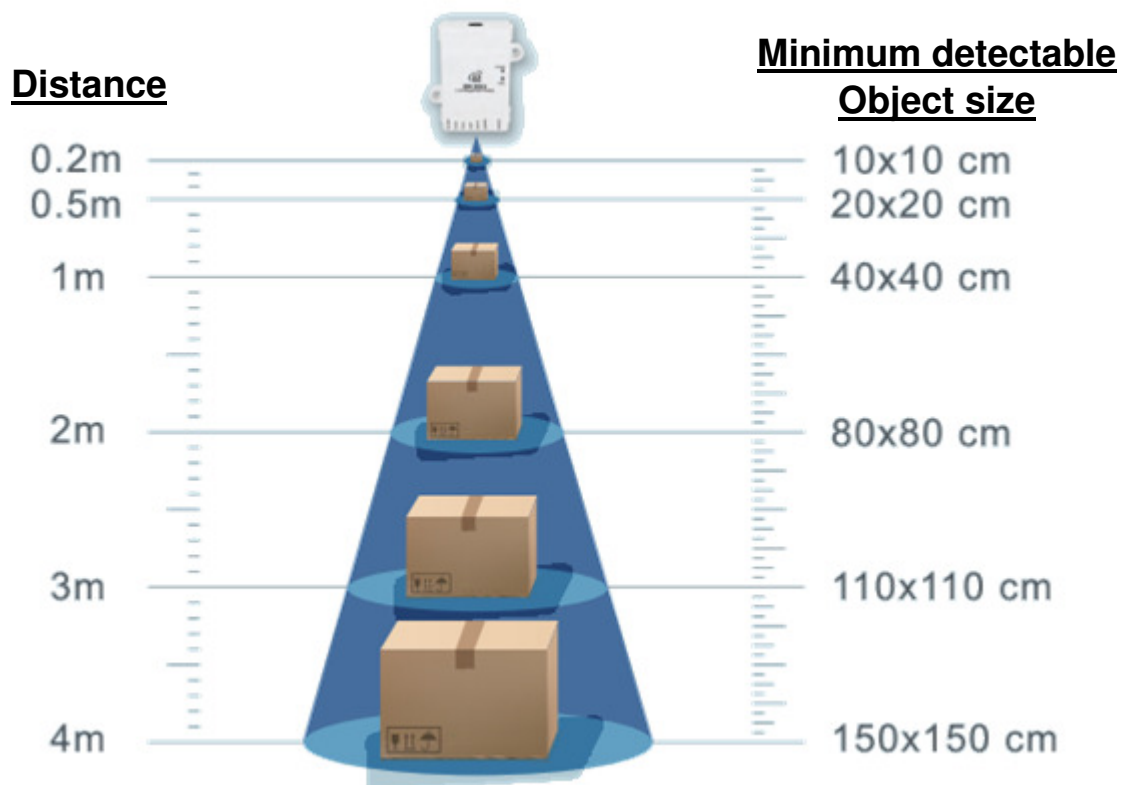
A tip for connecting the wire to the connector



A tip for removing the wire from the connector



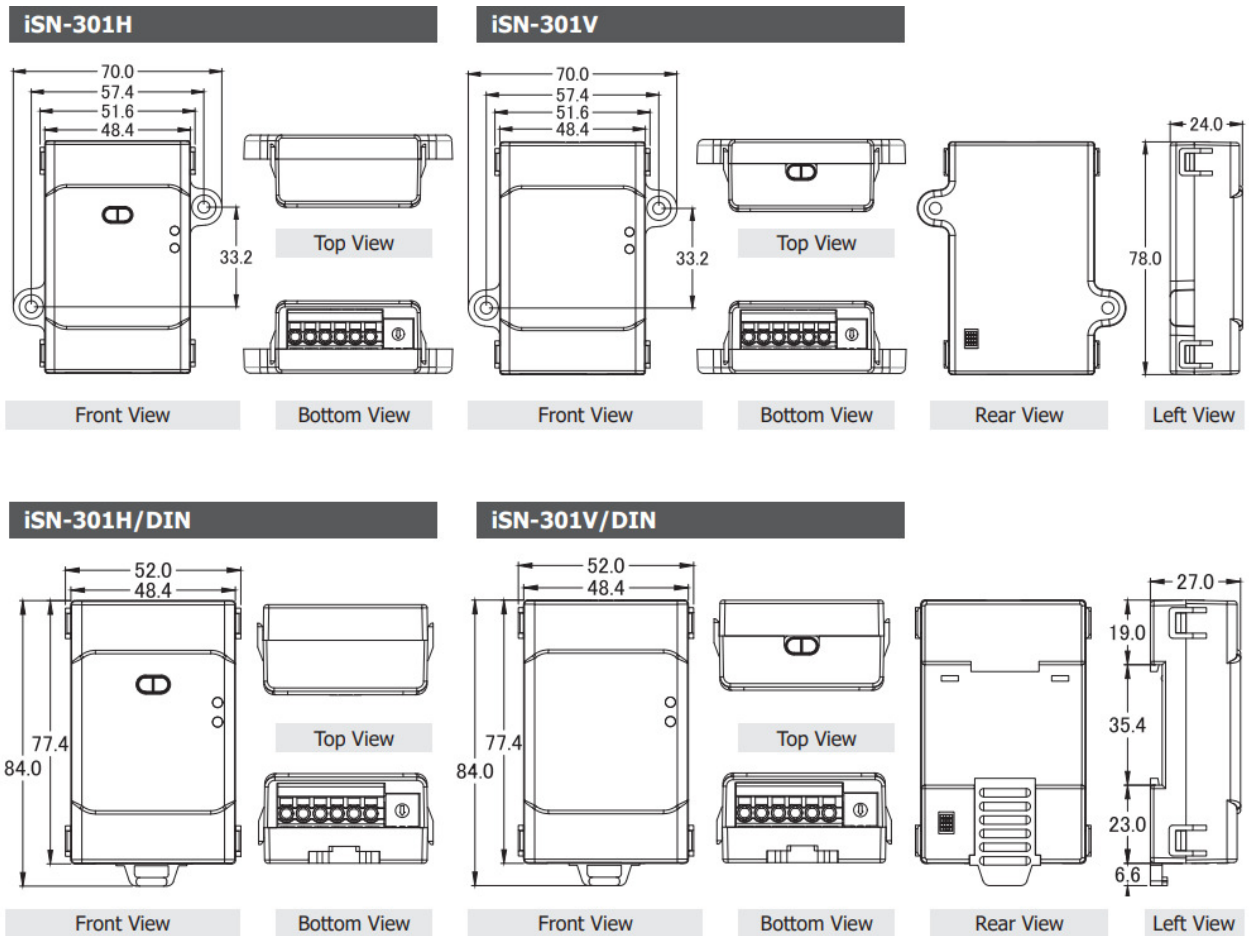
2.7. Application



1-ch Rangefinder Module



2.8 Dimensions (unit: mm)



3. Configuration via RS-485

- The factory default settings for RS-485 communication
 - Address: 1
 - Protocol: Modbus/RTU
 - Baud rate: 9600
 - Parity: N,8,1
 - Response Delay (ms): 0

Note

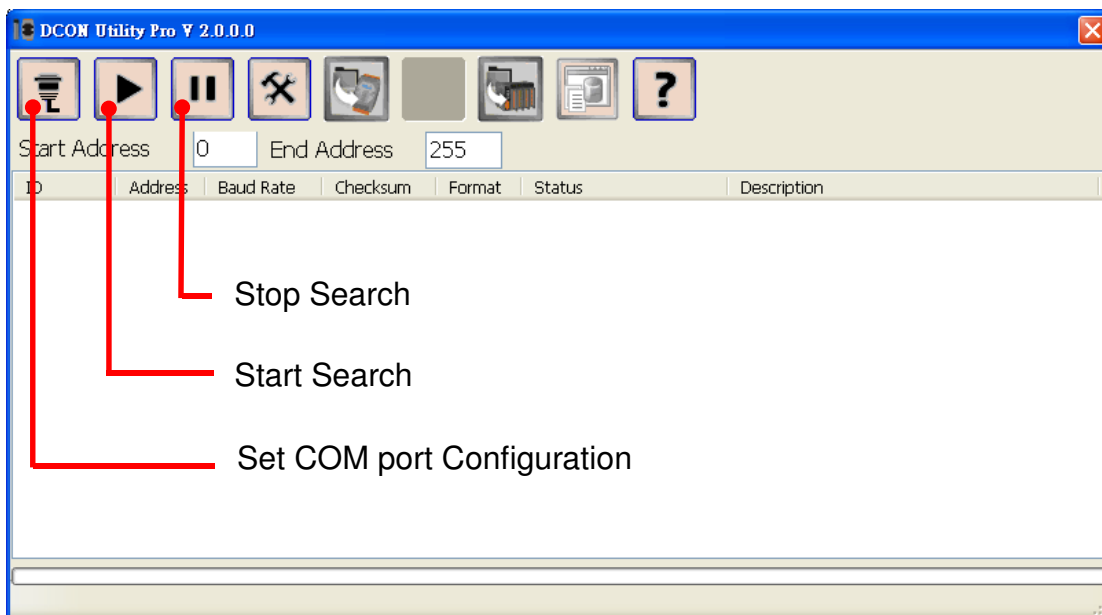
If there are multiple iSN-301 connected to the same RS-485 network, each module needs to be set with a unique RS-485 address. More than one module having the same address will cause communication failure.

➤ Testing RS-485 Communication

1. Download the DCON Utility Pro from

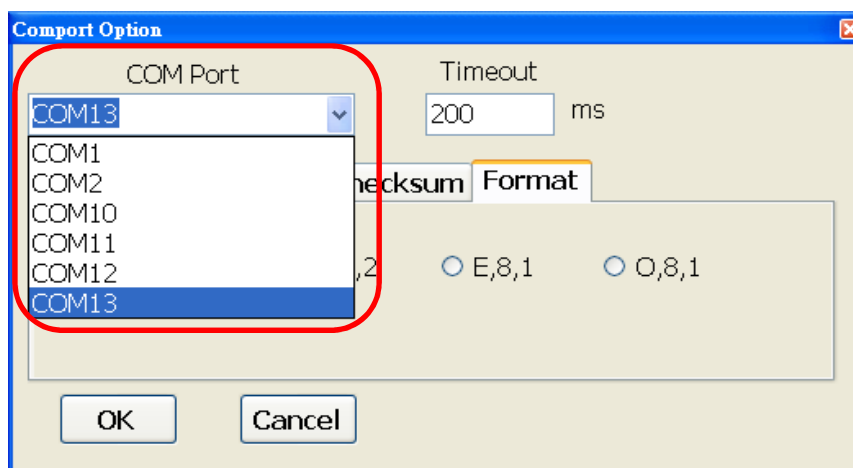
<https://www.icpdas.com/en/product/guide+Software+Utility+Driver+DCON+Utility+Pro>

2. Launch the DCON_Utility_Pro.exe.

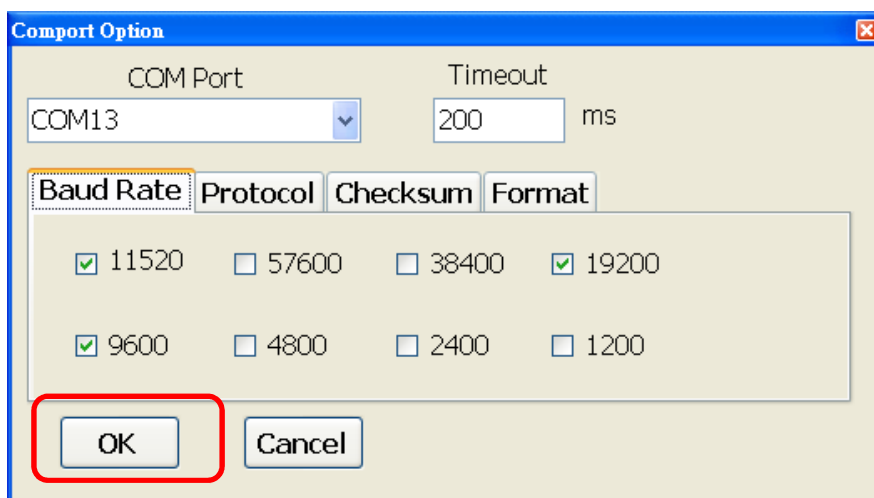


3. Click the icon  to configure the COM port.

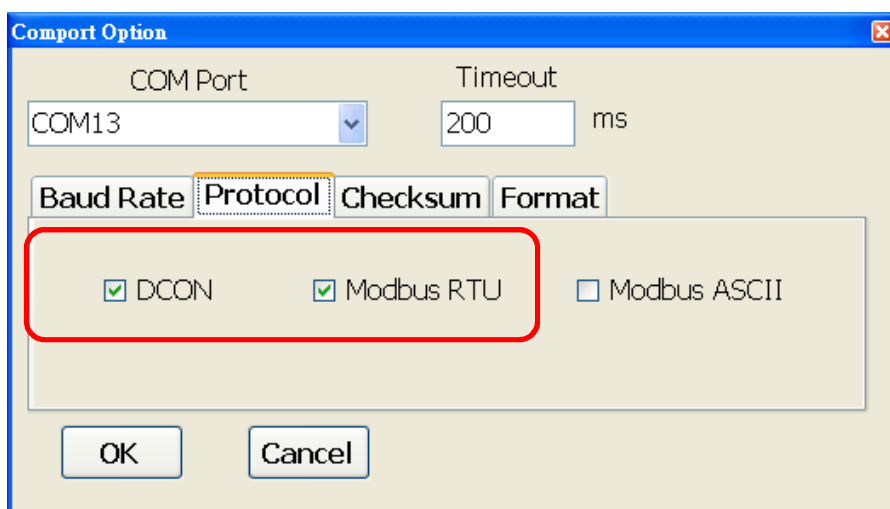
4. Select the COM Port number used to connect the iSN-301 logger.



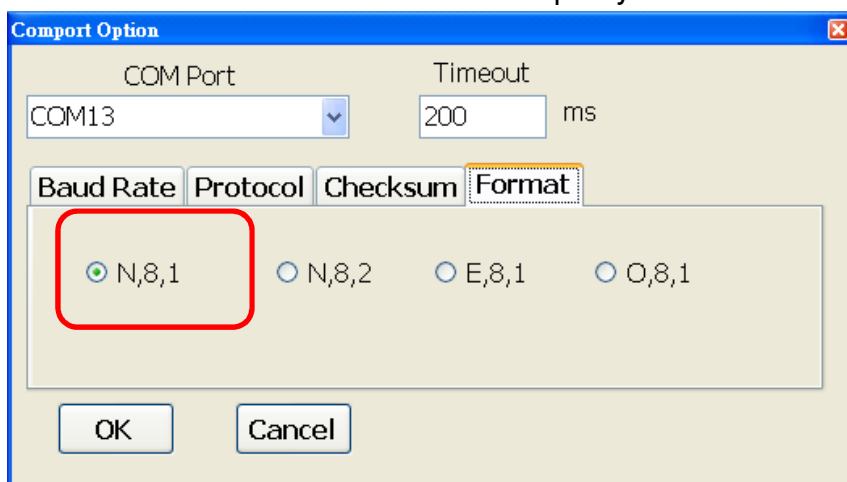
5. The Baud Rate is factory default to 9600 bps.



6. Select the Protocol tab.



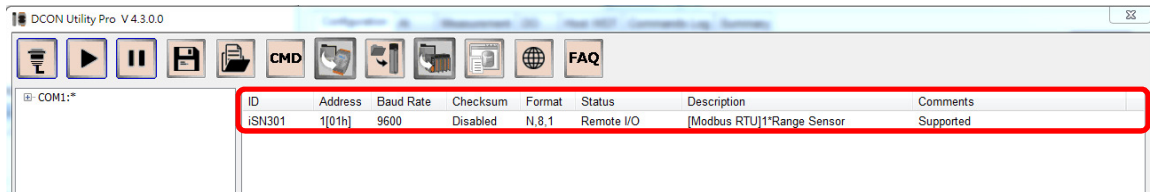
7. Select the Format tab and check the parity that set in the logger.



8. Click the Start Search icon.



9. The iSN-301 logger searched out will be listed as below.



10. Click the module name to configure the logger.

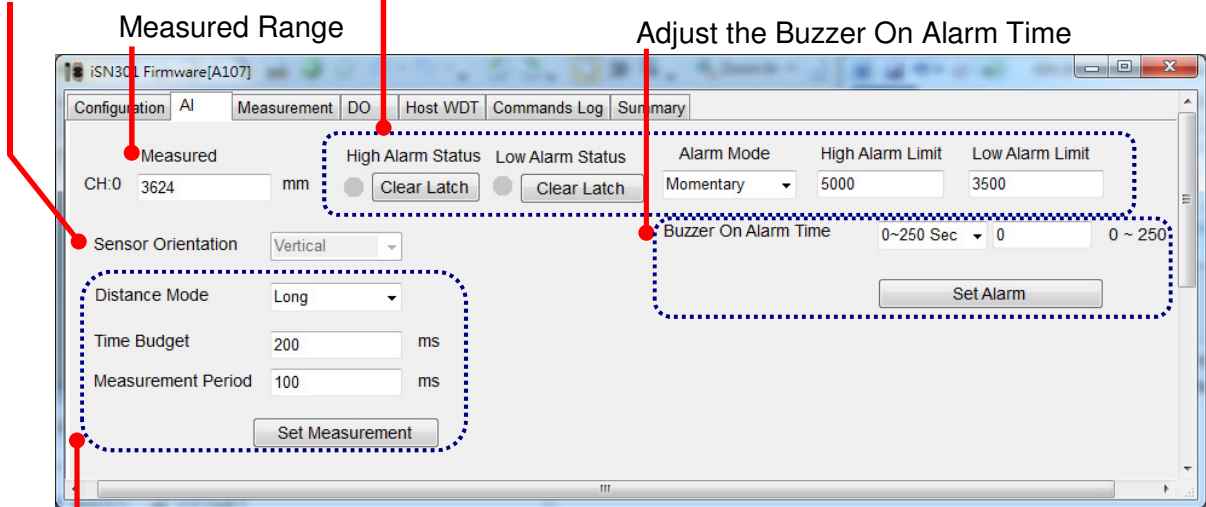
➤ **AI tab**

Sensor Orientation

iSN-301H : Horizontal

iSN-301V : Vertical

Adjust the Alarm Mode & Limit

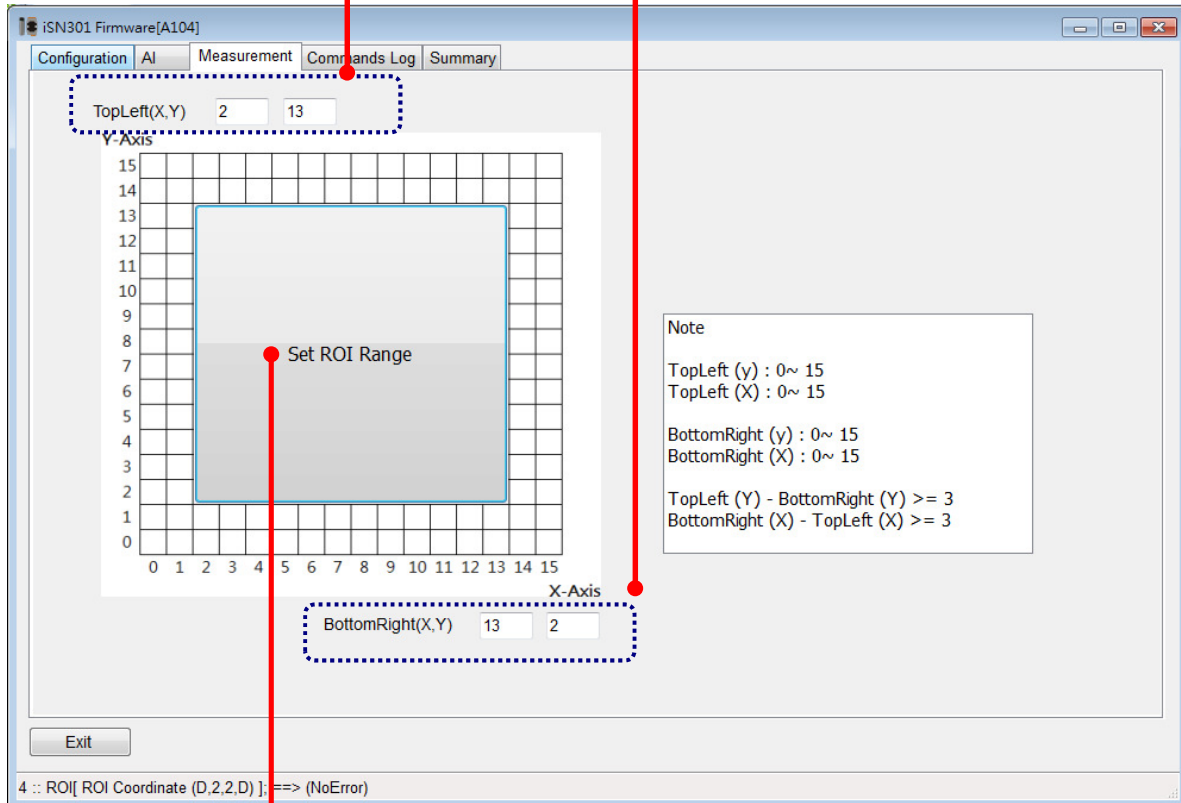


Distance Mode	For long distance mode, the maximum ranging distance is impacted by ambient light. Short distance mode is more immune to ambient light.
short	The max. distance is 136 cm for short distance mode
medium	The max. distance is 290 cm for medium distance mode
long	The max. distance is 400 cm for long distance mode
Time Budget	Timing budget in ms, valid range 20 to 1000 It is the ranging duration.
short distance mode	20ms is the minimum timing budget and can be used only in short distance mode.
all distance modes	33ms is the minimum timing budget which can work for all distance modes.
maximum distance of 4 m	140ms is the timing budget which allows the maximum distance of 4 m (in the dark on a white chart) to be reached under long distance mode.
Measurement Period	Inter measurement period in ms, valid range 20 to 5000 It is the delay between two ranging operations.

➤ **Measurement tab**

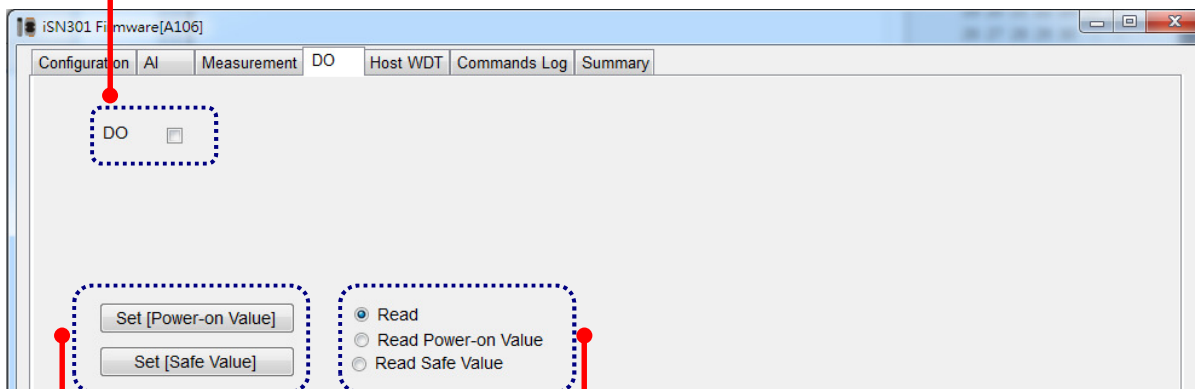
Adjust the ROI Range Top Left (X, Y)

Adjust the ROI Range Bottom Right (X, Y)



Set ROI Range button and Show ROI Range

Set or Show DO Status



Set or Show DO Status

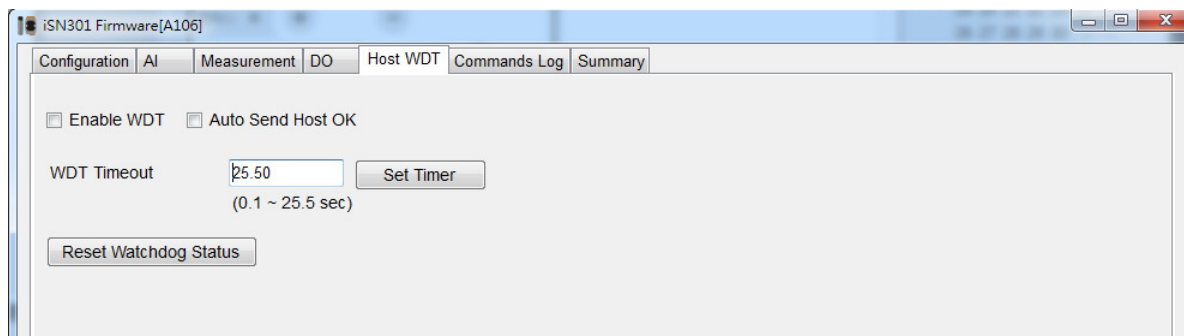
Select one of the radio button and the checkbox next to DO will display the setting for selected item.

➤ Host Watchdog

Host Watchdog is used to monitor the RS-485 communication status; if the host (PC) does not send command “~**” in the time period of WDT Timeout setting, the enabled Host Watchdog will announce the timeout error and turn the relay output to Safe value to avoid an unsafe act. Users cannot control the relay until the command “~AA1” is sent to clear the WDT timeout status.

On this tab:

1. Set the time period for WDT timeout, check the checkbox next to Enable WDT and click the Set WDT button to enable the Host watchdog.
2. Check the checkbox next to Send Host OK to send the “~**” command.
3. Uncheck the checkbox next to Send Host OK to stop sending ~** command, the Host watchdog timeout will occur and relay will turn to Safe value.
4. Click the Reset WDT button to clear the Host watchdog timeout status.
5. Uncheck the checkbox next to Enable WDT and click the Set WDT button to disable the Host watchdog.



Note

The Protocol/Baud Rate/Parity/Checksum items marked with "(INIT*)" means that when any of those items needs be modified, the pin 4.INIT needs to be set in ON position and power cycle the logger, then the item can be modified. After complete setting, set the pin 4.INIT back to OFF position and power cycle the logger again to take the setting effect.

3.1 iSN-301 Modbus Address Mappings (Base 1)

Address	Description	Attribute
30001 40001	Distance in mm	R
40225	High alarm limit of distance in mm	R/W
40241	Low alarm limit of distance in mm	R/W
30257 40257	Device mode, 0 for horizontal version, 1 for vertical version	R
40258	Distance mode, 1:short, 2:medium, and 3:long The max. distance is 136 cm for short distance mode, 290 cm for medium distance mode, and 400cm for long distance mode. For long distance mode, the maximum ranging distance is impacted by ambient light. Short distance mode is more immune to ambient light.	R/W
40259	Timing budget in ms, valid range 20 to 1000 It is the ranging duration. 20ms is the minimum timing budget and can be used only in short distance mode. 33ms is the minimum timing budget which can work for all distance modes. 140ms is the timing budget which allows the maximum distance of 4 m (in the dark on a white chart) to be reached under long distance mode.	R/W
40260	Inter measurement period in ms, valid range 20 to 5000 It is the delay between two ranging operations.	R/W
40261	ROI, top left coordinate is specified by high byte and bottom right coordinate is specified by low byte. For each byte, the high nibble is the horizontal coordinate and the low nibble is the vertical coordinate. 0x6996 for min ROI of 4x4 in center, 0x0FF0 for max ROI of 16x16.	R/W
40449	Distance offset in mm	R/W
40481	Firmware version (low word)	R
40482	Firmware version (high word)	R
40483	Module name (low word), 0x0301	R
40484	Module name (high word), 0x534E	R
40485	RS-485 module address, 1 to 247	R/W

Address	Description	Attribute
40486	RS-485 baud rate and parity settings Bits 5:0 Baud rate, valid range: 3 ~ 10 Bits 7:6 00: no parity, 1 stop bit 01: no parity, 2 stop bit 10: even parity, 1 stop bit 11: odd parity , 1 stop bit	R/W
40488	RS-485 response delay time in ms, valid range, 0 ~ 30	R/W
40489	RS-485 host watchdog timeout value, 0 ~ 255, in 0.1s	R/W
40492	RS-485 host watchdog timeout count, write 0 to clear	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 40513	High latched input value of distance in mm	R

Address	Description	Attribute
30545 40545	Low latched input value of distance in mm	R
00001	Digital output value of channel 0	R/W
00129	Safe value of digital output channel 0	R/W
00161	Power on value of digital output channel 0	R/W
00257	RS-485 Protocol, 0: DCON, 1: Modbus RTU	R/W
00260	Modbus RTU host watchdog mode 0: same as I-7000 1: can use AO and DO command to clear host watchdog timeout status Only for Modbus RTU protocol	R/W
00261	RS-485 host watchdog mode, 1: enable, 0: disable.	R/W
00262	Write 1 to play notification sound	W
00270	Host watch dog timeout status, write 1 to clear host watch dog timeout status	R/W
00273	Reset status, 1: first read after powered on, 0: not the first read after powered on	R
00280	Write 1 to clear all high latched input values	W
00281	Write 1 to clear all low latched input values	W
00289	Low alarm status of distance measurement.	R/W

00297	Read the low alarm status of distance measurement and clear the latched alarm status	R
00305	High alarm status of distance measurement.	R/W
00313	Read the high alarm status of distance measurement and clear the latched alarm status	R

Address	Description	Attribute
00321	Enable/disable alarm of distance measurement.	R/W
00337	Alarm type, momentary or latched, of distance measurement.	R/W
00385	Write 1 to clear high latched input value of distance measurement.	W
00417	Write 1 to clear low latched input value of distance measurement.	W

3.2 iSN-301 DCON Command Sets

Command	Description
\$AAF	read firmware version
\$AAI	read INIT status response: !AA0 -> INIT short to GND !AA1 -> else
\$AAM	read module name
\$AAP	Read Modbus RTU/DCON protocol response: !AA10 -> DCON !AA11 -> Modbus RTU
\$AAPN	Set Modbus RTU/DCON protocol N-> 0: DCON, 1: Modbus RTU
\$AA2	read configuration
\$AA5	read reset status !AA1 first after power on, !AA0 others
#AA	Read All Analog Inputs response > (distance in mm)
#AAN	Read Channel Analog Input N = 0 for distance in mm

%AANNTTCCFF	set configuration, NN: new address, TT = 00, CC: new baud rate FF: data format
@AABA	Read beep on alarm time response !AAHH, HH in hex, 0: disabled, 1 ~ 250: beep on alarm time in seconds, 251: beep on alarm continuously
@AABAHH	Set beep on alarm time HH in hex, 0: disabled, 1 ~ 250: beep on alarm time in seconds, 251: beep on alarm continuously
@AACH	Clear all high latched analog inputs to the current values
@AACHN	Clear channel high latched analog input to the current value, N = 0 for distance
@AACHCN	Clear high latched alarm of a channel, N = 0 for distance
@AACL	Clear all low latched analog inputs to the current values
Command	Description
@AACLN	Clear channel low latched analog input to the current value, N = 0 for distance
@AACL CN	Clear low latched alarm of a channel, N = 0 for distance temperature in 0.01° F, 5 for ambient light
@AADACN	Disable AI alarm of a channel, N = 0 for distance
@AADI	read DO response !AA0000, O: 0 ~ 1, DO value in hex format
@AADM	read device mode response !AA d, d is 0 for horizontal version and 1 for vertical version

@AADO0V	set DO, V-> 0 ~ 1 DO value in hex format
@AADS B	Read timing budget response !AAdddd, dddd is timing budget in ms in decimal format
@AADS Bdddd	Set timing budget, dddd is timing budget in ms in decimal format, valid range 20 - 1000. It is the ranging duration. 20ms is the minimum timing budget and can be used only in short distance mode. 33ms is the minimum timing budget which can work for all distance modes. 140ms is the timing budget which allows the maximum distance of 4 m (in the dark on a white chart) to be reached under long distance mode.

@AADSM	Read distance mode response !AA d , d is 1 for short, 2 for medium, and 3 for long
@AADSM d	Set distance mode, d is 1 for short, 2 for medium, and 3 for long The max. distance is 136 cm for short distance mode, 290 cm for medium distance mode, and 400cm for long distance mode. For long distance mode, the maximum ranging distance is impacted by ambient light. Short distance mode is more immune to ambient light.
@AADSO	Read optical center response !AA xy , xx and yy are optical center coordinate in hex format
@AADSP	Read inter measurement period response !AA $dddd$, $dddd$ is inter measurement period in ms in decimal format
@AADSP $dddd$	Set inter measurement period, $dddd$ is inter measurement period in ms in decimal format, valid range 20 - 5000. It is the delay between two ranging operations.
@AADSR	Read ROI response !AA $abcd$, a and b are coordinate of top left corner and c and d are coordinate of bottom right corner all in hex format
@AADSR $abcd$	Set ROI, a and b are coordinate of top left corner and c and d are coordinate of bottom right corner all in hex format, $abcd=6996$ for min ROI of 4x4 in center, $abcd=0FF0$ for max ROI of 16x16.
@AAEATCN	Enable AI alarm of a channel, $N = 0$ for distance measurement, T->M: momentary alarm, L: latched alarm
@AAHI(data)CN	Set high alarm limit of an AI channel, $N = 0$ for distance measurement
@AALO(data)CN	Set low alarm limit of an AI channel, $N = 0$ for distance measurement

Command	Description
@AARACN	Read AI alarm enabled/disabled status of a channel response !AAN, $N->0$: disabled, 1: momentary, 2: latched
@AARAL	Read AI alarm status and clear latched alarm status response !AAHLL

@AARAO	Read AI alarm status response !AAHLL
@AARH	Read all high latched values of analog input channels
@AARHN	Read channel high latched value of analog input
@AARHCN	Read high alarm limit of an AI channel
@AARL	Read all low latched values of analog input channels
@AARLN	Read channel low latched value of analog input
@AARLCN	Read low alarm limit of an AI channel
@AARO	Read the distance offset in mm
@AARO(data)	Set the distance offset in mm, data in format of -10000. ~ +10000.
~**	clear host watchdog timeout counter
~AA0	read host watchdog status
~AA1	clear host watchdog timeout status
~AA2	read host watchdog enable/disable status and timeout value
~AA3ETT	enable/disable host watchdog and set timeout value E-> 0: disable host watchdog, 1: enable host watchdog TT: host watchdog timeout in 0.1s in hex format
~AA4	read DO power on and safe value response !AA0POS
~AA50POS	set DO power on and safe value P-> 0 ~ 1: power on value in hex format S-> 0 ~ 1: safe value in hex format
~AARD	read response delay time in ms in hex format
~AARDVV	set response delay time in ms, VV in hex format, 00 - 1E

Baud Rate Setting (CC)

Bits 5:0

Baud rate, 0x03 ~ 0x0A

Code	0x03	0x04	0x05	0x06
Baud	1200	2400	4800	9600
Code	0x07	0x08	0x09	0x0A
Baud	19200	38400	57600	115200

Bits 7:6

00: no parity, 1 stop bit

01: no parity, 2 stop bits

10: even parity, 1 stop bit

11: odd parity, 1 stop bit

Data Format Setting (FF)

Bit 6

0: checksum disabled

1: checksum enabled

Base Address: 96 (0x60)

DIP Switch	
1	Off: Modbus RTU, On: DCON
2	Off: hardware configuration, On: software configuration
3	On: rotary switch address added by 16
4	On: INIT

Appendix: FAQ