MICROCYBER

G1100 WirelessHART Smart Gateway

User Manual

V1.2

WirelessHART

WirelessHART Smart Gateway G1100

Caution

In order to ensure the personal and property safety, and get the best product experience, before using, installation, and maintenance products, please be sure to read all the content of the document.

Security Reminder

The user must pay special attention to the content of this manual to ensure that the personal and property safety. The potential security problems may cause are marked with orange color. Please refer to the safety information before operations marked with that color.

Warning

The products described in the manual are not designed for nuclear industry application.

Content

1. Overview 1
1.1 Brief Introduction 1
1.2 Including Goods 1
2. First Connection 2
2.1 Summary 2
2.2 System Requirements 2
2.3 First Setting 3
2.3.1 Prepare PC/Portable Computer 3
2.3.2 Connection and Power On 4
2.3.3 Gateway Configuration 4
3. Installation and Connection 8
3.1 Summary 8
3.1.1 General Considerations 8
3.1.2 Physical Description 8
3.2 Installation 8
3.3 Connection 10
3.3.1 Ground 11
3.3.2 Ethernet 11
3.3.3 RS-485 11
3.3.4 Power 12
4. PC Integration 13
4.1 Summary 13
4.2 Network Structure 13
4.3 Modbus 14
4.3.1 Communication Setting 14
4.3.2 Register Map 15
4.4 Private Protocol 18
5. Failure Solution 20
6. Function 23
6.1 Language Selection 23
6.2 Network Information 24
6.2.1 Network Overview 24
6.2.2 Node Information 24
6.2.3 Measurement Information 28
6.3 Statistics Information 28
6.3.1 Network Statistics 28
6.3.2 Modbus Statistics 29
6.4 Setting 29
6.4.1 Network Setting 30
6.4.2 Node Setting 30
6.4.3 Security Setting 32
6.4.4 Ethernet Setting 33
6.4.5 Protocol Setting 33

Content

6.4.6 Modbus Register Map 33
6.4.7 Time Setting 33
6.4.8 About 34
7.Terms List 35
Appendix A Product Specification 36
A.1 Function Specification 36
A.2 Communication Specification 36
A.3 Self-assemble Network Specification 37
A.4 System Security Specification 37
A.5 Physical Specification 37
A.6 Ordering Information 38
A.7 Accessories 39
Appendix B： Product Certification 39
B.1 FCC and IC 39

1. Overview

Warning

Please pay attention to the rules, otherwise it may cause damages to personal and property.

- Please ensure the installation is carried out by the expertise staff.
- Please ensure the working environment and related danger lever are relevant.

1.1 Brief Introduction

WirelessHART smart wireless gateway is in charge of establishment, management and maintenance of WirelessHART network, and network optimization, to make the devices in the network work in the effective and safe situation. Meanwhile WirelessHART smart gateway integrates device wireless information in the network to the PC system or data application, and provides related security assurance.

WirelessHART smart wireless gateway has the leading data reliability, network safety and advanced customer experience. It provides Web service for real-time network running check and data, without any restrictions. The engineer shall check abundant device status and device information in the Web service. And it provides total configuration function and the user may configure the device at any time and anyway.

1.2 Including Goods

- WirelessHART smart gateway
- Fast guidance manual
- Metal installation accessories
- Network cable

2. First Connection

Warning

Please pay attention to the installation rules, otherwise it may cause death or severe injury.

- Please ensure the installation is only carried out by expertise staff.
  The explosion may cause death or severe injury.
- Please check the equipment's working environment and related dangerous environment certification are relevant.
  Electricity shock may cause death or severe injury.
- Please be careful when connecting wires and terminals.
- Please keep the distance at least 20cm between antenna and people when installing the devices.

2.1Summary

Warning

When the gateway is normal, please do not cut off the power, otherwise it will lead to unpredictable consequences.

Here is about the configuration setting on how to connect gateway for the first time, and before it is in field control network. The user shall notice that some gateway is only used in single application, without network connection. In these circumstances, the user still needs to configure items in this section.

Before installation gateway and connecting to field control network, the user shall configure IP address for the gateway. It is carried out via a private network between gateway and PC/portable computer. The following goods are required:

- Gateway
- PC/portable computer
- Cables (provided together with gateway)
- 24VDC (nominal value) power

2.2 System Requirements

There are the requirements for PC/portable computer, when to configure the gateway:
Network browser application program (support one of them)

Firefox browser 35 or plus

Chrome browser 40 or plus

Microsoft Internet Explorer 8.0 or plus

Ethernet

10/100base-TX Ethernet communication protocol

2.3 First Setting

2.3.1 Prepare PC/Portable Computer

The user shall configure PC/portable computer before gateway communication, to establish a private network. The gateway setting shall be found in the PC/portable computer‘s control panel. Following are the methods:

1. Open “Network Connections”.
2. Choose “Local Area Connection”.
3. Click right click, choose “Properties” in the list.
4. Choose Internet Protocol (TCP/IP), and choose “Properties”.

Figure 2-1 Local Area Connection Properties

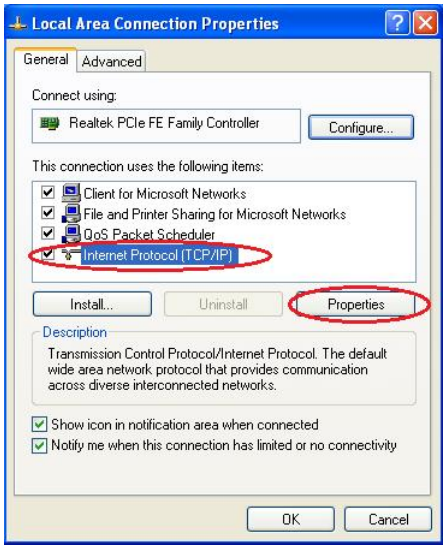
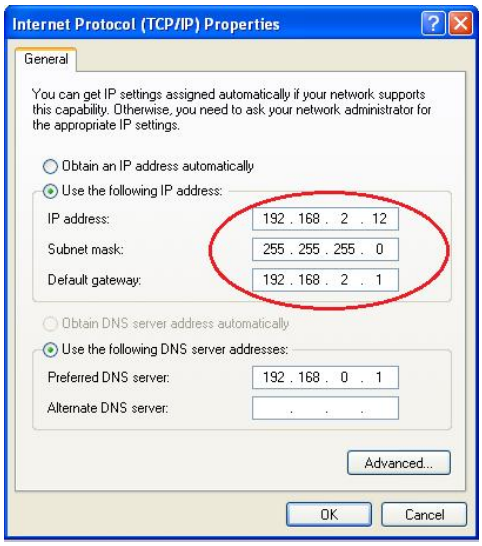


Figure2-2 Internet Protocol Properties



Caution

If PC/portable computer is from other network, please down the present IP and other settings, so that the PC/portable computer shall get back to previous network work after the configuration.

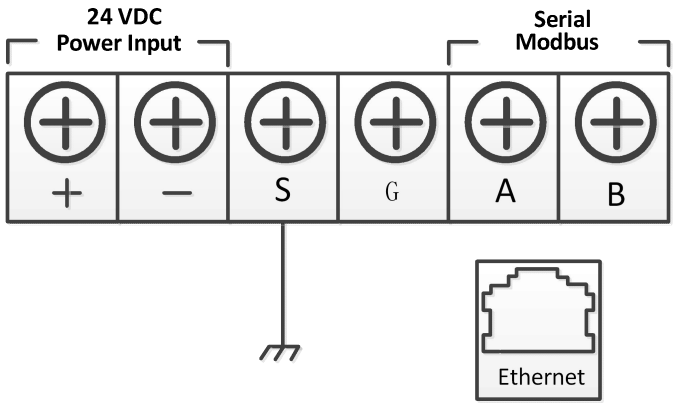
5. Choose “Use the following IP address” from “General”.
6. Set IP address as “192.168.2.XX” (and it cannot be as the same as gateway, gateway default IP is 192.168.2.253), and press Tab.

7. Subnet mask shall be set as 255.255.255.0.
8. Click “OK”, close “Internet Protocol (TCP/IP)” and “Local Area Connection”.

2.3.2 Connection and Power On

With network cables provided together with gateway, connect one end of cable to Ethernet port of PC/portable computer, and connect the other end of Ethernet port of gateway, shown as the Figure below. After the connection between gateway and PC/portable computer, connect 24VDC (nominal value) power, at least 500mA to power input terminal of gateway.

Figure 2-3 Gateway Connection Terminals Diagram



Warning

- Please be careful when connecting wires and terminals.
- The user must use the cable pipe entrance located at the bottom of housing when connecting to gateway. The connection “open gateway’s cover” may press the connection parts and damage the gateway.

2.3.3 Gateway Configuration

Now the user can log in the gateway and configure it into field control network.

2.3.3.1 Log in Gateway Webpage

Log in the gateway on following steps:
1) Open standard network browser.
2) Input in the address bar: https: //192.168.2.253.
3) Confirm the security, and then continue.
4) Input username admin.
5) Input password 123456.

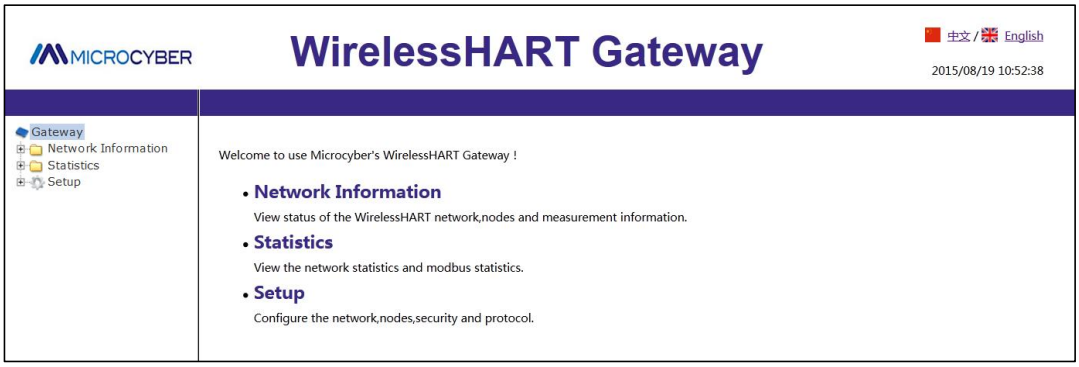
Notice

In address bar input https rather than http.

Now the network browser has been in the gateway's default homepage, the left side of homepage is navigation menu, including:

- Network information: Check wirelessHART network status, online device information and measurement information.
- Statistics: Provide wireless network statistic information and Modbus statistic information
- Setup: Configure network, node, security, protocol and other parameters.

Figure 2-4 Gateway Homepage



2.3.3.2 TCP/IP Gateway Setting

Warning

Please be more careful when user is modifying the TCP/IP network setting. If the setting is missing or wrong, the user probably cannot log in the gateway. Please contact network administrator, so that the user could use TCP/IP network setting correctly.

Before installing and connect the gateway to fieldbus control network, the user shall configure IP address and other TCP/IP network settings, as following:

1) Choose "Setup" >"Ethernet".

2) Input the following information:

- IP Address: 192.168.2.253 (gateway default IP for reference)
- Netmask: 255.255.255.0
- Gateway: 192.168.2.1

Notice

IP address range 192.0.0.1~223.255.255.254.

IP address 192.168.99.xx segment is not available.

3) Click "Submit".

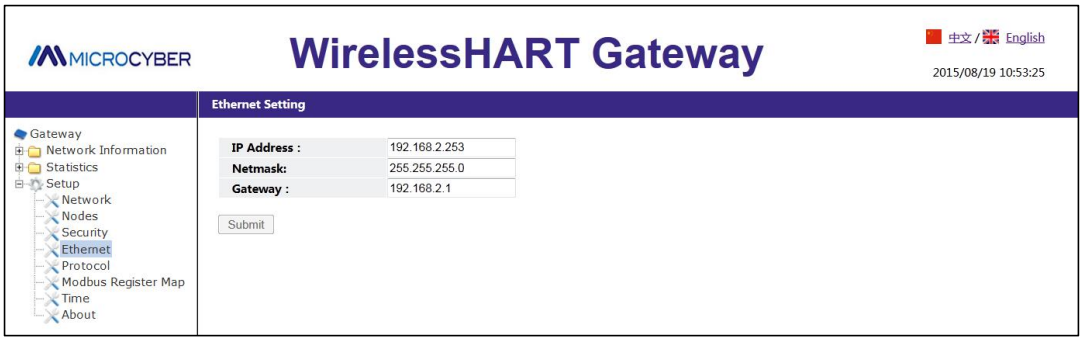
4) If the reminder is "Successful!", click "Yes". If the reminder is "Failed", the user shall resubmit

and check the gateway's Ethernet connection. Please refer to Section 5.

5) If the reminder is "Restart gateway now?", click "Yes". The gateway shall restart.

6) Restart network browser.

Figure 2-5 Ethernet Setting



Caution

After modifying the gateway IP, the communication with the webpage shall lost. After restarting the browser, and using the new IP address and other TCP/IPs, the network setting shall log in the gateway again. It may require modifying PC/portable computer's TCP/IP network setting, PC/portable computer's IP address and gateway's IP address must be in the same network segment.

2.3.3.3 Wireless Network Setting

Before installation the gateway and connecting it to field control network, the user shall configure the wireless network information. The wireless network setting is as following:

1) Choose "Setup" >"Wireless Network Setting".

2) Set the following information:

- Network name: Field wireless network name
- Network ID: 1～65535
- Join Key: 16-byte hexadecimal numbers

Default wireless network information:

- Network ID: 1229
- Join Key: 00000000 00000000 00000000 00000000

3) Click "Submit".

4) If the reminder is "Successful!", click "Yes". If the reminder is "Failed", the user shall resubmit and check the gateway's Ethernet connection. Please refer to Section 5.

5) Click "Restart", to restart the gateway and the setting is effective.

Figure2-6 Network Setting

3. Installation and Connection

Warning

Explosion may cause death or severe injury.

- Please check if the device working environment is related to relevant dangerous place certification.

Electrostatic discharge may damage electric devices:

- Before taking the electric devices, or connecting leads or terminals, the people-ground device shall be set. Electricity shock may cause death or severe injury. If the device is installed at high-voltage environment, and with failure situation and installation mistake, there probably shall be high-voltage between device leads and terminals.
- Please be careful when touching leads and terminals.

It may cause death or severe injury, if the user doesn't following installation rules:

- Please ensure the installation is only carried out by expertise staff.
- Please keep the distance at least 20cm between antenna and people when installing the devices.

3.1 Summary

The section is about how to install gateway and carry our electric connection correctly, including electric connection, ground and PC system connection.

3.1.1 General Considerations

Smart wireless gateway can be installed at any universal position. Please ensure the protection cover is ready, otherwise any electric device touch may bring in humility and pollution.
The gateway shall be installed in the place where is easy to connect PC system network (process control network) and wireless field network.

3.1.2 Physical Description

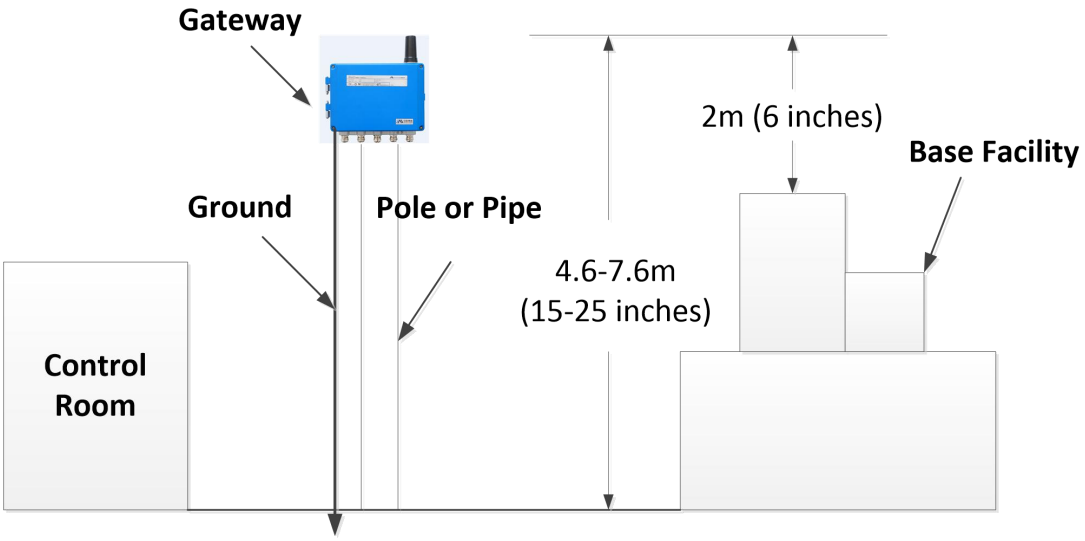
The dimension information is referred in Appendix A: Product Specification. Cast Aluminum covers gateway's electric circuit. The user may operate electric device, wireless device and wiring terminals after opening the housing.

3.2 Installation

Find the best wireless performance for the gateway. Generally, the place is 4.6-7.6m (15-25 inches) high from the ground or 2m (6 inches) high from the base facility. Figure 3-1 is an

example for that.

Figure 3-1 Gateway Installation



The gateway shall be fixed to the designed position with the pendant, and the pendant is provided together with the gateway. The hole dimension of gateway bottom housing and pendant are shown as Figure 3-2, Figure 3-3, Figure 3-4.

The steps to install gateway as following:

1) With screw, to fix pendant ① to the designed position.

2) With screw, to fix pendant ② to the gateway bottom housing.

Hang gateway to pendant ①, to finish the installation.

Figure 3-2 Gateway and Pendant

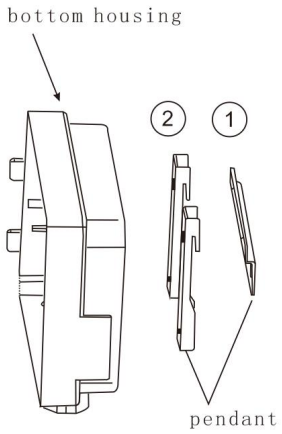


Figure 3-3 Gateway Bottom Housing Dimension (Unit: mm)

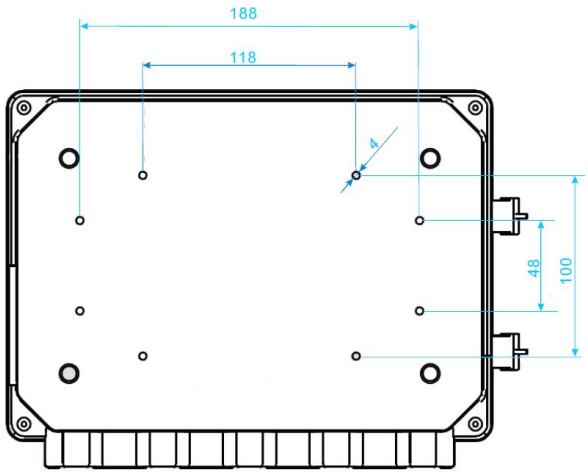
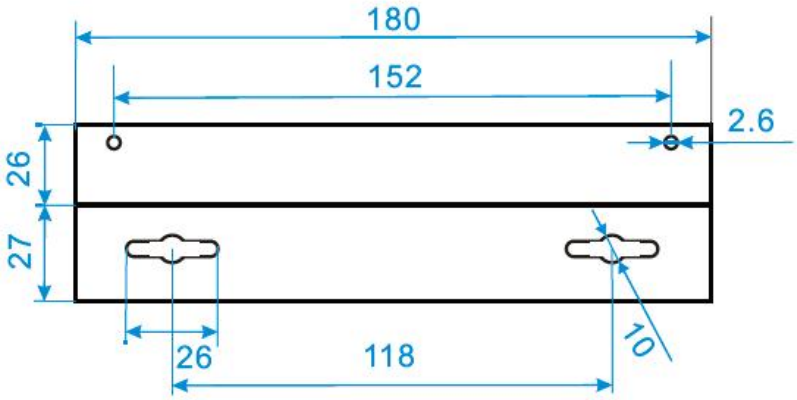


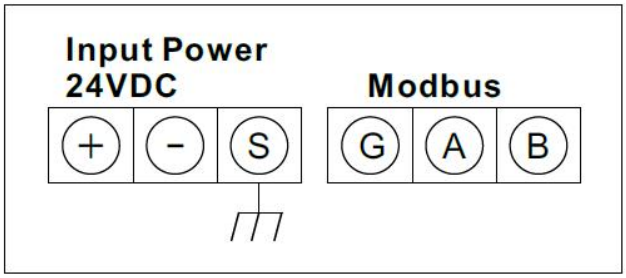
Figure 3-4 Gateway Pendant ① Dimension (Unit: mm)



3.3 Connection

All the connections to gateway may be at the wiring terminals, the wiring terminal is inside the housing, and the wiring terminal label is inside the external housing. The standard wiring terminal label is shown in Figure 3-5.

Figure 3-5 Standard Wiring Terminal Mark



In junction box of external housing, there are five lead entrances for power wire and communication wire. Don't make power wire and communication wire together to pass lead pipe, or make the signal wire near the powerful electric device.

Install lead pipe end cap at the new lead pipe port. In order to meet NEMA 4X and IP65 requirements, the user shall wind PTEE belt at external thread or smear sealant, to create watertight seal.

3.3.1 Ground

The gateway housing shall be grounded according to national and local electric specification. The most effective way is to connect gateway housing to the ground via minimum impedance. The user may also connect external ground terminal and ground to make gateway grounded. The impedance shall be no more than 1 Ω. The external ground terminal is at the bottom of the gateway, and it has the mark as following:

3.3.2 Ethernet

The gateway has a 10/100Based-TX Ethernet communication port (shown as Figure 2-3). The connection is for access to gateway webpage and pass Modbus TCP and own protocol communication.

For Ethernet connection, the user shall use Cat 5E type shield cable to connect Ethernet concentrator, interchanger or router. The maximum length of cable is no more than 100m (328 inches).

3.3.3 RS-485

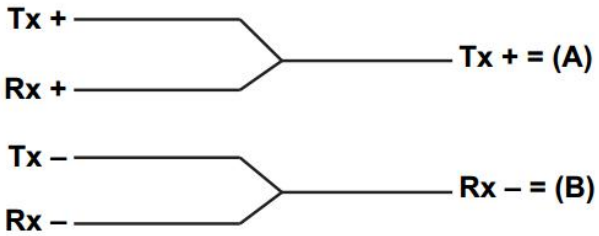
The gateway assigns RS-485 (serial) connection (Figure 3-5). The user may assign the connection via A and B serial Modbus terminals, and the connection can be used for communication between RS-485 data bus and Modbus RTU.

The user may use 18 AWG single STP to connect gateway and RS485 data bus. The bus length is

no more than 1220m (4000 inches). The user shall connect Tx+ (positive pole, sending) and Terminal A, and connect Tx+ (negative pole, receiving) and Terminal B. The wiring shielded layer shall be shut and insulated, to prevent gateway housing to contact terminals of other ends.

If 4-wire full duplex configuration is used for all the data bus, please change it into 2-wire half duplex configuration, according to Figure 3-6.

Figure 3-6 Full Duplex to Half D Duplex



3.3.4 Power

The gateway is powered by 24 VDC (nominal value), and requires at least 500 mA current. The positive and negative poles are connected to left side of terminal (Figure 3-5). The additional housing ground wire is under the housing.

The user shall connect the power to the positive pole + of wiring terminal and negative pole – of power terminal (Figure 3-5). The wiring shall be near gateway, and using external power cut-off switch and breaker.

Caution

UPS is recommended, to ensure the availability during outage period.

4. PC Integration

4.1 Summary

The section is about how to connect gateway and PC system, and integrate collected data from field device network, covering network structure, security ability and data mapping.

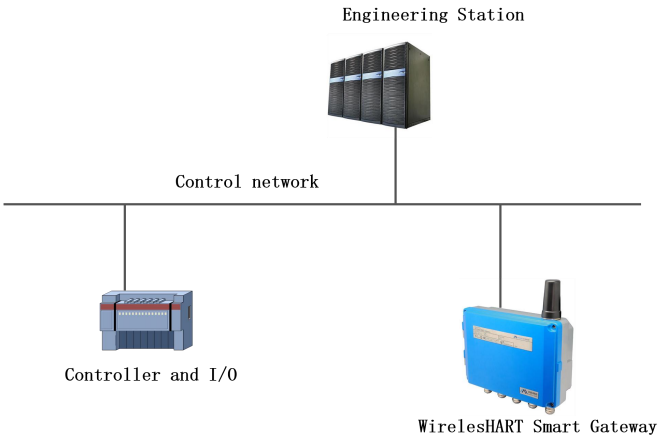
4.2 Network Structure

When the user is determining the network structure and protocol to integrate, the physical connection type is pretty important. Ethernet is the primary physical connection type, and RS485 can be used as the optional one. When the sub-gateway is sending integrate data to host system, and the network structure in Figure 4-1 is helpful.
If the user has higher security requirements, the user shall connect WirelessHART gateway to PC system via LAN (rather than WAN)

Ethernet

Ethernet connection supports Modbus TCP and private protocols. With this connection type, the gateway shall connect to control system via network interchanger, router or concentrator directly. (Shown in Figure 4-1)

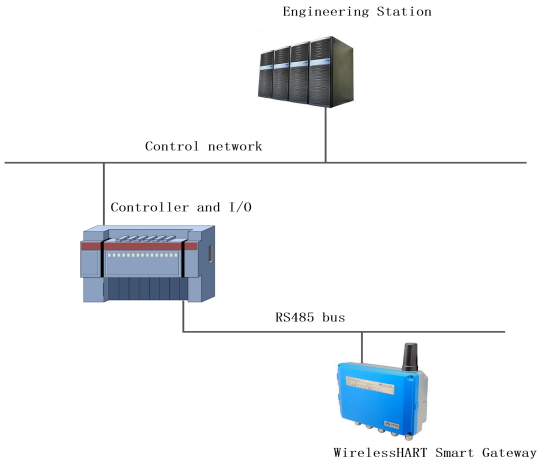
Figure 4-1. Ethernet LAN Structure



RS485 (Serial)

RS485 connection supports Modbus RTU protocol. With this connection type, gateway shall connect RS485 bus, the bus is generally connected with I/O board or Modbus I/O board.

Figure 4-2. RS485 LAN Structure



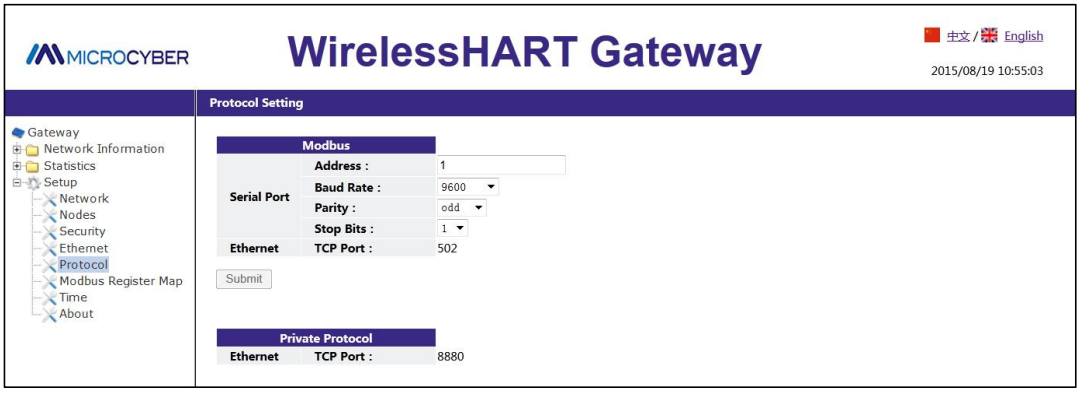
4.3 Modbus

The gateway supports RS485 serial port's Modbus RTU and Modbus TCP based on Ethernet. As a sub-device of Modbus network, polling by Modbus master device or client end (PC system) is requested.

4.3.1 Communication Setting

The communication setting in gateway shall set as the same as that of Modbus master device or client end. Choose "Setup" >"Protocol" in the gateway webpage, to enter Protocol Setting.

Figure 4-3. Protocol Setting



Address: The address is used by gateway for Modbus RTU communication, range 1~247.

Baud Rate: Serial Modbus RTU communication date ratio or speed, 1200~ 115200 bits/s supported.

Parity: The setting determination is used for failure check's odd-even check of Modbus RTU

communication. (none, even check or odd check)

Stop bit: The setting determination is used for numbers of stop bit of Modbus RTU communication information end. (1 or 2)

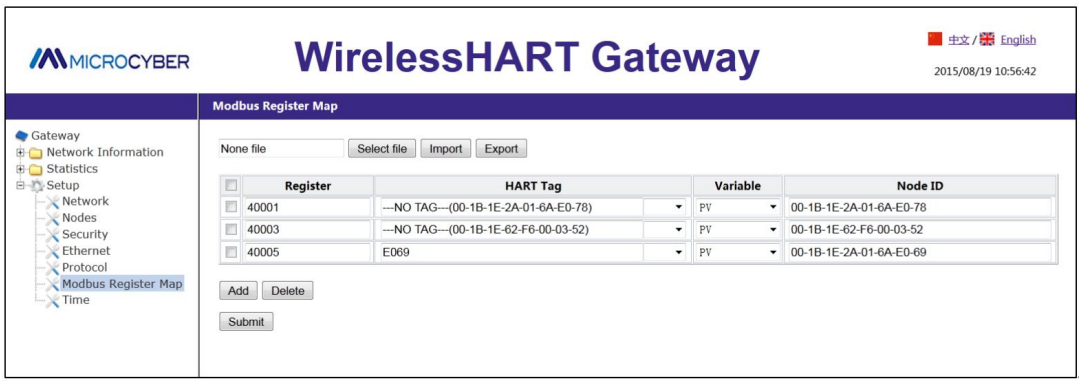
TCP Port: It is the TCP/IP port number for Modbus TCP (Ethernet), used by the gateway. The default value is 502.

Click “Submit” and there will be “Restart the Gateway now?”, click “OK”. The gateway shall restart, and the setting is effective.

4.3.2 Register Map

Register map is to distribute device data points in the wireless field to Modbus register, and Modbus primary device or client side shall read these registers. In the gateway setting, choose “Setup” >”Modbus Register Map” to enter.

Figure 4-4. Modbus Register Map List



1. The way of adding new data points to Modbus register map:

1) Click “Add”.
2) Fill in all the items for the new data points.
3) Do step 2 again, for each new added data point.
4) Click “Submit”.
5) When the modification is accepted, the reminder will be “Successful!”.

2. The way of deleting Modbus register map data points:

1) Mark the items to delete.
2) Click “Delete”, wait until all the items to delete disappears.
3) Click “Submit”.
4) When the modification is accepted, the reminder will be “Successful!”.

Register (Register starting address):It is the Modbus register number. Modbus register holds 2-byte (16-bit) information, so 32-bit floating value and integer value need 2 Modbus registers. Field device state (HARTState) is 1-byte data, and it represents register’s high byte, and low byte

is not effective. Each date point has the only Modbus register number.
No. 40001~49000 registers are used for floating value or integer value.
No. 30001~39000 registers are used for device state (HARTState) (high byte effective)
No. 10001~19000 registers are kept for Boolean type value (bit, coil, binary system, etc.).
HART Tag: Long tag for wireless field device.
Variable: Variable name of wireless field device. Please refer to Table 4-1.
Node ID: Long address for wireless field device.

Table 4-1. Available Device Variable

Parameter	Description	Data Type
PV	Primary value	32-bit floating
SV	Second primary value	32-bit floating
TV	Third primary value	32-bit floating
QV	Fourth primary value	32-bit floating
PV_HEALTHY	PV healthy state	Boolean
SV_HEALTHY	SV healthy state	Boolean
TV_HEALTHY	TV healthy state	Boolean
QV_HEALTHY	QV healthy state	Boolean
State	Wireless communication state	Boolean
HartState	Device running state	8-bit integer

PV, SV, TV and QV (dynamic variables) change when the device type changes and they are important dynamic variables for HART device. Please refer to HCF_SPEC_99 for more details.
**_HEALTHY parameter is the healthy state indications for dynamic variables. The parameters combine wireless field device's important diagnosis information and communication states. 1: good; 0: bad.
State is relevant to wireless communication, and marks the device state in wireless network. 1: on-line；0:off-line.
HartState is the field device running state, following is the detailed info for HartState.

Table 4-2. Device Status

Bit Code	Description
0x80	Device malfunction: The device detected a serious error or failure that compromises device operation.
0x40	Configuration changed: An operation was performed that changed the device's configuration.
0x20	Cold start: A power failure or Device Reset has occured.
0x10	More status available: More status information is available via Command 48, Read Additional Status Information.
0x08	Loop current fixed: The Loop Current is being held at a fixed value and is not responding to process variations.
0x04	Loop current saturated: The Loop Current has reached its upper (or lower) endpoint limit and cannot increase (or decrease) any further.
0x02	Non-Primary variable out of limits: A Device Variable not mapped to the PV is beyond its operating limits.
0x01	Primary variable out of limits: The PV is beyond its operating limit.

3. The way to import register map file:

The user may use the way of importing file to set gateway register map, only CSV file is supported.

1) Click “Select file”, choose the window to upload file.
2) Choose CSV file to upload.
3) Click “Import” to upload the file.
4) If the upload is successful, it will show “Upload a file successfully”.
5) If the upload is failed, it will show “Failed to upload a file”.

Caution

CSV file shall be edited in the particular format.

1. Table format, includes register start address and register name.
2. Register name format is “device tag.device variable.device ID”, and device variable name value is shown in Table 4-1.
3. Register start address must be in the defined range, shown in Table 4-3.
4. Register addresses should not be overlapped.
5. The file size is 500KB at most.

Click “Export”, and the gateway register map list is saved in terms of CSV file in PC/portable computer.

The detailed Modbus register map is shown as following:

Table 4-3. Modbus Register Map

Modbus Master		Webpage Configure Modbus Slave	
Function Code	Read Number at most	Register Start Address	Optional Variables
02	1-2000	10001-19000	State、**_HEALTHY
04	1-125	30001-39000	HartState
03	1-125	40001-49000	PV、TV、SV、QV

Caution

When Modbus master is reading gateway's Modbus data, the user shall notice:

1. Gateway Modbus module only supports function codes 02, 03 and 04.
2. When reading data with function codes 02, 03 or 04, the gateway supports to read multiple data continuously.
3. Function codes 02, 04: During continuous read, there should not be register addresses which are not configured by the gateway. If there are register addresses which are not configured by the gateway, the gateway shall reply error data frame.
4. Function codes 03: During continuous read, there may be register addresses which are not configured by the gateway. For the register addresses which are not configured by the gateway, the reply data is 0.
5. When the user is importing the Modbus Register map, if the device doesn't exist in the device mark, when the data is read, the gateway shall reply error data frame.

4.4 Private Protocol

Gateway could only process supportive commands provided by HART protocol. For some customized commands, the gateway shall convert these commands to private protocol data format, and send out via TCP/IP. Meanwhile, gateway shall send out field device's burst info via private protocol way. The transfer data flow is ASCII characters, and each data frame begins with "[", and ends with "]". There is "," in each character, and byte range is 0~255. The TCP port number of private protocol is 8880.

Table 4-4. Own Protocol Format

Control Byte	Node ID	Device Status	Extended Device Status	Command ID	Number of Byte	Payload	CRC Parity
1Byte	8Byte	1Byte	1Byte	2Byte	1Byte	N Byte	2Byte

Among them:

Control byte: 1 byte

bit0 -- 0: Response 1: Request

bit1 -- 0: Unicast 1: Broadcast

bit2~bit7 –: Default value is 0.

Node ID: Device long address, 8-byte hexadecimal numbers.

Device status: 1 byte, please refer to details in Table 5-2.

Extended device status: 1 byte, please refer to details in HCF_SPEC_183.

Command ID: 2-bytes ,Command number.

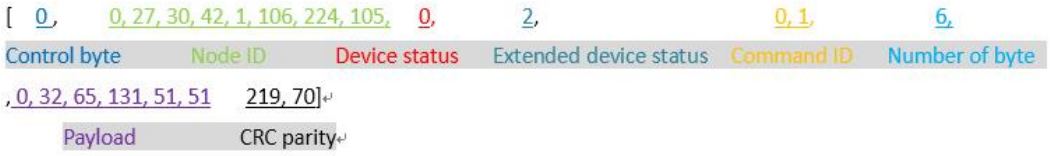
Payload: Data packets corresponding to the command ID.

CRC parity: 2 bytes, CRC parity code for control byte to load.

Master device or client-side may use TCP/IP interface way, to receive field device report information via private protocol format.

Example:

Example of data frame with node ID “00-1B-1E-2A-01-6A-E0-69”:



5. Failure Solution

Caution

For more information, please refer to Section 1 in the manual, or get more documentation form Microcyber's website: www.microcyber.cn.

The section is about basic information for WirelessHART network's failure solution. The user may send email to Microcyber's wireless specialists via "specialists. wireless@microcyber.cn"

First Connection		
1	Web browser return: No display for the webpage or Not found the webpage. Or display as "Disconnected from the network..."	1. Check if the power is correct, the nominal value is 24VDC and 500 mA. Open the housing top cover, to check if the indication light is on. 2. Use additional network cable to connect gateway and PC/portable computer. Check if the network cable is installed correctly. 3. Check gateway IP address (default address is https://192.168.2.253/), the related PC/portable computer address shall be 192.168.2.XXX. 4. Forbid proxy browser setting. 5. Please user security connection way to connect gateway device, to input https://192.168.2.253/. Please notice to use "HTTPS" service. 6. If the above solutions are not helpful, please clear the cache data in the browser and try again.
2	Cannot find the gateway after modifying IP address	1. Check if the webpage reminds modification is successful after IP address modification. After the successful modification, the gateway shall restart to make it effective. If the user doesn't restart the gateway, the user may use previous IP address to connect the gateway. 2. After gateway IP modification, please check if PC/portable computer is modified to related IP segment. (e.g. If the gateway's IP address is modified as 192.168.10.XXX, the PC/portable computer's IP address shall be 192.168.10.YYY) 3. Please refer to Item 1 to see if there is any operation mistake.
3	Cannot login the gateway after input the username and password	1. Please check if the username and password are input correctly. The default username is admin and the password is 123456.

Failure Solution

Wireless Field Device		
1	Wireless field device is not listed in the device list.	1. Please check if the device is powered correctly, the user may use configuration software/handheld device to check. 2. Check if the device is in the distance available for communication. 3. Check if the wireless device setting parameters are confirmed. Check if “Network Setting”, “Network ID” and “Join Key” are relavant to field device parameter setting. 4. Comfirm wireless gateway “Network Setting”>” Active Advertising” is “Activated”. 5. If wireless device is adapter device, please wait for more minutes, generally WirelessHART adapter device shall be charged for 3-5 minutes, and then join the website.
2	Cannot display process data in “Measurement Information” after wireless device joined the network	1. In the gateway’s “Burst Information”, find the device, and click the device’s HART Tag link, to check if the Burst Mode is configured. The user may use the gateway’s on-line configuration function to configure, and the setting, after 1-5 minutes, to check if there is process date in “Measurement Information”.
3	No data display in “Measurement Information” after Burst Mode configuration for wireless field device	1. Check if Burst configuration is correct. 2. Check the number of on-line device and related Burst period. Because WirelessHART network bandwidth is limited, so the user shall reduce Burst period and number of Burst used by each device. 3. After reducing Burst period, if there is still no process data, the user shall reduce Burst period and restart gateway to try.
Modbus Communication		
1	Cannot use Modbus RTU communication	1. Check RS485. 2. Check the wiring. 3. Check if terminal connection is necessary. 4. Check if the gateway’s Modbus parameter setting is related to Modbus master setting, to protocol page to confirm and check Modbus serial parameters. 5. Check gateway’s Modbus device address. 6. In “Modbus Register Map” page, to check if Modbus register map is correct.
2	Cannot use Modbus TCP communication	1. Check gateway’s Modbus TCP terminal port number setting. (The default one is 502.)

		2. Check if Modbus master device's IP address is configured correctly, and fill in gateway's IP address correctly, and confirm the gateway and Modbus master are in the same LAN and configured in the same network segment. 3. In "Modbus Register Map" page, to check if Modbus register map is correct.
3	Receive abnormal Modbus response frame	1. Check if the register address (not configured) is read.(especially when Function code 02 and Function code 04 are used) 2. Check if the read length is correct. (For Function code 02), the odd number of bytes should not be read. 3. Function code 03 supports to read multiple bytes continuously, and 2 bytes are related to 1 register start address. The user shall pay attention to read address and register address are related. 4. Check if the device address and gateway address are related. (for Modbus RTU) 5. When reading PV/TV/SV/QV, check if burst is on.
Private Protocol		
1	Cannot communicate with Private protocol	1. Check connection set of data application's client side, fill in gateway's IP and port number (port number: 8880) correctly. And confirm gateway and Modbus master are in the same LAN and configured in the same network segment.
2	Data received from OEM protocol is messy code form	1. OEM protocol output is ASCII characters, rather than hexadecimal data.

6. Function

Caution

For more information, please refer to Section Terms in the manual, or get more documentation form Microcyber's website: www.microcyber.cn.

Warning

- Following the documentation and related HART specification during the device configuration.
- With the required engineer's guidance to do configuration.
- Error configuration and error time may terrible results.

This section is about WirelessHART smart gateway's function provided in a Web page, including: network information, statically information and part of function setting.

Caution

If the connection between gateway and field control network breaks up, the right side of page will show "Disconnected from the network..."

6.1 Language Selection

The WirelessHART smart gateway web page provides switch function in both Chinese and English.

The Language Selection function is shown in Figure 6-1. Part of the red box can be used to selection language (Chinese or English), each time to switch the whole page jump to the gateway homepage.

Figure 6-1.Language Selection

6.2 Network Information

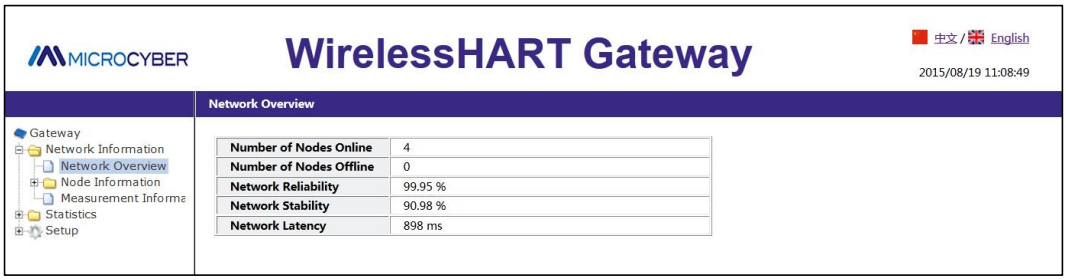
Caution

Each webpage shall refresh at a period time, the updated data shall be marked in green.

6.2.1 Network Overview

Choose “Network Information”>“Network Overview”.

Figure 6-2 Network Overview



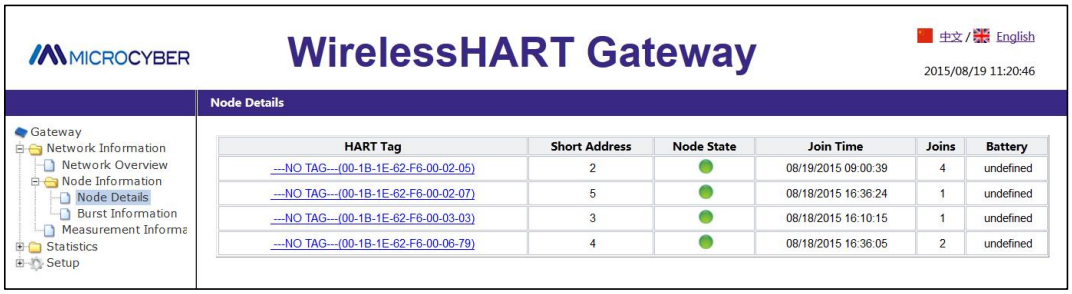
Number of Nodes Online: Number of online node in the present network.
Number of Nodes Offline: Number of offline node in the present network.
Network Reliability: It is the percentage of data package received by gateway. 100% represents the node and data packages sending to nodes are receiving successfully. The value is the average of the whole network range.
Network Stability: In the defined path, the sending data package achieves 100% of its goal. <100% represents some data packages are sending again. The value is the average of the whole network range.
Network Latency: It is the rage time for transmission of a data package from node to the gateway. The value is the average of the whole network. The range is ms(millisecond).

6.2.2 Node Information

6.2.2.1 Node Details

Choose “Network Information”>“Node Information”>“Node Details”.

Figure 6-3 Node Details



HART Tag: Long tag of node.

Short Address: Short address distributed by gateway to nodes.

Node State: online, offline.

Join Time: The latest time for the node to join in the network.

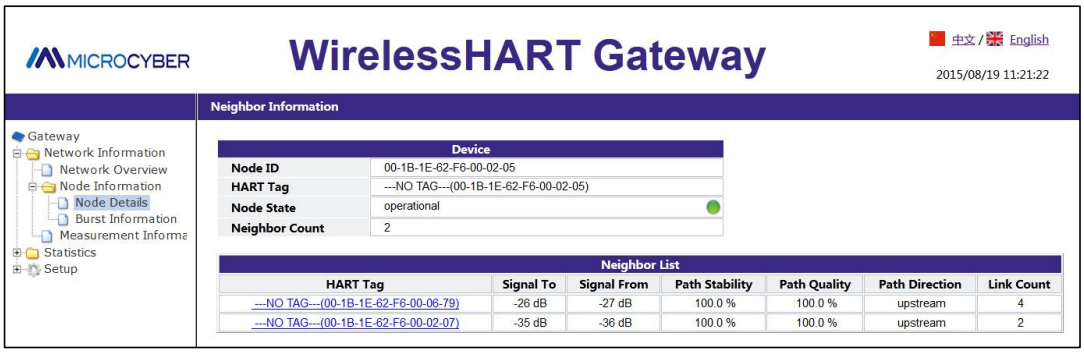
Joins: The number of node to join in the network.

Battery: Only for the inner supportive commands.

Caution

Click the hyperlink for HART Tag to enter “Neighbor Information”.

Figure 6-4 Neighbor Information



Node ID: Long address of node, 8-byte hexadecimal data.

HART Tag: Long tag of node.

Node State: Valued ”idle”or”negotiating”or”operational”, online, offline.

Neighbor Count: Number of neighbor node.

Neighbor List: List of neighbors.

HART Tag: HART tag of neighbor node.

Signal To: The signal strengthens of neighbor node receiving from node data statics, and the unit is db.

Signal From: The signal strengthens of node receiving from neighbor data statics, and the unit is db.

Path Stability: Path stability is the stability between node and neighbor node.

Path Quality: Path quality is the communication quality between node and neighbor node, and

the unit is percentage.

Path Direction: Path direction's range is valued as upstream or downstream.

Link Count: It is the number of link between node and neighbor node. If it is 0, it means there is no path to use.

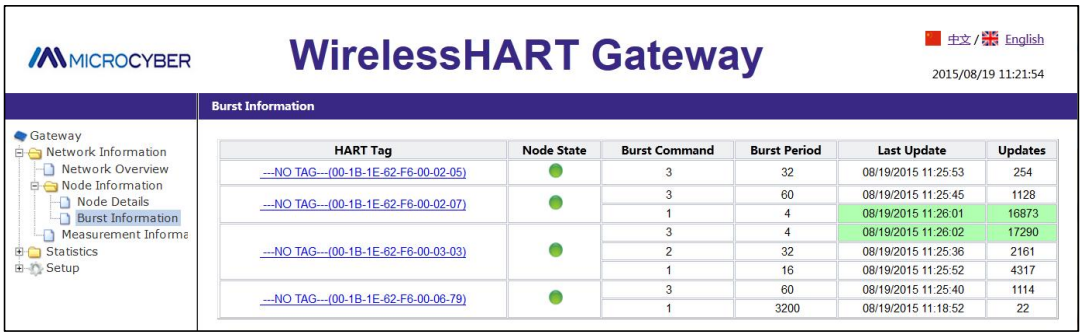
Caution

It may display none in the neighbor list and it is normal. If the user would like to check the real-time content, please keep the webpage for a while.

6.2.2.2 Burst Information

Choose "Network Information">"Node Information">"Burst Information".

Figure 6-5 Burst Information



HART Tag: Long tag of node.

Node State: online, offline.

Burst Command: Command number of burst information.

Burst Period: Period supports range 1, 2, 4, 8, 16, 32, 60~3600.

Last Update: It is the latest time for the gateway to receive node burst.

Updates: the number of burst information received by gateway.

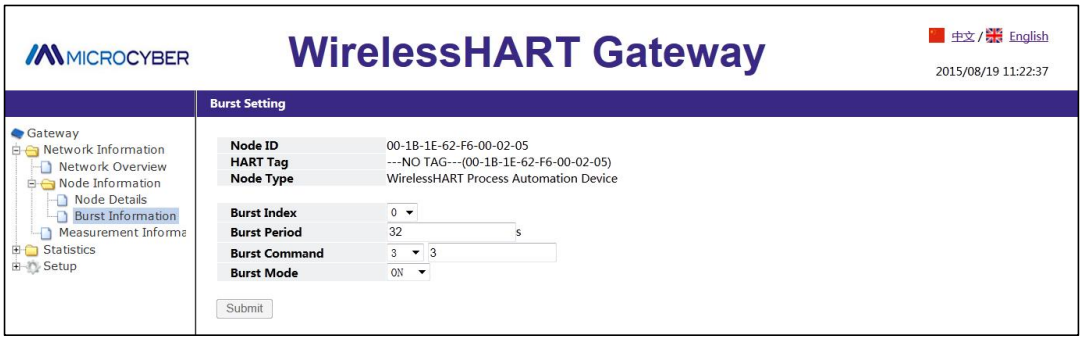
Caution

A node supports 4 pieces of Burst information at most, the list shall display all the burst information in sequence such as Burst0, 1, 2, 3(It won't display the Burst mode which is not on). When multiple burst use the same burst command, it may show the line order, to tell which Burst information.

Caution

Click hyperlink for HART Tag, to enter Burst Setting. There is no hyperlink for offline nodes.

Figure 6-6 Burst Setting



Node ID: Node's long address, 8-byte hexadecimal number.
HART Tag: Long tag of node.
Node Type: Device type of node, values are shown as Table 6-1.

Table 6-1 Device Type List

Process Automation Device
Discrete Device
Hybrid: Process Automation + Discrete
I/O System
WirelessHART Process Automation Device
WirelessHART Discrete Device
WirelessHART Hybrid: Process Automation + Discrete
WirelessHART Gateway
WirelessHART Access Point
WirelessHART Process Adapter
WirelessHART Discrete Adapter
WirelessHART-Enable Handheld/Portable Maintenance Tool

Burst Index: Burst information index, valued range 0, 1, 2, 3.
Burst Period: Period supports range 1, 2, 4, 8, 16, 32, 60~3600, and the unit is s(second).
Burst Command: Support command 1, 2, 3, 9, 33, 48, 128~253, 64768~65021. The user may input via drop-down box or manually.
Burst Mode： Support ON, OFF.
Adapter： It is the adapter tag for present Burst information. Only when node device type is set as WirelessHART Process Adapter, shall it display.

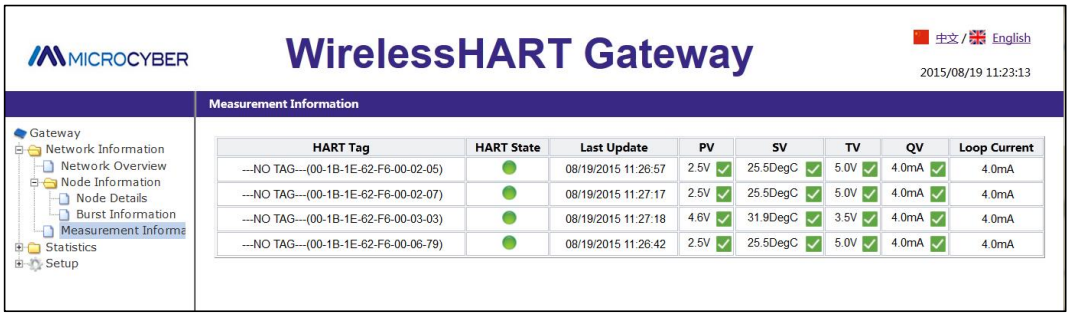
Caution

It shall wait for a while to be effective after Burst Period, Burst Command, Burst Mode, Adapter are modificated. After the modification, it shall show "Change in progress...", when the modification items are grey until appear, the modification shall be effective.

6.2.3 Measurement Information

Choose “Network”>“Measurement Information”.

Figure 6-7 Measurement Information



HART Tag: Long tag of node.

HART State: Display means device online and HART device state is normal.

Only display means device offline.

Display and tip words means HART device state is abnormal.

Tip words are the descriptions for present device’s abnormal state, please refer to Table 4-2 for details.

Last Update: It is the latest time for updates.

PV、SV、TV、QV: four dynamic variables, please refer to Table 4-1 for details.

The health state of the dynamic variable is displayed after dynamic variable values， please refer to Table 4-1 for details.

Display means the health state is normal.

Display means the health state is abnormal.

Loop Current: It is the loop current on HART bus, and the unit is mA.

6.3 Statistics Information

Caution

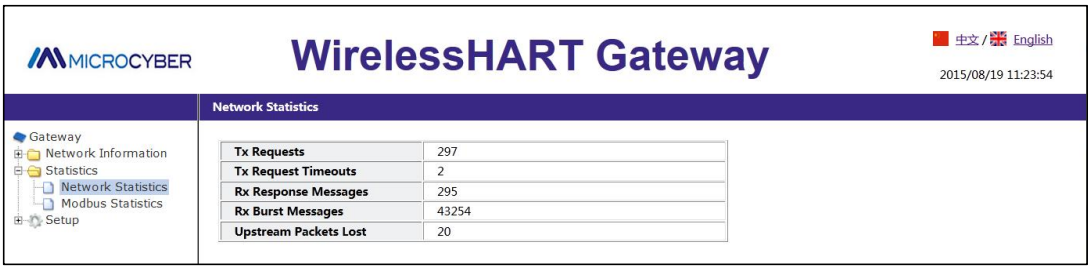
The webpage shall real-time refresh, and the updated date shall be marked in green.

If the HART Tag repeat, Will lead to the green highlights show wrong.

6.3.1 Network Statistics

Choose “Statistics”>“Network Statistics”.

Figure 6-8 Network Statistics



Tx Request: The number of request commands sent by gateway.

Tx Request Timeouts: The number of timeout request commands sent by gateway.

Rx Response Messages: The number of response commands received by gateway.

Tx Request= Tx Request Timeouts+ Rx Response Messages

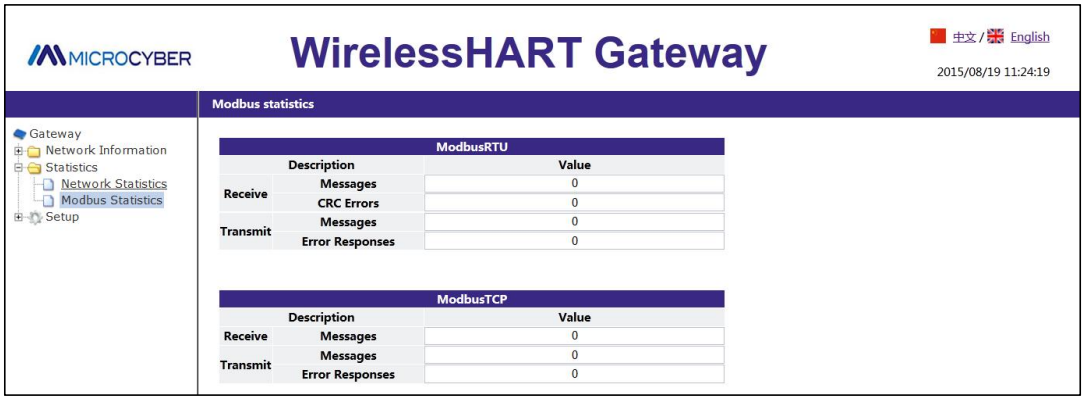
Rx Request: The number of request commands received by gateway.

Upstream Packets Lost: Number of Burst package lost.

6.3.2 Modbus Statistics

Choose “Statistics”>“Modbus Statistics”.

Figure 6-9 Modbus Statistic



It is about the detailed information for ModbusRTU and ModbusTCP data.

6.4 Setting

Caution

In the setting webpage, when the setting items are modified, there will be reminder in yellow in the input box.

Warning

After the complete set on the gateway，please do not immediately cut off power, otherwise it will lead to the setup is unable to take effect, resulting in an expected result.

6.4.1 Network Setting

Choose “Setup”>“Network”.

Figure 6-10 Network Setting

Network Name: It is defined by customers, and it can be characters, numbers, etc.

Network ID: 1~65535

Join Key: It is the security key for starting to join network, 16 bytes, and hexadecimal.

Show Join Key: It is used to display and hide the content joined to the security key.

Advertising Time: It is the time for advertising, 1~255min. When advertising state is Idle, the advertising time shall be set, click “Activation” to activate.

Gateway Reset: Manual reset gateway. Click “Restart”, wait for a while, the reset is effective and the webpage shall refresh.

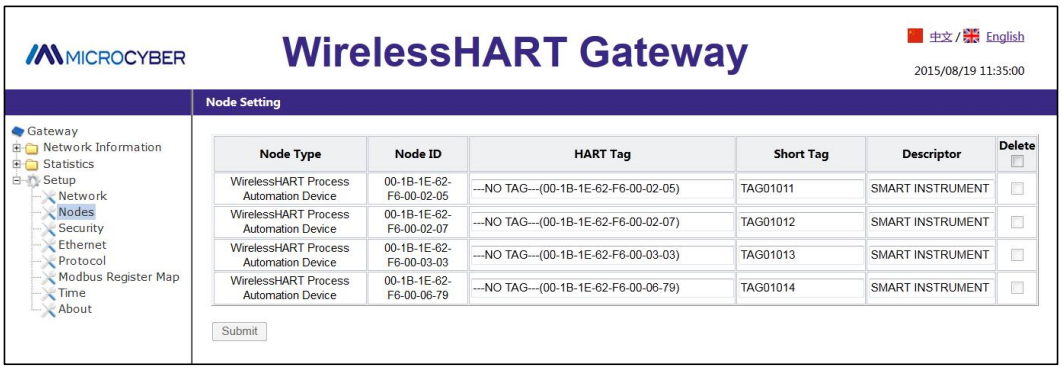
Caution

The gateway shall be effective with manual reset after the modification of Network ID, Join Key, etc. And some devices could be offline.

6.4.2 Node Setting

Choose “Setup”>“Nodes”.

Figure 6-11 Node Setting



Node Type: Node device type, refer to Table 6-1, read-only.

Node ID: Long address of node and it provides the only hexadecimal marked by device.

HART Tag: It is used to mark field device and it supports 32 bytes at most. HART Tag supports ISO Latin-1 characters, shown as Table 6-2.

Caution

HART Tag settings can not be repeated, otherwise it may bring uncertain consequences.

Table 6-2 ISO Latin-1 Characters

20	21 !	22 "	23 #	24 $	25 %	26 &	27 '	28 (	29)	2A *	2B +	2C ,	2D -	2E .	2F /
30 0	31 1	32 2	33 3	34 4	35 5	36 6	37 7	38 8	39 9	3A :	3B ;	3C <	3D =	3E >	3F ?
40 @	41 A	42 B	43 C	44 D	45 E	46 F	47 G	48 H	49 I	4A J	4B K	4C L	4D M	4E N	4F O
50 P	51 Q	52 R	53 S	54 T	55 U	56 V	57 W	58 X	59 Y	5A Z	5B [	5C \	5D]	5E ^	5F _
60 `	61 a	62 b	63 c	64 d	65 e	66 f	67 g	68 h	69 i	6A j	6B k	6C l	6D m	6E n	6F o
70 p	71 q	72 r	73 s	74 t	75 u	76 v	77 w	78 x	79 y	7A z	7B {	7C |	7D }	7E ~	

A0	A1 ¡	A2 ¢	A3 £	A4 ¤	A5 ¥	A6 ¦	A7 §	A8 ¨	A9 ©	AA ª	AB «	AC ¬	AD -	AE ®	AF ¯
B0 °	B1 ±	B2 ²	B3 ³	B4 ´	B5 µ	B6 ¶	B7 ·	B8 ¸	B9 ¹	BA º	BB »	BC ¼	BD ½	BE ¾	BF ¿
C0 À	C1 Á	C2 Â	C3 Ã	C4 Ä	C5 Å	C6 Æ	C7 Ç	C8 È	C9 É	CA Ê	CB Ë	CC Ì	CD Í	CE Î	CF Ï
D0 Ð	D1 Ñ	D2 Ò	D3 Ó	D4 Ô	D5 Õ	D6 Ö	D7 ×	D8 Ø	D9 Ù	DA Ú	DB Û	DC Ü	DD Ý	DE Þ	DF ß
E0 à	E1 á	E2 â	E3 ã	E4 ä	E5 å	E6 æ	E7 ç	E8 è	E9 é	EA ê	EB ë	EC ì	ED í	EE î	EF ï
F0 ð	F1 ñ	F2 ò	F3 ó	F4 ô	F5 õ	F6 ö	F7 ÷	F8 ø	F9 ù	FA ú	FB û	FC ü	FD ý	FE þ	FF ÿ

Short Tag: It supports 8-byte length at most.

Descriptor: It supports 16-byte length at most.

Short Tag and Descriptor support Packed ASCII characters, shown as Table 6-3.

Table 6-3 Packed ASCII Character

@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?

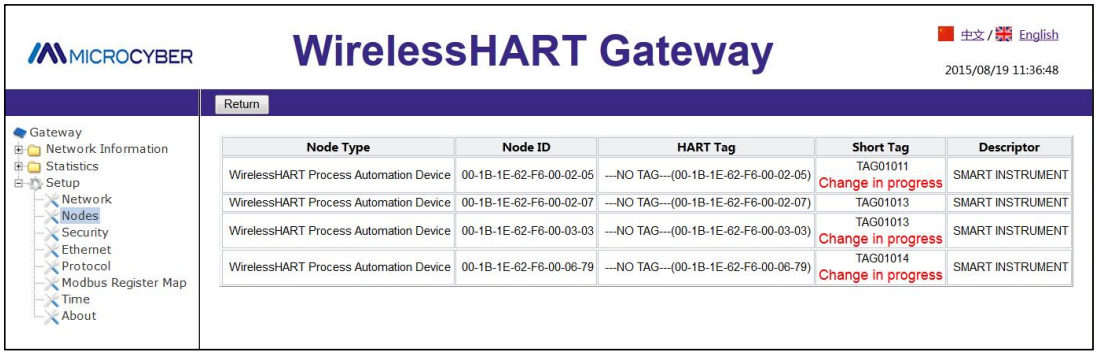
Delete：Delete the offline nodes in the network.

Caution

For the nodes off the network, HART Tag, Short Tag and Descriptor items in grey cannot be written, and the Delete function is available.

Submit: Click “Submit” to see the following webpage.

Figure 6-12 Observe the Node Setting

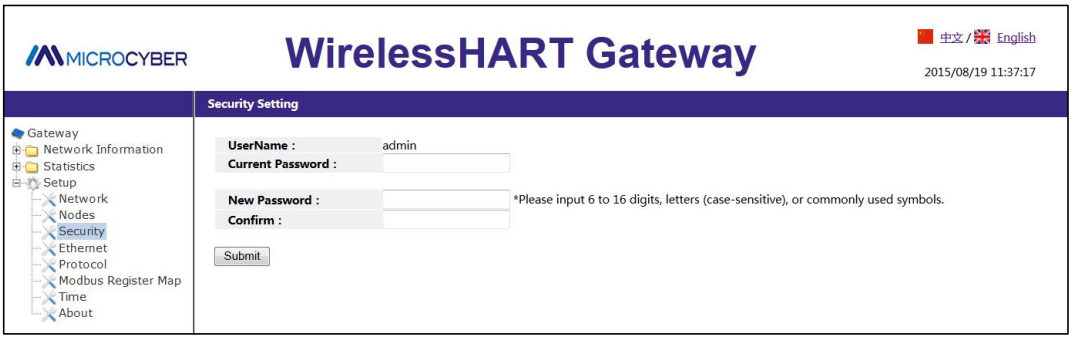


The webpage shall refresh all the information of node setting, after modification, it will show” Change in progress”, until it disappears, the modification is effective. If not, when return to Node Setting, the webpage modification items shall display ” Change in progress”, but the node page cannot real-time refresh, and shall be refreshed manually.

6.4.3 Security Setting

Choose “Setup”>“Security”.

Figure 6-13 Security Setting



Click “Submit”, the webpage shall display “Restart the Gateway now?” click OK. The gateway shall restart, and the setting shall be effective.

6.4.4 Ethernet Setting

Please refer to TCP/IP Network Setting part in Section 2.3.3.2.

6.4.5 Protocol Setting

Please refer to Communication Setting part in Section 4.3.1.

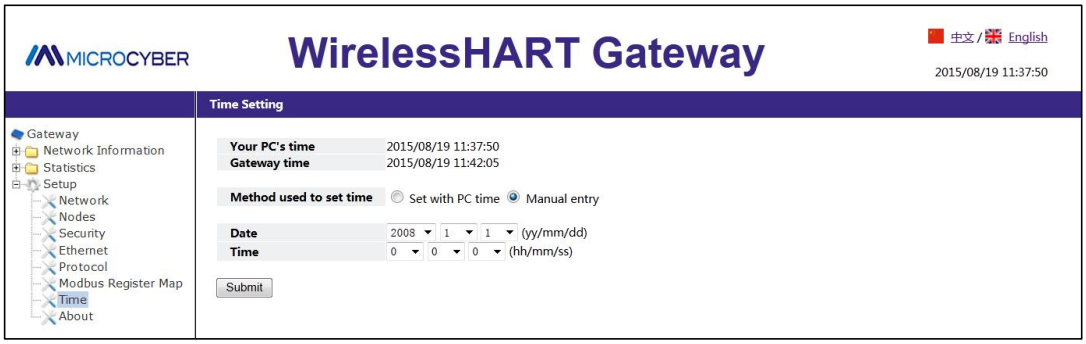
6.4.6 Modbus Register Map

Please refer to Modbus Register Map part in Section 4.3.2.

6.4.7 Time Setting

Choose “Setup”>“Time”.

Figure 6-14 Time Setting



The webpage is used to display and set gateway time.

Set with PC Time: The gateway time shall be relevant to PC time.

Manual entry: The user is admitted to set date (year/month/day) and time (hour/minute/second).

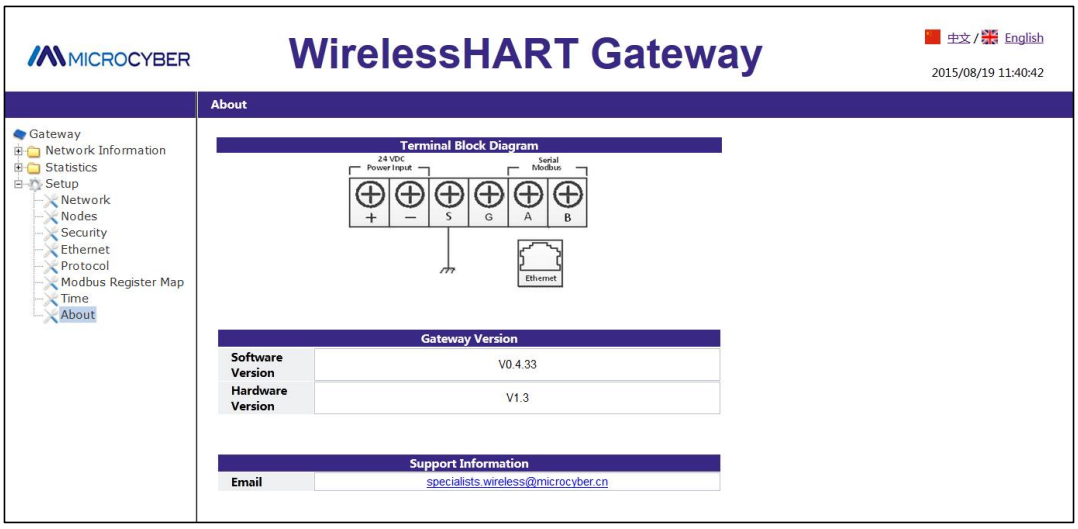
Caution

It may bring deviation between gateway set time and gateway real time, and it is resulted by network delay.

6.4.8 About

Choose “Setup”>“About”.

Figure 6-15 About



This page is used to display the gateway’s terminal block diagram, gateway version and support information.

7.Terms List

Term List	Description
Join Key	It is the hexadecimal security code for wireless device to join in wireless network, and the join keys for gateway and device must be same.
Device ID	Provide the only hexadecimal number of device mark.
Network Reliability	It is the connection performance for gateway and wireless field device. It is calculated according to the ratio between receiving number of information and estimated number of information. And it is calculated to all the paths.
Path	It is the wireless connection between two devices in the wireless network, and it is also called hop.
Path Reliability	It is the connection performance for two devices in the wireless network. It is calculated according to the ratio between receiving number of information and estimated number of information.
TCP/IP	It is the protocol to specify how to transfer data via Ethernet.
Wireless Field Device	Wireless Field device belongs to Wireless field network
Wireless Field Network	WirelessHART network consists of smart wireless gateway and multiple wireless devices.

Appendix A Product Specification

A.1 Function Specification

Input voltage

12~30VDC

Current consumption

24V, current < 0.5A

Antenna's RF power output

Standard antenna:

The highest 10dBm (10mW) EIRP

Environment

Working temperature range:

-40~70℃ (-40~158℉)

Working humility range:

10-90% related humility

EMC

Comply with:

GB-T 17626.2-2006

GB-T 17626.4-2008

GB-T 17626.5-2008

YDT_1312.8-2004

Antenna selection

The integration of omnidirectional antenna

A.2 Communication Specification

Isolation RS485

The twisted-pair communication connection for Modbus RTU multiple ports

Baud rate: 115200, 57600, 38400, 19200, 9600, 4800, 2400 or 1200

Protocol: Modbus RTU

Wiring: Single shield twisted-pair, the longest distance is 1200m.

Ethernet

10/100base-Tx Ethernet communication port

Protocol: Modbus TCP

Wiring: Cat5E shield cable, the wiring distance is 100m.

Modbus

Support 32-bit floating value, integer value, Boolean type Modbus RTU and Modbus TCP

Modbus register is defined by the user.

A.3 Self-assemble Network Specification

Protocol

IEC 62591 (WirelessHART), 2.4-2.5GHZ DSSS.

Largest network scale

250-point wireless device

Supported device refresh ratio

1, 2, 4, 8, 16, 32s or 1~60 min

Network scale/Delay

250-point device：<60s

100-point device：<10s

50-point device：<5s

Data reliability

>99%

A.4 System Security Specification

Ethernet

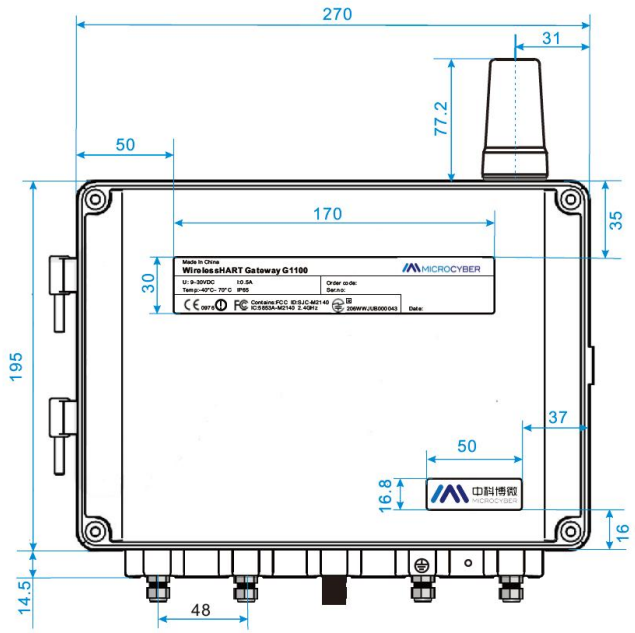
SSL TCP/IP communication

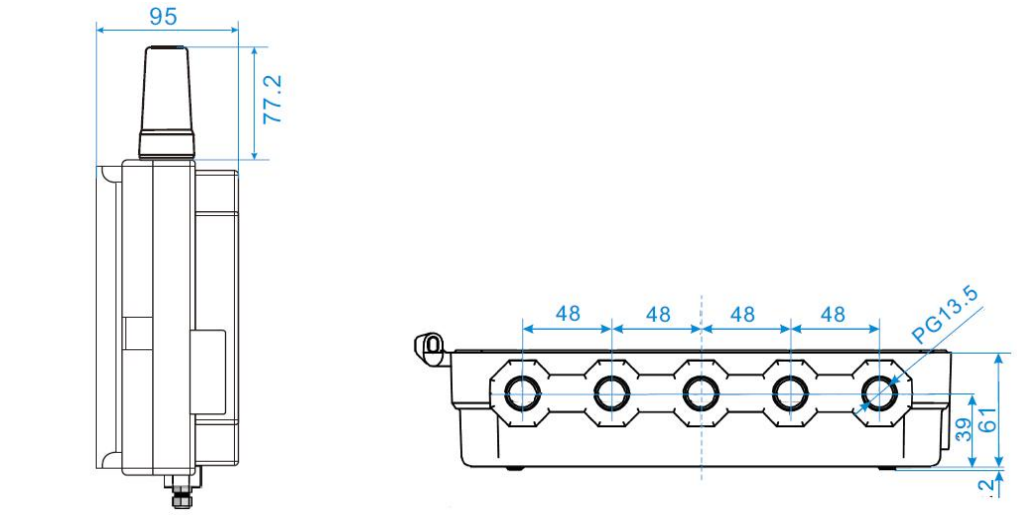
Self-assemble network

AES-128 encryption WirelessHART, including single session ley.

A.5 Physical Specification

Figure A-1 Smart Gateway Dimension (Unit: mm)





A.6 Ordering Information

★ The standard product is the basic option, if the non- standard product is required, it shall be ordered, and the delivery time shall be checked if the extended product is required.

Model	Product Description	
G1100	Smart Wireless Gateway	
Power Input		
Standard		Standard
A	24VDC nominal value (12~30VDC)	★
Ethernet connection-physical connection		
Standard		Standard
1	Single Ethernet port	★
Wireless update ratio, working frequency and protocol		
Standard		Standard
A3	The update ratio shall be configured by the user, 2.4GHz DSSS, WirelessHART	★
Serial communication		
Standard		Standard
A	Modbus RTU via RS485	★
Ethernet communication-data protocol		
Standard		Standard
1	HTTPS, TCP/IP ,Modbus TCP, own protocol	★
Antenna		
Standard		Standard
A	2dBi 2.4G omnidirectional antenna	★
Typical Model: G1100 A 1 A3 A 1 A		

A.7 Accessories

Project Description	QTY
Fast Guidance	1
1.5M cable	1
Matching installation bracket	1
Matching installation screw	4

Appendix B： Product Certification

B.1 FCC and IC

The device complies with FCC specification 15. The device shall comply with the following items: The device cannot be interrupted. The antenna and people shall be keep 10cm away with each other during installation.