



ALM-Horn Series User's Manual

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ALM-Horn Series User's Manual

Document Revision

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1. Introduction

The ALM-Horn Series include 3 model, -BR with water clean upper cover, ALM-Horn as standard siren, Blue + Red LED, ALM-Horn-WF have WLAN connection complies with the IEEE802.11b/g/n standards, support Modbus TCP protocol & HTML, ALM-Horn-MRTU have RS-485 interface support Modbus RTU protocol.

ALM-Horn series device includes 1-channel digital input for any dry contact output such as SA, BA, FA ..etc, and 1-channel digital output. Each device has 4 kinds of alarm tone, NC/NO input mode select by switches. The ALM-Horn-WF & -MRTU support Modbus protocol, Which makes perfect integration for monitoring or control in SCADA software, HMI Modbus & Utility. ALM-Horn series have High Sound Pressure output, wide input power range & IP43 waterproof



Figure 1-1: Application architecture for the ALM-Horn-WF(-BR)

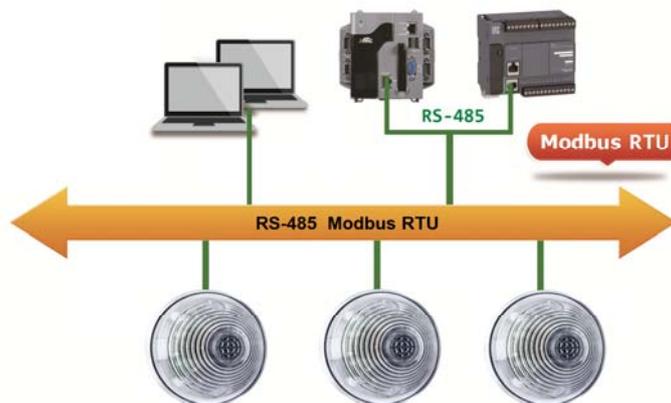


Figure 1-2: Application architecture for the ALM-Horn-MRTU(-BR)



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1.1 Features

- Standard Alarm Siren or with Wi-Fi, RS-485 interface
- Modbus TCP, Modbus RTU protocol
- Photo couple input, Open Collector output
- Wide power supply range
- Wide operating temperature range
- Piezo Transducer Output
- Water clear upper cover with 8 Ultra-Bright RED LED, or -BR version with 8 Blue + 8 Red Ultra-Bright LED.
- 4 Selectable Alarm Tone
- NC/NO Input Selectable

1.1.1 Features Description

The ALM-Horn series device accepts any dry contact to trigger DI input, when the alarm been trigger it output from Piezo Transducer, LED's & open collector DO.

ALM-Horn series include 4 kinds of alarm tone, the DIP switch's select which tone when DI been trigger, DIP switch also select the DI trigger mode NC (Normal Close) or NO (Normal Open).

For Communication device, ALM-Horn-WF/ALM-Horn-MRTU it also accepts Modbus protocol to monitor DI status and remote trigger 4 kinds of alarm tone (independent with DI trigger mode DIP switch select).

It has 2 way to make ALM-Horn use as standard siren just supply power without DI input, one, just switches DI trigger mode to NC (Normal Close), another is short the wire of DI input with GND.



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1.2 Specifications

Table 1-1: System Specifications

Device	ALM-Horn(-BR)	ALM-Horn-WF(-BR)	ALM-Horn-MRTU(-BR)
Alarm Output			
Piezo Transducer Pressure Level	120 ± 5 dB @10cm/3.0 KHz (W/O waterproof membrane)		
LED	Water clear upper cover with Ultra-Bright RED LED x 8 -BR: With 8 Blue + 8 Red Ultra-Bright LED		
Volume Control	no		
Digital Input			
Channels	1		
Input Type	Dry Contact: Sink		
Dry Contact Level	NO: Open, NC: Close to GND		
Photo-Isolation	3750 VDC		
Input Condition	Pulse Width must > 200mSec or more		
Digital Output			
Channels	1		
Output Type	Open Collector (Sink)		
Max Load Current	400 mA		
Load Voltage	+3.5 VDC ~ +30 VDC		
Dip Switch Select			
SW1,2	4 kinds of alarm Tone		
SW4	Input Mode (NO/NC) select		
Wi-Fi Interface			
Interface	-	Wi-Fi 2.4G	-
Standard Supported	-	IEEE 802.11b/g/n	-
Wireless Mode	-	Station & AP (1 Client)	-
Encryption	-	WEP, WPA and WPA2	-
Service	-	TCP, Modbus TCP, HTML	-
MRTU Interface			
Interface	-	-	RS-485
Parity /Data bit/ Stop bit	-	-	None/Odd/Even, 8, 1/2
Baud Rate	-	-	300 ~ 115200 bps
Protocol	-	-	Modbus RTU
Watchdog	-	-	Yes, 1.8s



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Device	ALM-Horn(-BR)	ALM-Horn-WF(-BR)	ALM-Horn-MRTU(-BR)
LED Indicators			
Power/Status	2 colors LED, Blue for System status, Red for Alarm status.		
Protection			
Waterproof	IP43 (Panel Mount Upright Position)		
ESD (IEC 61000-4-2)	±8 kV Air for Random Point		
EFT (IEC 61000-4-4)	±2 kV for Power		
Environment			
Operating Temperature	-20 ~ +75°C		
Mechanism			
Dimensions(WxLxH)	119mm x 119mm x 48mm		
Installation	Panel Mount/Wall Mount		
Power Requirements			
Input Voltage Range	12 ~ 48 VDC with Reverse Protection (Vin to GND)		
Consumption	0.4 W Active.	0.7 W Standby.	0.48 W Standby.

2. Hardware

2.1 Outward Appearance

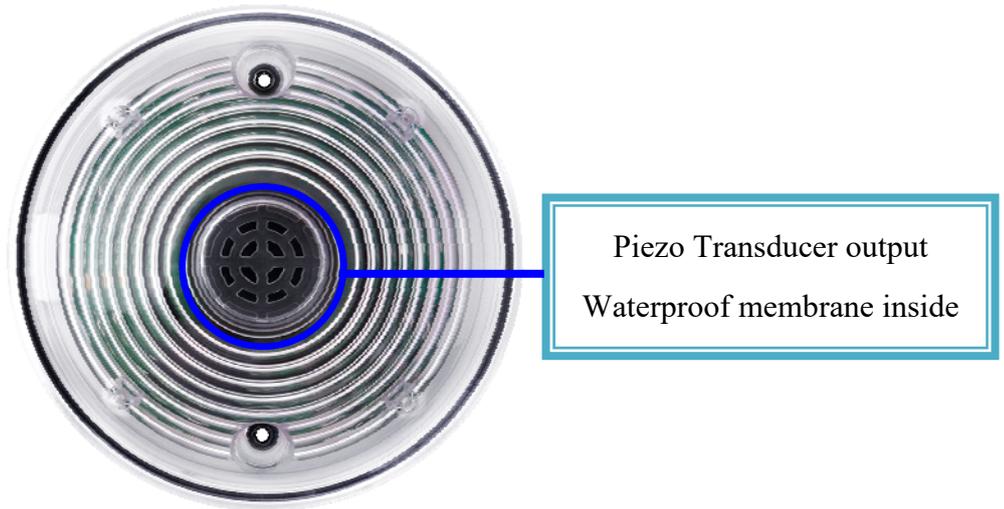


Figure 2-1: Front Panel

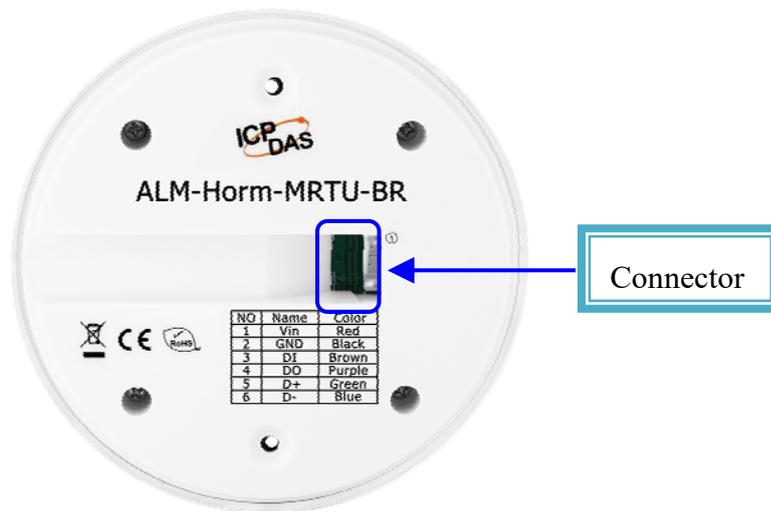


Figure 2-2: Back Panel

2.1.2 Connector Pin Define

Terminal NO	Pin Name	Wire Color
1	Vin	Red
2	GND	Black
3	DI	Brown
4	DI.GND	Black
5	D+	Green
6	D-	Blue

Figure 2-3: I/O Connector of ALM-Horn-MRTU(-BR)

Terminal NO	Pin Name	Wire Color
1	Vin	Red
2	GND	Black
3	DI	Brown
4	DI.GND	Black
5	NC	Green
6	NC	Blue

Figure 2-4: I/O Connector of ALM-Horn(-BR) & ALM-Horn-WF(-BR)

2.2 Configuration & Setting

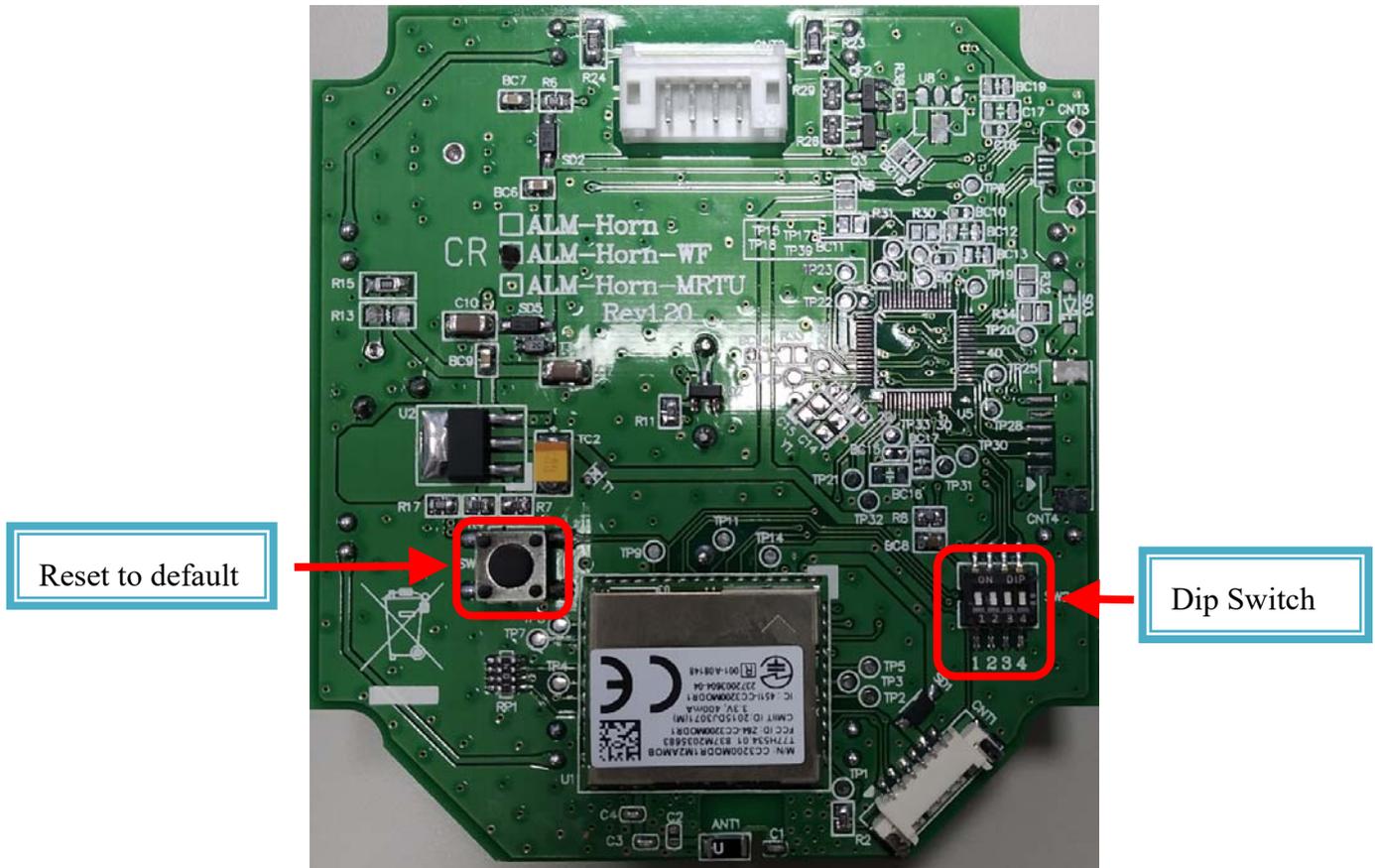


Figure 2-5: Switches on the PCB

2.2.1 Reset to default for ALM-Horn-WF(-BR) only

Remove the back panel, Press & hold the Reset button on the bottom side over 6 Sec until the Red LED(Status/Alarm) quick flash then release to restore device default setting. **Default is set in AP mode.**

2.2.2 Dip Switch Select (All ALM-Horn series)

Dip Switch	Switch	Index	Waveform
<p>1 2 3 4 Tone</p>	ON 	0	
	ON 	1	
	ON 	2	
	ON 	3	

Figure 2-6: Alarm Tone select switch for DI trigger alarm

Dip Switch	Switch	Input Mode
<p>1 2 3 4 Input Mode</p>	ON 	NO(Normal Open): Short to GND Alarm
	ON 	NC(Normal Close): Open from GND Alarm

Figure 2-7: DI Input Mode (NO/NC) select switch

Note: Change the Input Mode NC/NO must restart the power to take effect.

2.3 Dimensions

The diagrams below provide the dimensions of the ALM-Horn series to use in defining your enclosure specifications. All dimensions are in millimeters.

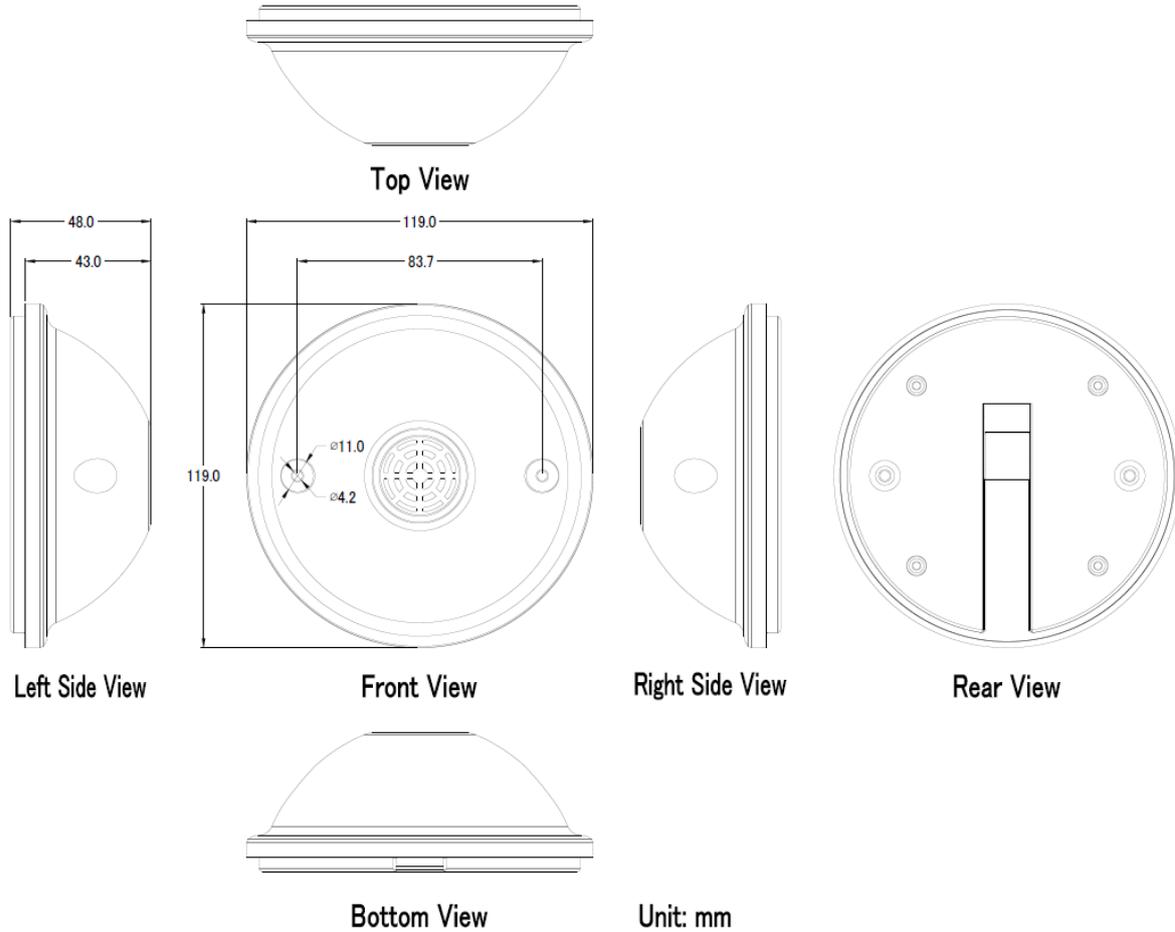


Figure 2-8: Dimension of the ALM-Horn series

2.4 Wire Connection

2.4.1 Wire connection define

The following describe the wire color



Figure 2-9: Wire color

2.4.2 I/O connection

2.4.2.1 Digital Input (DI) wiring

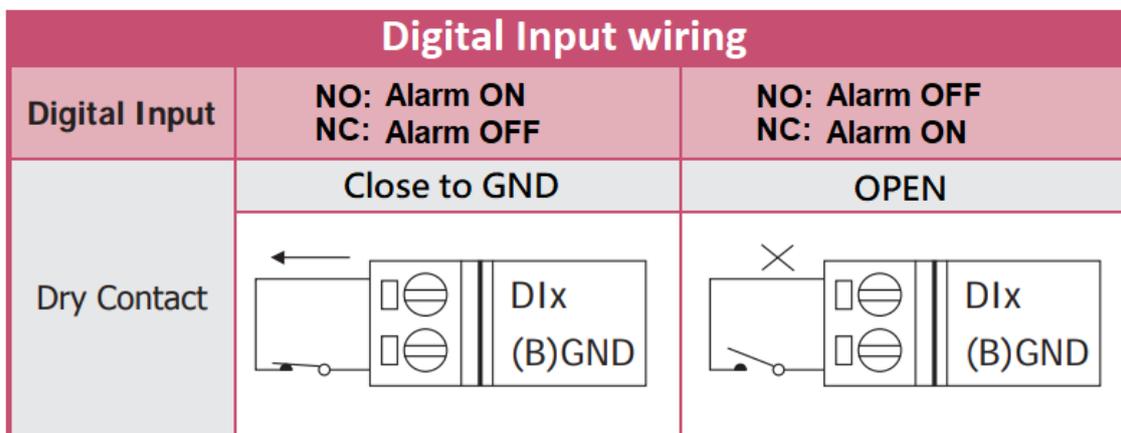


Figure 2-10: DI Dry contact wiring

2.4.2.2 Open Collector Digital Output(DO) wiring

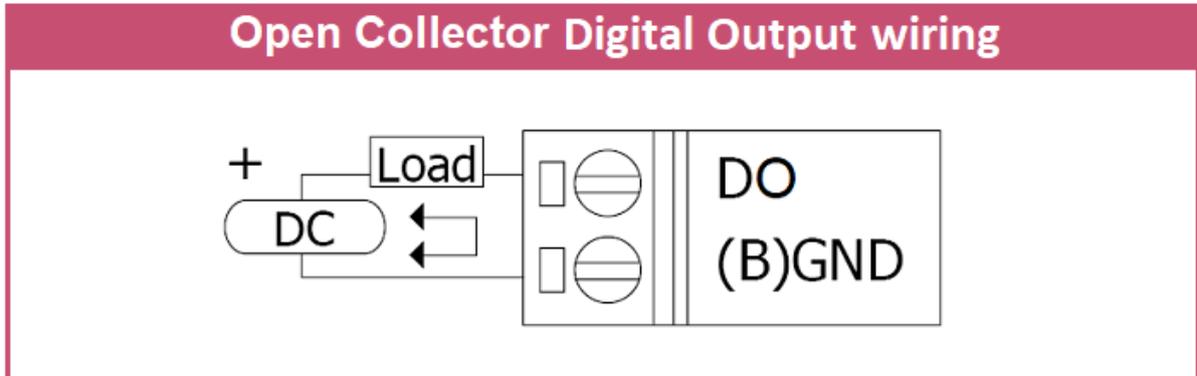


Figure 2-11: Open Collector Output wiring

2.4.2.3 RS-485 wiring for ALM-Horn-MRTU

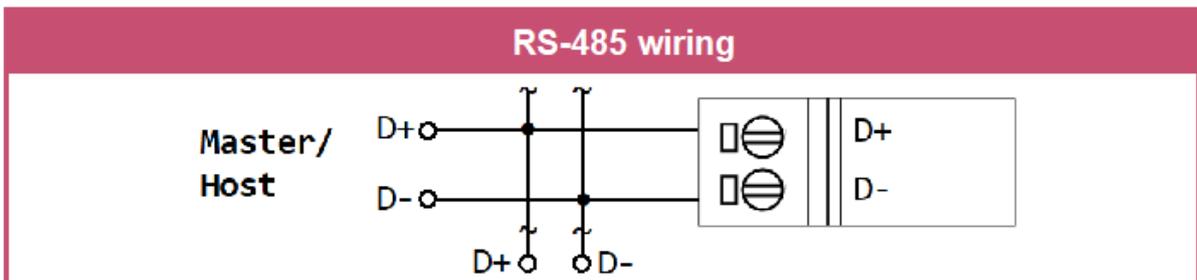


Figure 2-12: RS-485 wiring for ALM-Horn-MRTU

3. Software

3.1 ALM Utility for ALM-Horn-WF(AP Mode)

The Utility provides the simple way to operating and acquire I/O status. The Utility can use the wireless network interface to configuration. Provide AP(Access Point) & STA(Station) mode to connect the ALM-Horn-WF.

ALM Utility available on both Windows & Android application to operating and configure the ALM-Horn-WF.

Utility Support Windows 7 (or later versions) and Android 5.0 (or later versions).

The following is the main screens provided by Utility, these utility tools can be thought as a useful tool for configuration and monitoring on the ALM-Horn-WF. It supplies several functions, such as Monitoring, Control, Connection, Wi-Fi setting and F/W upgrade, etc...

3.1.1 Main Screen

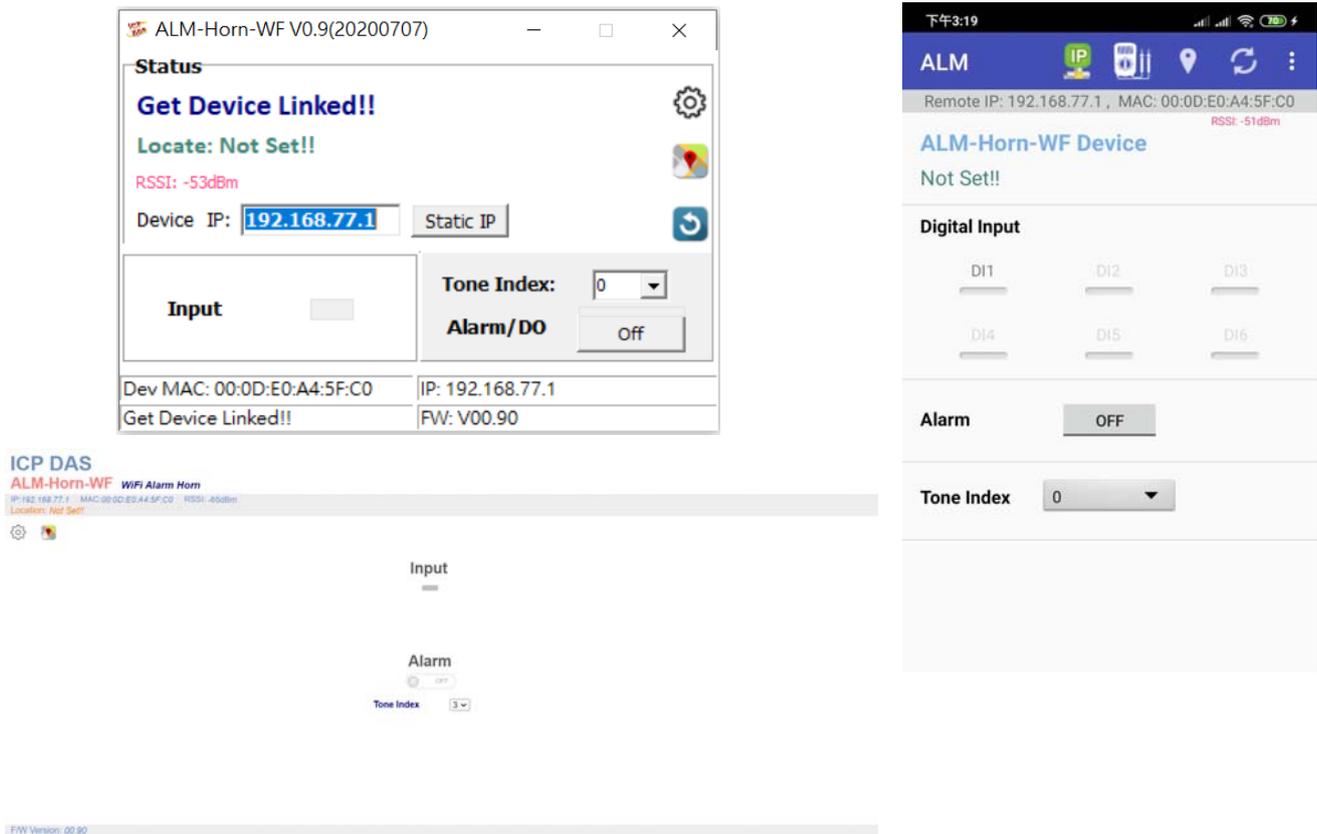


Figure 3-1: Utility main screen
(Windows Utility , Android App, WEB)



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3.1.2 Controller Status

Show the connected controller information, user define Locate string, RSSI strength, Device IP & Static IP button for changing device IP in STA mode.

ICP DAS

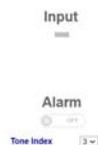
ALM-Horn-WF WiFi Alarm Horn

IP: 192.168.77.1 MAC: 00:0D:E0:A4:5F:C0 RSSI: -65dBm
Location: Not Set!!



3.1.3 DI/DO Status & Control

Show the DI/DO status, The value can be read DI or set DO with Tone Index in this area.



FW Version: 00.90

3.1.4 Icon Button

ICON	function	
	Setup	Open the Setup Screen (Android versions Setup function under the  icon)
	Find Controller	Red Led blinking, use to find the connected Controller
	Refresh	Refresh status
	Menu	Only Android Device, Include setup, FW Version & About.

Table 3-1: icon Indicator

3.1.5 Configuration/Setup

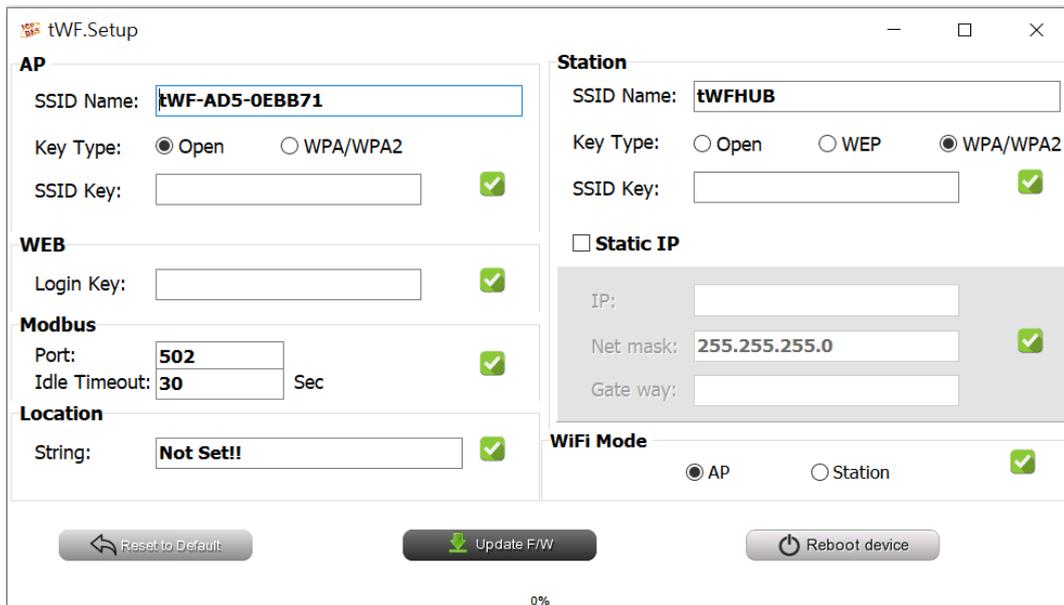
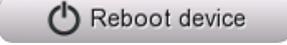


Figure 3-2: ALM Utility setup page

Click apply icon  to save each subject's setting, after finish all setting click  to make device take effect on new setting

AP :

SSID Name

1. Default Controller's SSID in Wi-Fi AP mode, will be ALM-06-xxxxxx.
Note: xxxxxx is the last 6 characters MAC address of your device.

Key Type

AP mode SSID Key type (default is **Open**)

SSID Key

AP mode SSID Key, (default is **None**)

STA :

SSID Name

Wi-Fi AP's SSID intent to connect (default is **tWFHUB**)

Key Type

Wi-Fi AP's SSID Key Type (default is **WPA/WPA2**)

SSID Key

Wi-Fi AP's SSID Key (default is **00000000**)



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Static IP:

IP: Specific an IP that is not been used.

Mask: Default will be **255.255.255.0**.

Gateway: Basically define in the AP you are going to connect.

SSID	Service Set Identifier: Connected devices must be the same SSID, SSID length must not exceed 31 characters.
Key Type	Key of Encryption, connected devices must with the same Key. Open : No Key request. WEP(Shared) : Key length must be 15 characters. WPA/WPA2-PSK : Key length must between 8~15 characters.

Table 3-2: Station SSID & Key type configure

Wi-Fi Mode :

ALM Controller working mode (default is in **AP**)

AP (Access Point) :

PC or Android Device connect to ALM Controller directly through AP(Fixed IP:**192.168.77.1**), AP mode support only one connection, If Multiple devices connect at a same time, only first connected devices can access.

STA(Station):

ALM Controller will auto connect to specific Wi-Fi AP, PC or Android Device also need to connect to the same AP, then they can use those ALM Controller in same domain.

***. Please check specific Wi-Fi AP is active and SSID/key is same as the setting before use.**

Location information:

Set the information for you to identify & locate those Controller easily, length must under 31 characters.

Modbus Port:

Modify Modbus TCP Port (default is **502**)

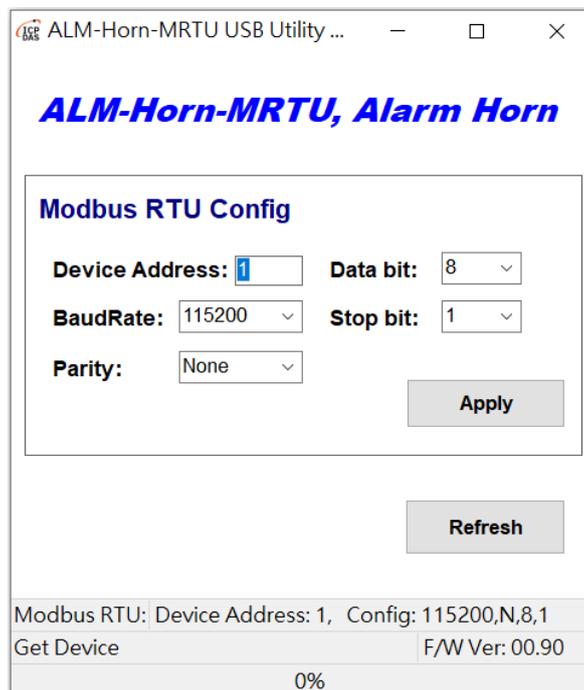
Modbus Idle Timeout:

Set Idle Timeout for Modbus TCP connection (default is **120 Sec**) in STA(Station) mode, recommend 30 Sec. when device in STA mode connect to an AP, Host device break connect with AP and lost connection, the device will hang in a dead connection. To prevent this happen, set a timeout, the device will close the connection and wait for next connect.

3.1.6 IP Scanner

There are lots of free IP scanner tools in both Windows & Android OS, for example “[Advanced IP Scanner](#)” for Windows, “[Network Analyzer](#)” for Android, those are high performance scanner tools on each OS.

3.2 USB Utility for ALM-Horn-MRTU



The Utility provides the simple way to configuration ALM-Horn-MRTU via Micro USB from the device. Include Device Address, Baud Rate, Parity, Data bit length, Stop bit length. After finish setting, press “Apply” to make device take effect with the new config.



4. Modbus Protocol

4.1.2 Function Code

The function code field of a Modbus data unit is coded in one byte. Valid codes are in the range of 1 ... 255 decimal (the range 128 - 255 is reserved and used for exception responses). When a Modbus request is sent from a Modbus Client to a Server device the function code field tells the Server what kind of action to perform.

The Modbus TCP/RTU feature of ALM-Horn-WF/-MRTU supports 5 function codes, which allows the reading and writing of data contents of registers.

Function Code	Descriptions
01 (0x01)	Read Coil Status
02 (0x02)	Read Input Status
03 (0x03)	Read multiple Analog Output registers
05 (0x05)	Force Single Coil
06 (0x06)	Write single Analog Output registers register

Table 5-2: Supports Function Codes of ALM-Horn-WF/-MRTU

Any other function code request will be returned with an error response indicating the function code is not supported, as well as a request for too much data or data at a register address that not present.

4.1.3 Error Response

Byte Index	Field Name	Byte count	Description
00	Address	1 Byte	1 to 247
01	Function code	1 Byte	Function code + 0x80
02	Exception code	1 Byte	01

Table 4-2: Error response of Modbus Protocol

If a CRC mismatch occurs, the module will not respond.



4.2 Data Encoding

Modbus uses a “big-endian” representation for address and data items. This means that when a numerical quantity larger than single byte is transmitted, the most significant byte (MSB, also called the high-order byte) is send first. The following sub-topics describe the different byte of encoding and show how the data is encoded as it is within the Modbus packet.

4.2.1 Binary

A binary item is represented as a single bit within a data word. All binary is packed into 16-bits data words, which are accessed using function code 01 and 02. Therefore, a single register contains 16 bits of binary data, each having a specific meaning.

Value	1st	2nd
0xAA55 (1010101001010101)	0xAA (10101010)	0x55 (01010101)

Table 5-3: A single register contains 16 bits of binary data

4.2.2 16-bits Word

A 16-bits word item is transmitted with the most significant byte first. Function code 03 and 04 read 16-bits items at a time; therefore, each of these data items will fit within one register that is read.

Value	1st	2nd
0x1234	0x12	0x34

Table 5-4: A 16-bits word item

4.3 Modbus TCP Protocol Description

The Modbus protocol defines a simple protocol data unit independent of the underlying communication layers. The mapping of Modbus protocol on network can introduce some additional fields on the application data unit.

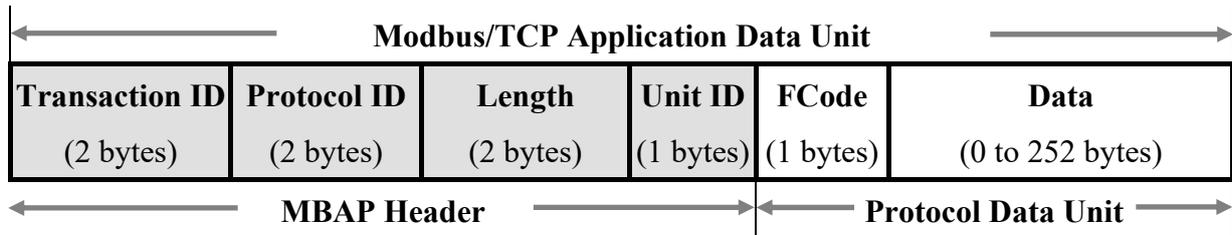


Figure 5-1: Modbus/TCP Application Data Unit

4.3.1 MBAP

The Modbus/TCP extension includes 7 additional bytes to the original Modbus protocol, which allows for transport over the TCP/IP layers.

A dedicated header is used on TCP/IP to identify the Modbus Application Data Unit. It is called the MBAP Header (MODBUS Application Protocol Header). The MBAP Header consists of 7 bytes of information:

Fields	Length	Description
Transaction Identifier	2 bytes	Identification of Request/Response transaction – Copied from request to response
Protocol Identifier	2 bytes	0 = Modbus protocol
Length	2 bytes	Number of following bytes - Includes the Unit Identifier
Unit Identifier	1 byte	Identification of remote slave

Table 5-1: MODBUS/TCP Application Protocol Header

4.4 ALM-Horn-WF/-MRTU Address Mapping

Address	CH	Descriptions	Range	Access Type
00001	1	Alarm with Tone index 0	0=OFF, 1=ON	R
00002	2	Alarm with Tone index 1	0=OFF, 1=ON	R
00003	3	Alarm with Tone index 2	0=OFF, 1=ON	R
00004	4	Alarm with Tone index 3	0=OFF, 1=ON	R

Table 5-6: FC01 Read DO address (0xxxx)

Address	CH	Descriptions	Range	Access Type
10001	1	Digital Input	0=OFF, 1=ON	R

Table 5-7: FC02 Read DI address (1xxxx)

Address	CH/Length	Descriptions	Range/Value	Access Type
40011	Always 1	Read Idle Timeout value	16bit Word	R

Table 5-8: FC03 Read multiple AO address (4xxxx)

Address	CH	Descriptions	Range	Access Type
00001	1	Set Alarm with Tone index 0	0x00=OFF, 0xFF=ON	W
00002	2	Set Alarm with Tone index 1	0x00=OFF, 0xFF=ON	W
00003	3	Set Alarm with Tone index 2	0x00=OFF, 0xFF=ON	W
00004	4	Set Alarm with Tone index 3	0x00=OFF, 0xFF=ON	W

Table 5-8: FC05 Write DO address (0xxxx)

Address	CH	Descriptions	Range/Value	Access Type
40011	-	Write Idle Timeout value	16bit Word(1~65000)	W

Table 5-9: FC06 Write single AO address (4xxxx)



Technical Support

If you have problems about using the ALM-Horn Series device, please contact ICP DAS Product Support.

Email: service@icpdas.com