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Wi-Fi Serial Device Server

USR-W610

User Manual

V2.0

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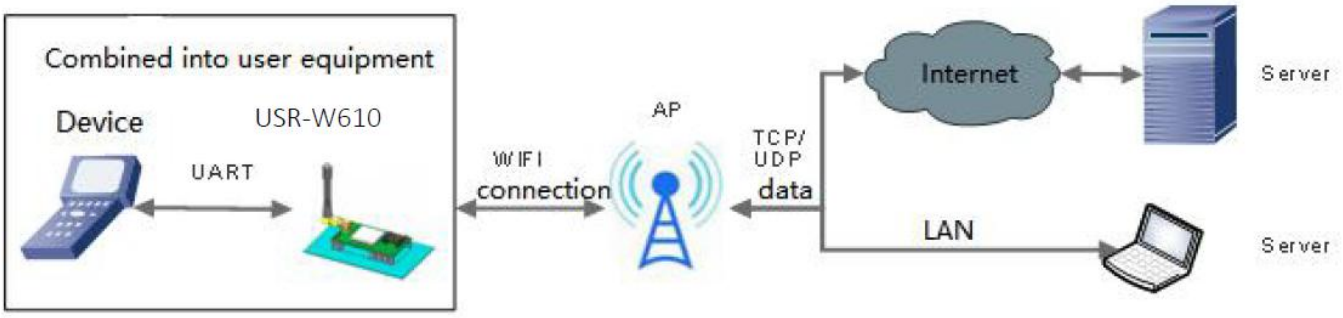
1. Introduction

1.1. Brief Introduction

USR-W610 supports serial port to WIFI function, make the serial port (RS485)connection switch into TCP/IP net interface to realize the bi-direction transparent transmission between serial port and WIFI/Ethernet. Enable serial devices to have TCP / IP network interface function immediately, connect to the network for data communication, greatly extend the communication distance of serial devices, as below:



1.2. Parameters

Power	
Power Supply	DC: 5.0～36.0 V, Connector: 5.5*2.1 mm & 2 pin terminal block
Working Current	170 ~ 350 mA @ 5V
Wi-Fi	
Standard	IEEE 802.11 b/g/n
Frequency Range	2.400GHz-2.4835GHz
Power Output	802.11b: +19dBm (Max.@11Mbps)
	802.11g: +18dBm (Max.@54Mbps)
	802.11n: +17dBm (**Max.@HT20**, MCS7) +17dBm (**Max.@HT40**, MCS7)
Receive Sensitivity	802.11b: -89dBm（@11Mbps）
	802.11g: -81dBm（@54Mbps）
	802.11n: -73dBm（@HT20, MCS7） -71dBm（@HT40, MCS7）
Wi-Fi Antenna	SMA-female
Wi-Fi Security	WPA-PSK(TKIP)/ WPA2-PSK(TKIP)/ WPA-PSK(AES)/ WPA2-PSK(AES)
Ethernet	
Port Number	1 x RJ45, WAN/LAN configurable
Rate	10 /100 Mbps, auto MDI/MDX
Protection	1.5KV electromagnetic isolation

Serial Port	
Port Number	RS232/RS485, not work at the same time RS232: DB9-male connector RS485: 2-pin terminal block
Baud rate	RS232：300～460.8Kbps RS485：300～230.4Kbps
Data Bits	5, 6, 7, 8
Stop Bit(s)	1, 2
Parity Bit	None, Even, Odd, Space, Mark
Flow Control	Hardware: RTS/CTS(TTL0) Software：XON/XOFF
Physical Character	
Dimensions(mm)	86*82.5*25mm(L*W*H)
Operating Temperature	-40～85℃
Storage Temperature	-40~125℃
Operating Humility	5%～95%（Non-condensing）
Storage Humility	5%～95%（Non-condensing）
Installation	Wall mounting
Basic Features	
Network protocol	IP,TCP,UDP,HTTP,HTTPS,MQTT,SSL/TLS,ARP, DHCP
IP Assignment	Static/DHCP
DNS Service	√
Built-in Webpage	√
Config Method	Built-in Webpage, Config Software, AT Command
Work Mode	TCP Server/TCP client/UDP Server/UDP Client/HTTPD client
MQTT	MQTT client, Standard MQTT protocol
SSL Encryption	√
Modbus Gateway	Modbus TCP/RTU protocol conversion Multi-host polling: up to 16 hosts
WebSocket	√
RF2217 Similar	√
Registration Packet	√
Heartbeat Packet	√
Others	
Certificate	CE, FCC, RoHS
Warranty	2 years

1.3. Indicators

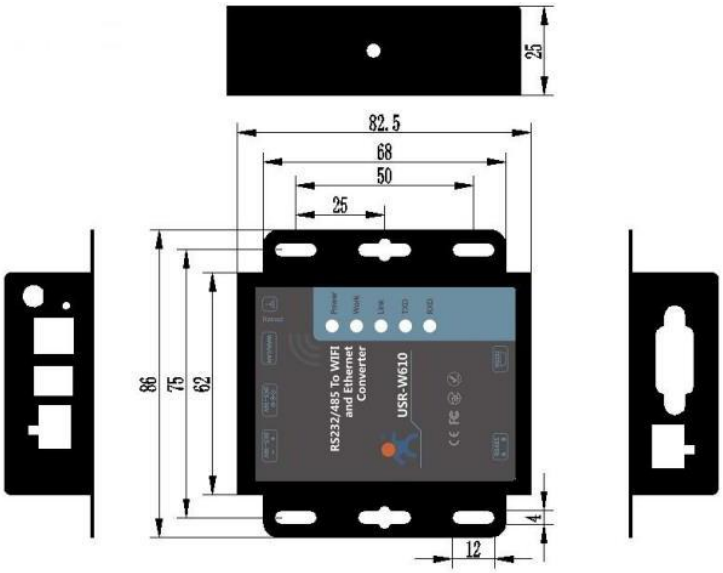
USR-W610 comes with 5 indicators.

LED	Description
Power	Power LED will light after powering the module successfully
Work	Work LED will blink every two seconds if module works normally.
Link	Link LED will light after module establishing WIFI connection
TXD	TXD LED will blink when module sends data from serial side
RXD	RXD LED will blink when module's serial side receives data

1.4. Hardware interface

1.5. Dimension

Unit: mm



2. Get Started

2.1. Hardware connection

Power on the USR-W610, connect it with the PC with USB to RS485 or USB to RS232 cable.

2.2. Default parameters

After powering on the W610, users can find a new WiFi network named USR-W610-xxxx. Connect PC to USR-W610 via LAN port or via Wi-Fi, users can login the serial device server via Chrome or the other browser. The default network parameters are shown in the following table:

Parameter	Default value
SSID	USR-W610-xxxx
LAN IP	10.10.100.254
Username	admin
Password	admin

Open the browser, enter 10.10.100.254 in the URL blank, and press Enter, it will navigate to the following webpage. After entering the login password, clicking login, the web page will show configuration page of USR-W610.

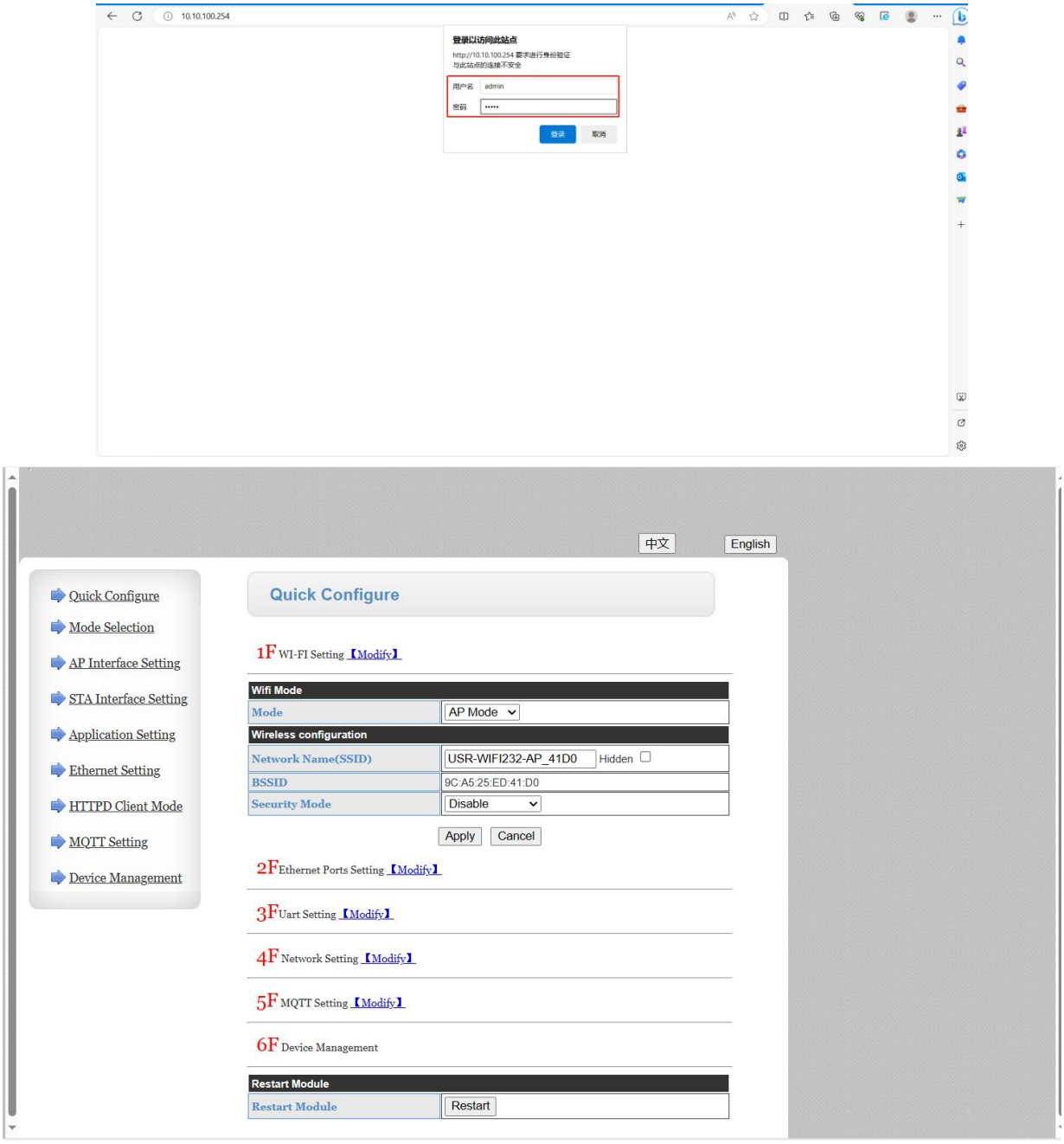


Figure 1. The configuration page of W610

3. Networking application

USR-W610 serial device server can be configured as STA or AP. And W610 also supports one 100M Ethernet interface.

AP: Access point, central node of a wireless network. In general, wireless router is an AP and other wireless terminal can connect to each other through AP.

STA: Station, terminal of a wireless network. Such as PDA, mobile phone.

3.1. Wireless networking

When W610 works in STA mode, W610 will adjust own channel to be same as AP's channel which W610 want to connect to. And when W610 works in AP mode, user can configure W610 to automatically choose channel and W610 will choose a channel according to surrounding environment.

3.1.1. AP mode

User can connect own devices as STA devices such as PC/PAD/phone to W610 works in AP mode directly to realize data transmission. After establishing connection successfully, user can enter W610 Web Server to configure the W610. User can also connect serial devices to W610 through RS232 or RS485 interface.

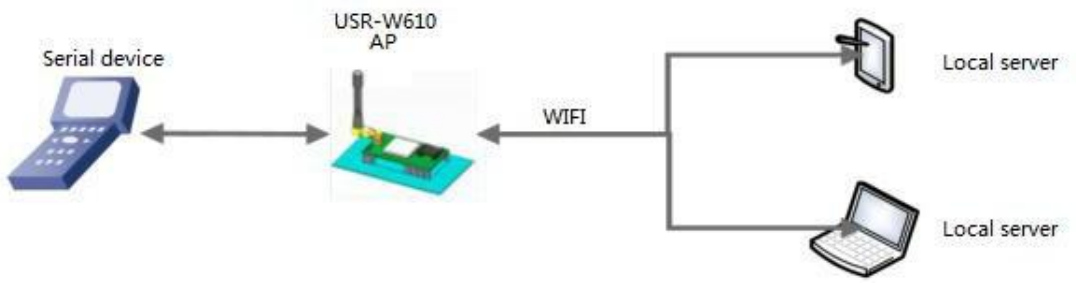


Figure 2. AP Mode

The WIFI serial server works in AP mode. The above applications can be set using the following AT commands:

(1)Set the WIFI server to AP mode AT+WMODE=AP

(2)The parameters of the WIFI serial server in AP mode can be set according to needs or use the default parameters. For example:

AT+WAP=11BGN,USR-DR404-TEST,Auto(Optional)

AT+WAKEY=WPA2PSK,AES,12345678(Optional)

(3)Restart AT+Z

Note:

1.All AT command settings need to enter the AT command mode (for details, please refer to the section "4.3.1. Serial AT Commands")

2.After restarting the device, the parameter settings take effect. To refresh the original configuration information in memory and restart the operation.

3.1.2. STA Mode

W610 works in STA mode can connect to an AP to realize communication with other devices which connect to same AP. And if this AP has connected to internet, USR-W610 can also access internet.

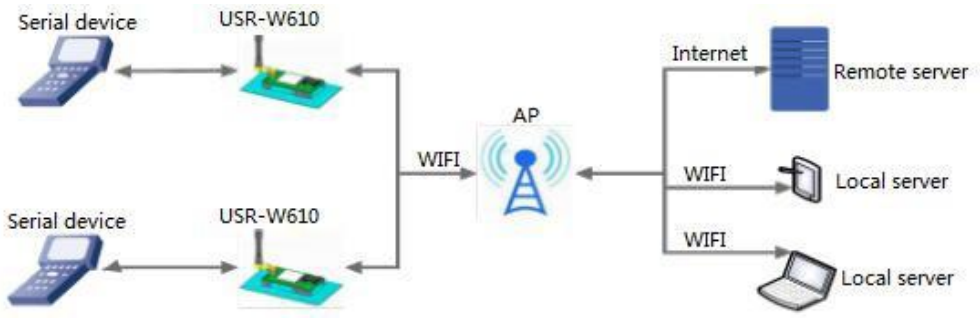


Figure 3. STA Mode

WIFI serial server parameter settings are as follows:

(1)Set the working mode of WIFI serial server:

AT+WMODE=STA

(2)Set the SSID, encryption mode, and password of the router to be connected (for example, the SSID of the route is: USR-WIFI-TEST, the encryption mode is WPA2PSK, AES, and the password is www.usr.cn). As follows:

AT+WSSSID=USR-WIFI-TEST

AT+WSKEY=WPA2PSK,AES,www.usr.cn

(3)Restart AT+Z

3.1.3. AP+STA Mode

W610 supports AP+STA mode which can enable an AP interface and a STA interface simultaneously. W610's STA interface can connect to an AP and AP interface can be connected by STA devices.

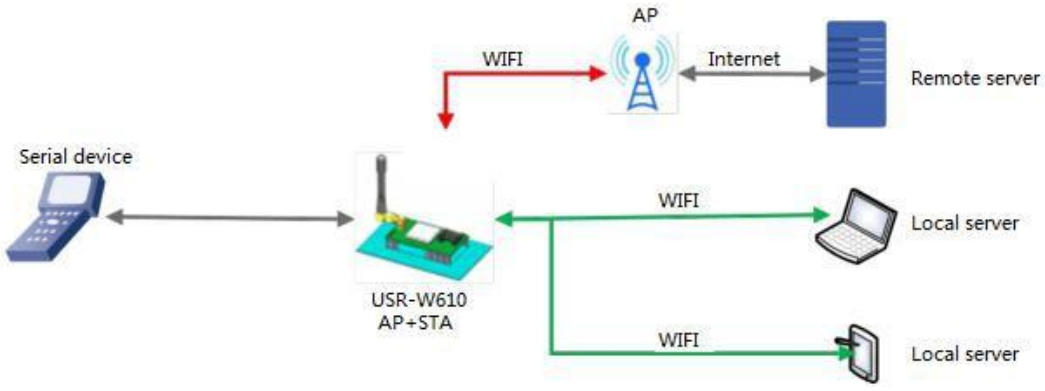


Figure 4. AP+STA Mode

WIFI serial server parameter settings are as follows:

(1) Enable AP + STA function of WIFI serial server,

AT+FAPSTA=on

(2) Parameters take effect after resetting the module,

AT+RELD

(3) Set the WIFI serial server to STA mode, the WIFI serial server AP interface is still valid,

AT+WMODE=STA

(4) Set the SSID, encryption mode, and password of the route to be connected (for example, the SSID of the route is: USR-WIFI-TEST, the encryption mode id WPA2PSK, AES, and the password is www.usr.cn). As follows:

AT+WSSSID=USR-WIFI-TEST AT+WSKEY=WPA2PSK,AES,www.usr.cn

(5) Set socket A, socket B Socket A setting example:

AT+NETP=TCP,Server,8899,10.10.100.100

Set the IP and port of the server to be connected.

Socket B setting example:

AT+TCPADDB=192.168.1.100

AT+TCPPTB=18899

(6) Restart

AT+Z

When the AP + STA function is enabled, the STA port needs to be connected to another router. Otherwise, the STA port will continuously scan the router, which will affect the AP port during scanning, such as data loss. If the user determines that the STA cannot connect to the AP at this time, you can use the command to stop the scanning of the STA port:

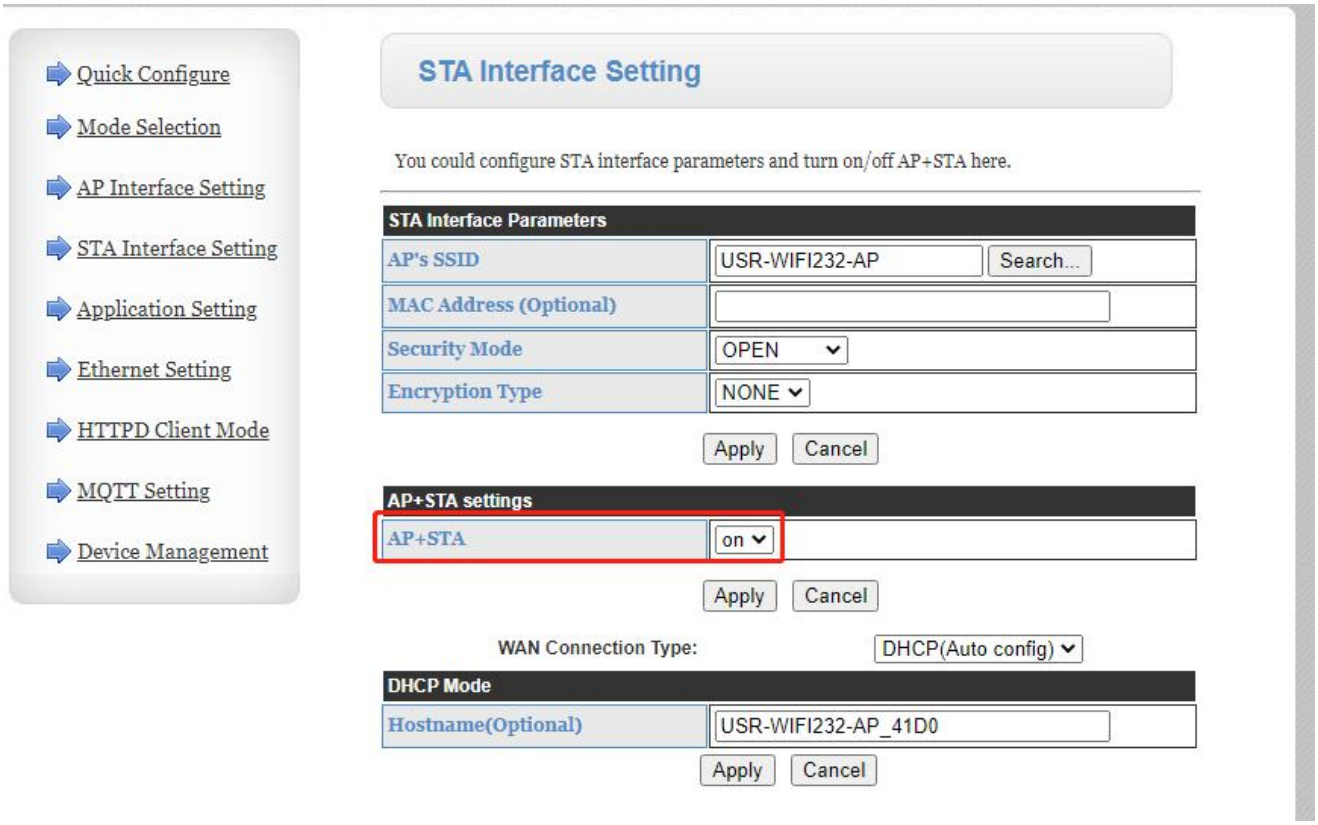
AT+STTC=on/off

"on" means to scan the router, "off" means not to scan, this command will not save after restart.

AT+FSTTC=on/off

This command can be saved, takes affect after restart.

Web page settings: Login to built-in web pages, enter "STA Interface Setting", enable AP+STA function. After clicking "Apply", restart to take effect.



3.1.4. AP, STA Application

User can configure two W610 one as AP and another as STA, then connect W610 in STA mode to W610 in AP mode to realize AP, STA application.

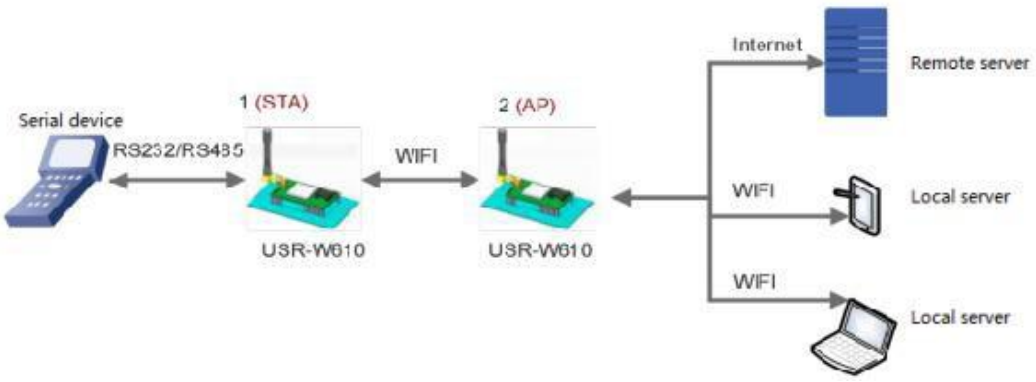


Figure 5. AP, STA Application

WIFI serial server parameter settings are as follows:

The WIFI serial server numbered 1 works in STA mode, and the numbered 2 works in AP mode:

(1) For No. 1 WIFI serial server, set to STA,

AT+WMODE=STA

(2) For No. 2 WIFI serial server, set to AP,

AT+WMODE=AP

(3) The WIFI serial server No. 1 is connected to the AP (WIFI serial server 2) as a STA. Therefore, the SSID and

password to be connected to WIFI serial server 1 are the AP parameters of WIFI serial server 2.

The SSID and password of the No. 2 WIFI serial server can be queried by the following AT command:

AT+WAP

AT+WAKEY

Can also be set as required, or use the default parameters. The example of parameters setting of WIFI serial server 2 are as follows:

AT+WAP=11BGN,USR-DR404-TEST,Auto(Optional)

AT+WAKEY=WPA2PSK,AES,12345678(Optional)

An example of parameter setting of No. 1 WIFI serial server is as follows (the AP parameters to be connected correspond to the SSID and password of WIFI serial server 2):

AT+WSSSID=USR-DR404-TEST

AT+WSKEY=WPA2PSK,AES,12345678

Consistent with WIFI serial server 2 parameters.

(4) Restart AT+Z

3.1.5. Encryption Mode

Encryption can make sure secure data transmission and improve communication security. W610 supports various encryption mode including:

WPA-PSK/TKIP

WPA-PSK/AES

WPA2-PSK/TKIP

WPA2-PSK/AES

WEP

Note: When module adopts WEP encryption mode, HEX format is 10 bytes or 26 bytes password and ASCII format is 5 bytes or 13 bytes password; when module adopts WPA-PSK and WPA2-PSK encryption mode, password is at least 8 bytes.

3.2. Wired Networking

3.2.1. AP+LAN

When W610 works in AP mode, other STA devices can connect to W610 through RJ45 or WIFI. In this network, all devices will be distributed a IP in same network segment with W610. Application diagram as follow:

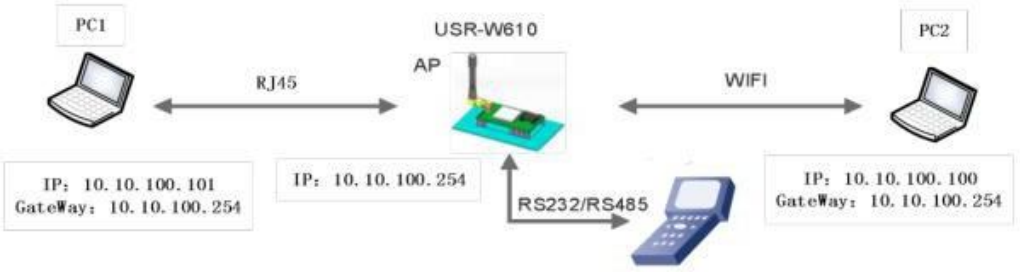


Figure 6. AP+ALN Application

WIFI serial server parameter settings:

(1) Enable Ethernet interface ,

AT+FEPHY=on

(2) The above settings will take effect after restoring factory settings,

AT+RELD

AT + RELD command does not restore the above settings.

(3) Set USR-DR404 to AP,

AT+WMODE=AP

(4) For the LAN parameters of the serial server, can use the default parameters or modify the IP address (DHCP gateway) and subnet mask of the serial server. Here are the default parameters:

AT+LANN=10.10.100.254,255.255.255.0

(5)Restart

3.2.2. AP+WAN

User can configure W610 in AP mode and Ethernet interface in WAN interface(enable DHCP) to connect to internet. In this mode, W610 can work as second grade router and other STA device can connect to W610 AP interface to access internet.

After W610 connecting to first grade AP, W610 can get IP address from first grade AP. And W610 will distribute IP address to STA devices which connect to W610 AP interface. Application diagram as follow:

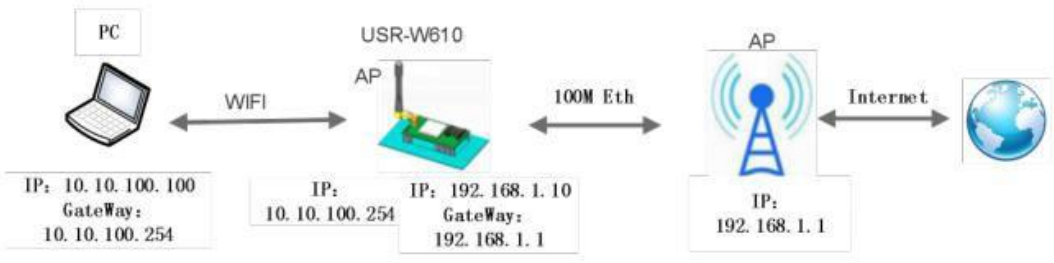


Figure 7. AP+WAN Application

WIFI serial server parameter settings:

(1) Enable Ethernet interface,

AT+FEPHY=on

(2) Set the working mode of Ethernet to WAN,

AT+FVEW=enable

(3) The above settings will take effect after restoring factory settings,

AT+RELD

AT + RELD command does not restore the above settings.

(4) W610 works in AP mode, enable DHCP(Default),

AT+WMODE=ap

AT+DHCPDEN=on

(5) For security reasons, can modify the AP name and encryption parameters (optional),

AT+WAP=11BGN,B2-WIFI-TEST,Auto

AT+WAKEY=WPA2PSK,AES,www.usr.cn

(6) Can keep the default or set LAN parameters of serial server, IP address (DHCP gateway) and subnet mask (optional)

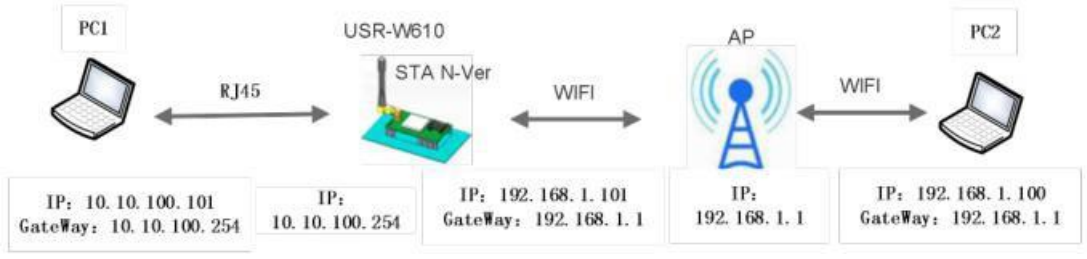
AT+LANN=192.168.2.1,255.255.255.0

Note: It is necessary to ensure that the LAN IP address set cannot be on the same network segment as the WAN IP address obtained by the serial server from the AP!

(7) Restart

3.2.3. Router Mode

W610 can work in STA mode with N-Ver version to apply route mode. W610 can get IP address from AP and distribute IP address to device which connect to W610 through Ethernet interface. Application diagram as follow:



Router mode

Note: In above application diagram, PC1 can initiate a connection to PC2 but PC2 can't initiate a connection to PC1.

WIFI serial server parameter settings:

(1) Set the serial server software version to N-Ver,

AT+FVER=n

(2) Enable Ethernet interface,

AT+FEPHY=on

(3) Reset the module, the setting will take affect,

AT+RELD

AT + RELD command does not restore the above settings.

(4) Set the working mode to STA,

AT+WMODE=STA

(5) Set the SSID and password of the route to be connected (according to the actual parameters of the route)

For example:

AT+WSSSID=USR-WIFI-TEST

AT+WSKEY=WPA2PSK,AES,www.usr.cn

(6) Set LAN parameters of serial server, IP address (DHCP gateway) and subnet mask Query the IP obtained by the serial server from the AP:

AT+WANN

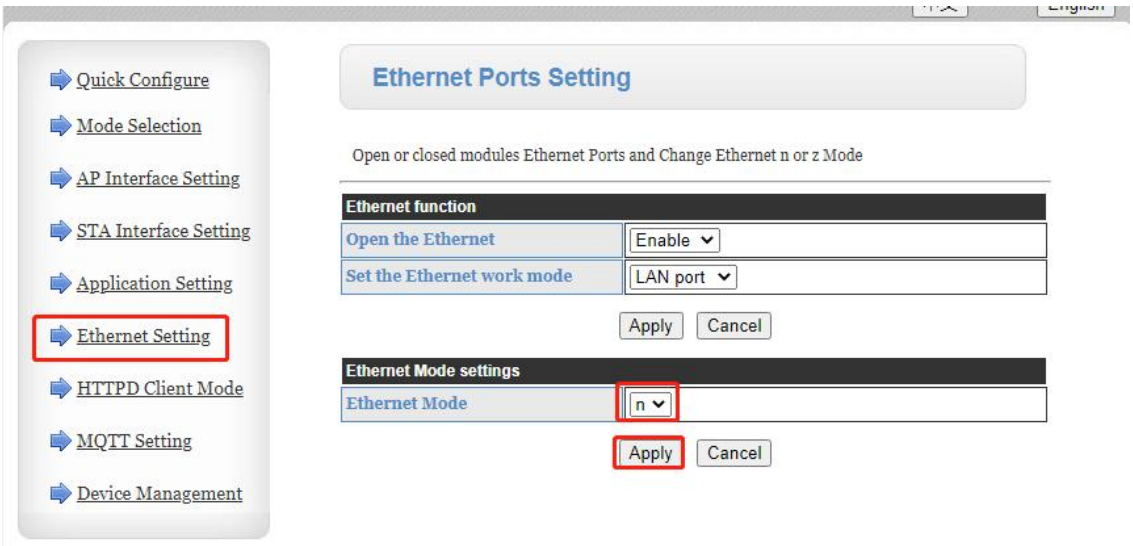
Set the LAN parameters of the serial server to ensure that the LAN IP address cannot be on the same network segment as the WAN IP address obtained by the serial server from the AP. Since this example is not on a network segment, can keep the default:

AT+LANN=10.10.100.254,255.255.255.0(Optional)

(7)Restart.

Web page setting: Log in to the built-in web page of DR404, enter the page of Ethernet setting, and set the Ethernet Mode to " n" in the Ethernet mode settings. Click "Apply" , then restart the module to take effect.

As shown below:



3.2.4. Bridge mode

W610 can work in STA mode with Z-Ver version to apply bridge mode. After connecting to AP, device which connect to W610 through Ethernet interface can get IP address from AP. In this whole network, PC1 and PC2 can communicate to each other without limitation. If user want to achieve communicate between W610 to other devices, user need set LAN interface IP address of W610 into same network segment as AP. Application diagram as follow:

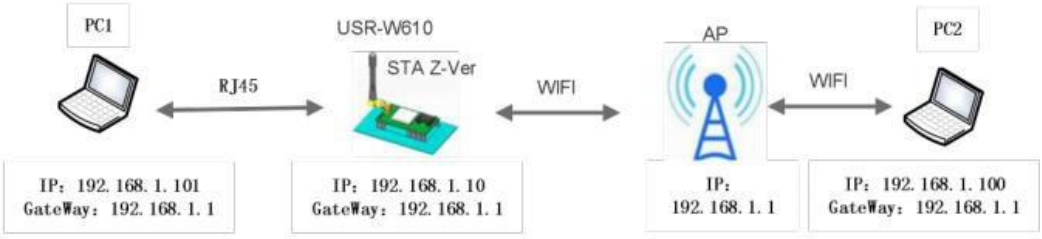


Figure 8. Bridge Mode

WIFI serial server parameter settings:

(1) Set the serial server software version to Z-Ver,

AT+FVER=z

(2) Enable Ethernet interface,

AT+FEPHY=on

(3) Reset the module, the setting will take effect.

AT+RELD

AT + RELD command does not restore the above settings.

(4) Set the working mode to STA.

AT+WMODE=STA

(5) Set the SSID and password of the route to be connected. For example:

AT+WSSSID=USR-WIFI-TEST

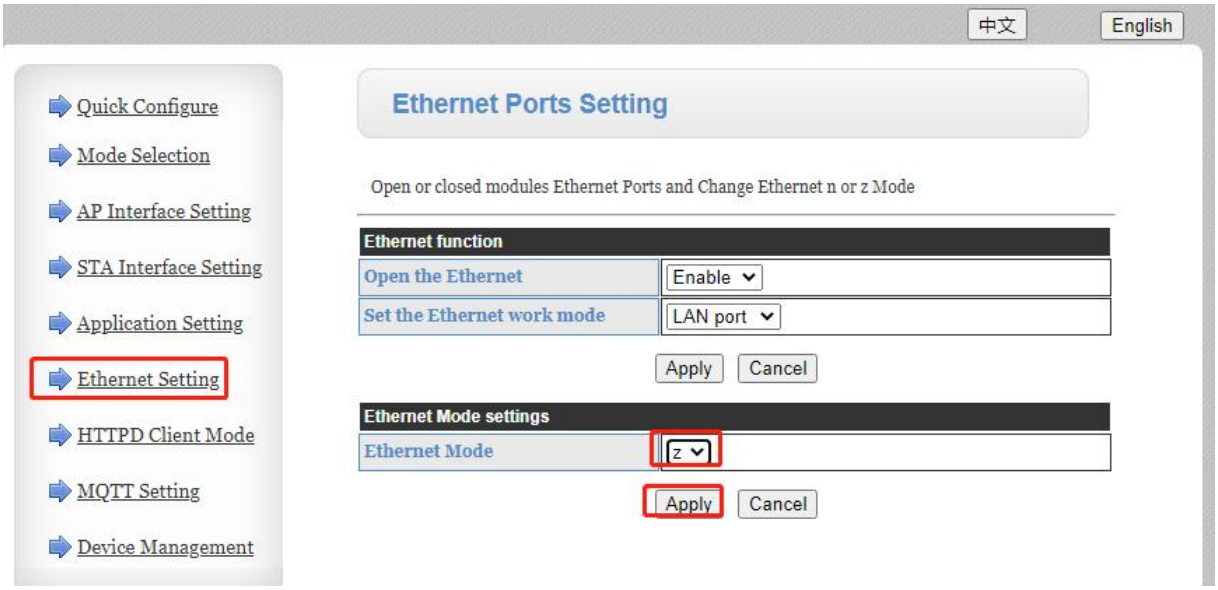
AT+WSKEY=WPA2PSK,AES,www.usr.cn

(6) Set LAN parameters of serial server, IP address (DHCP gateway) and subnet mask:

AT+LANN=192.168.1.10,,255.255.255.0

(7)Restart.

Web page setting: Log in to the built-in web page of DR404, enter the page of Ethernet setting, and set the Ethernet Mode to " z" in the Ethernet mode settings. Click "Apply" , then restart the module to take effect.



4. Product function

USR-W610 supports 6 working modes: transparent mode, serial command mode, HTTPD Client mode, Modbus TCP <=> Modbus RTU mode, AT command mode and MQTT mode.

4.1. Data Transfer Mode

4.1.1. Transparent mode

USR-W610 supports transparent transmission mode. Under this mode, the data needs to be sent and received will be transported transparently between the serial port and WIFI/Ethernet, no analyzing, minimize the complexity of use. The parameter settings can refer to the Section 4.2 Socket function.

Figure 9. Transparent mode

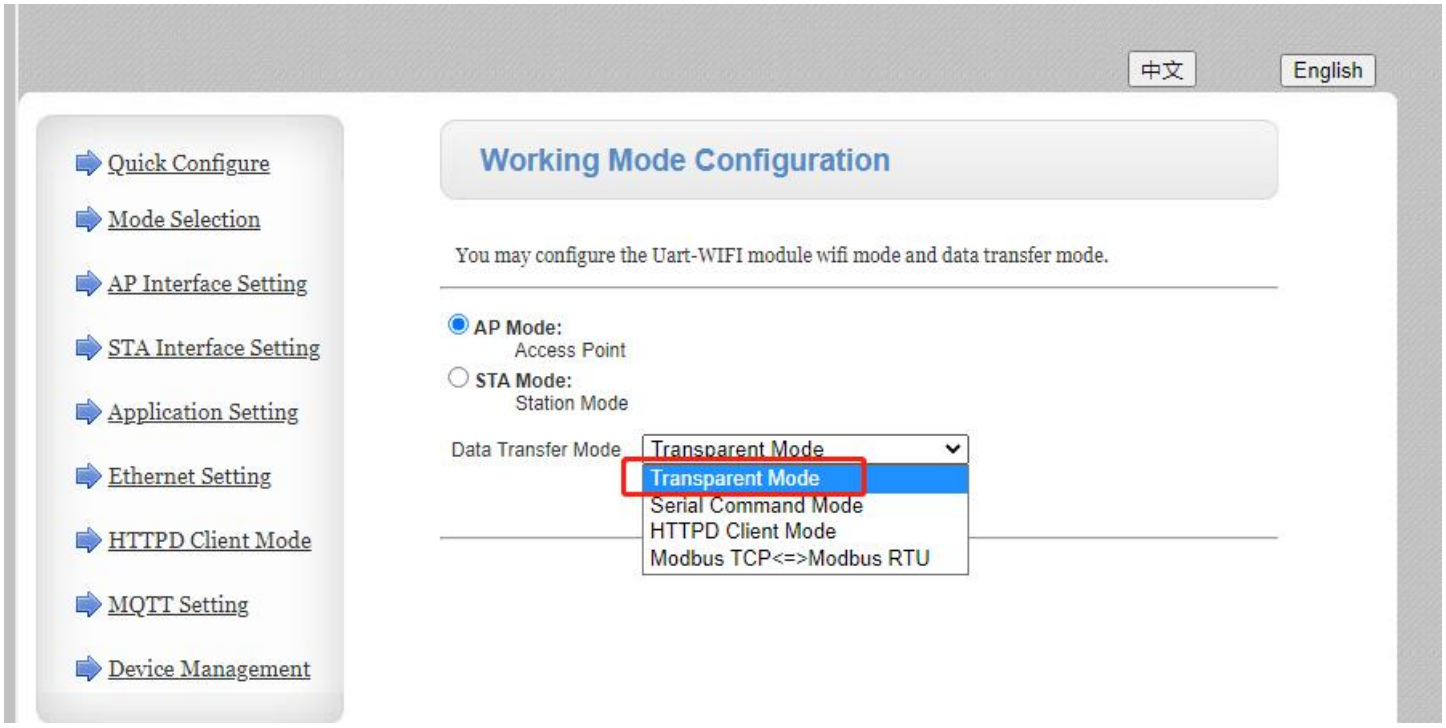


Figure 10. Setting page of transparent mode

4.1.2. Serial command mode

In this mode, when USR-W610 works as UDP client or TCP client, allow sending serial data to different servers.

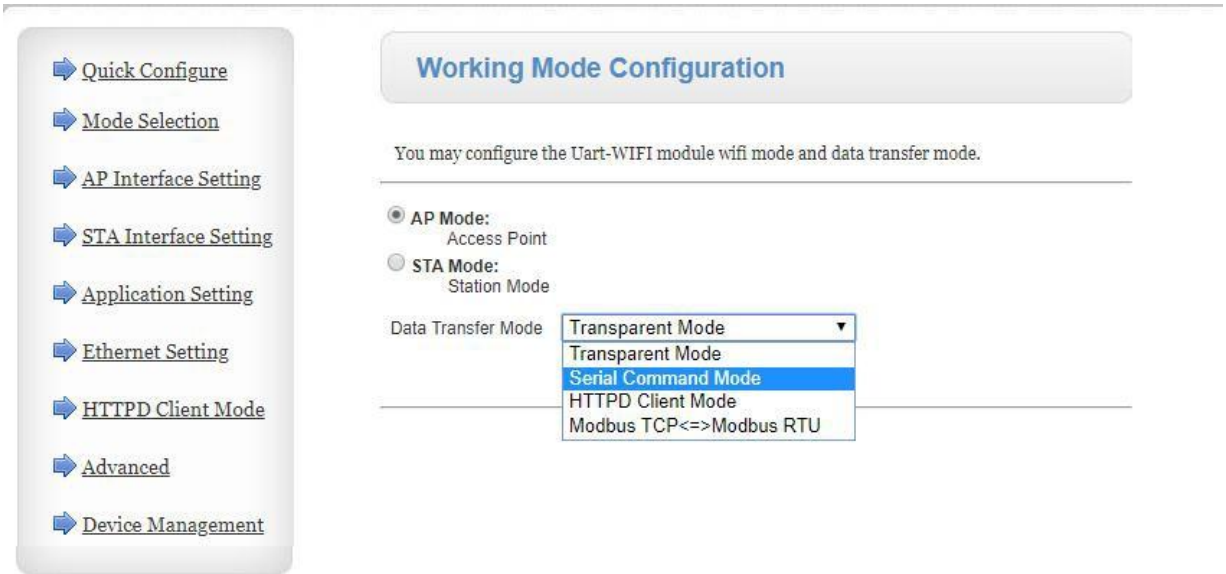


Figure 11. Serial command mode

The MCU sends data packets according to the following format. After the WIFI serial server has finished parsing, it only sends n bytes of data to the destination address. When data is returned, the data is output directly from the serial port without parsing.

Table 1. Protocol of serial command mode

Header	Length	Function code	Reserved parameter	Destination port	Destination address	Data	Parity
2	2 (n+m+5)	1	2	2	m	n	1

Header: 0x55 0xaa

Length: The total number of bytes from function code(included) to parity (do not included), the high is in front.

Function code:

Bit0: (UDP: 0 ; TCP: 1)

Bit1: (long connection: 0)Note: Only long connections are currently supported.

Bit2: (IP: 0;domain name: 1)

Bit7: (Simple protocol: 0; Full protocol: 1) Note: Only simple protocols are currently supported.

Note:

- For Bit1, long connection, then after sending data, the connection will remain until the target address is changed again.
- For Bit2, it indicates whether the destination address is IP or domain name. If it is IP, the destination address is 4 bytes; if it is a domain name, the length of the destination address is the length of the entire domain name string (where the last byte of the destination address is 0x00, is the end of the string, the length of the domain name is indefinite)
- For Bit7, under the simple protocol, the reply frame contains only data; under the full protocol, the reply frame will fail to send, waiting for timeout, and the frame format of the response device IP under UDP broadcast.

Reserved parameter:

First byte: long connection, 0X00. Second byte: reserved.

Destination port:

Low byte first, such as port 33, here is 21 00.

Destination address:

If it is IP, it is 4 bytes. For example, 192.168.0.133 means 85 00 A8 C0; if it is a domain name, the address length is indefinite and ends with "\ 0".

Data:

Variable length, up to 1000 bytes Parity:

From the function code, to the byte before the parity, add. The following are examples of specific applications: Send data：55 aa 00 0a 00 00 00 21 00 85 00 A8 C0 01 0f

Length type 00 0a：Length: n+m+5, here is 10

Function code 00： UDP mode

Destination IP address 85 00 A8 C0： 192.168.0.133

Data 00： Length is 1,

Parity：0x00+0x00+0x00+0x21+0x00+0x85+0x00+0xA8+0xC0+0x01=0x0f

4.1.3. HTTPD Client Mode

The HTTPD Client mode supports three HTTP request methods: POST, PUT, and GET. After setting the specific content of the HTTP header through the AT command or the web page, each time data is sent, the WIFI serial server will automatically encapsulate the sent data into HTTP protocol data and send it to the designated HTTP server. The data received from the server will be directly transmitted to the serial port without any processing.

First set HTTP parameters through AT command:

No.	Item	Description
1	HTPMODE	New and old, HTTP header setting mode switch(HTTPD Client)
2	HTTPURL	Old setting/query HTTP server IP and port
3	HTTPTP	Old setting/query HTTP requesting type
4	HTTPPH	Old setting/query HTTP protocol header path
5	HTTPCN	Old setting/query HTTP protocol header Connection
6	HTTPUA	Old setting/query HTTP protocol header User-Agent
7	HTPSV	New setting/query server address and IP(HTTPD Client)
8	HTPTP	New setting/query requesting way(HTTPD Client)
9	HTPURL	New setting/query requesting path(HTTPD Client)
10	HTPHEAD	New setting/query HTTP header(HTTPD Client)
11	HTTPSCEN	Setting/query HTTPD Clientconnection mode(long/short)
12	HTTPSCT	Setting/queryHTTPDClientshortconnection timeout(3-65535s)

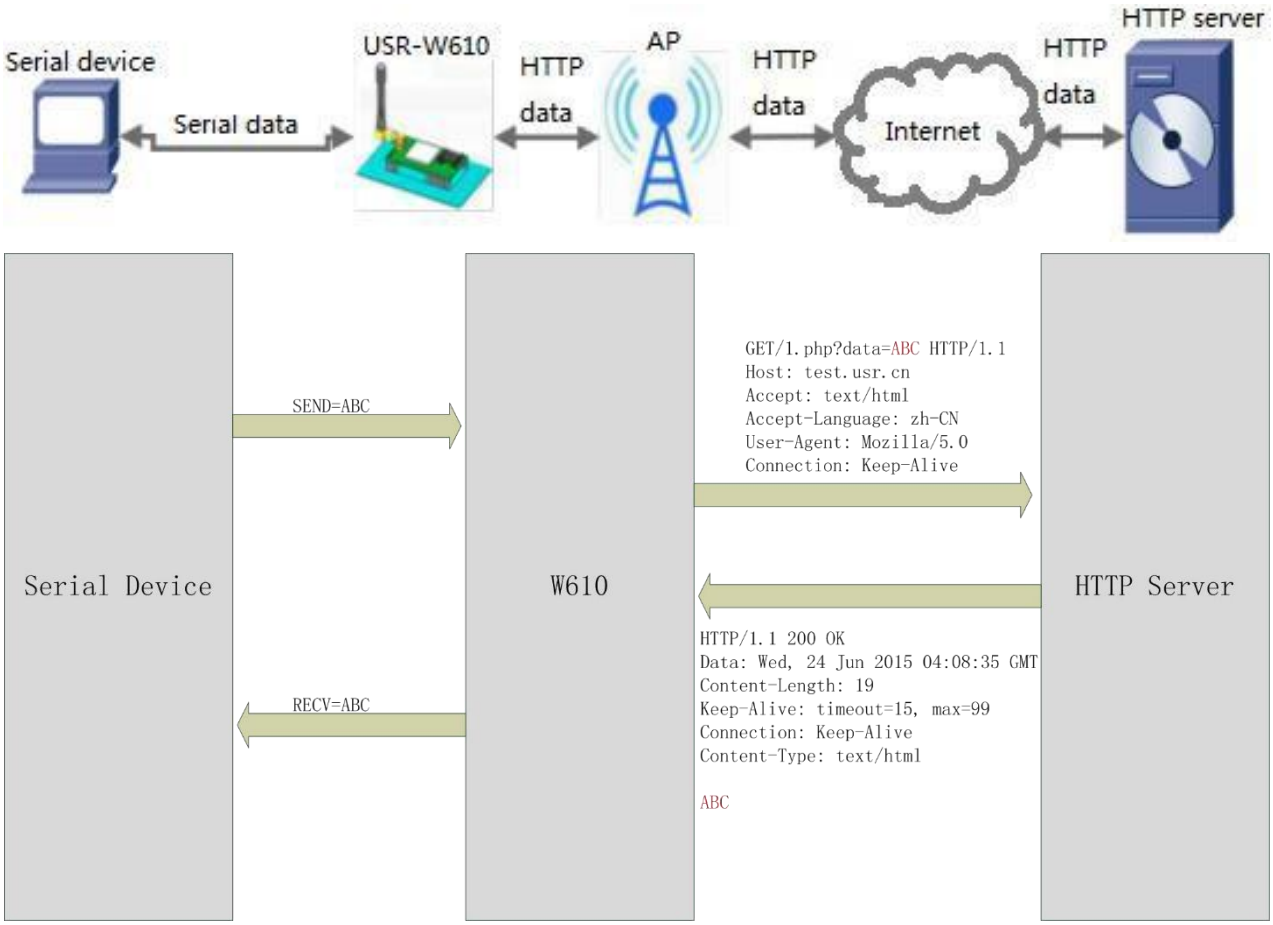


Figure 12. HTTP Mode

When the request method is POST or PUT, the data of the serial port will be added after the HTTP protocol header; when the request method is GET, the data of the serial port will be added after the protocol header path.

Users can customize the content of the HTTP header in the new version of the definition method, and can add, delete, and modify the content of each HTTP header according to their own needs(If the HTTP request type is POST / PUT, USR-DR404 will automatically add Content-Length).The setting commands include "AT + HTPMODE, AT + HTPSV, AT + HTPTP, AT + HTPURL, AT + HTPHEAD". For specific command setting procedures, please refer to the “AT command” chapter. Similarly, there are corresponding settings pages in the web page.

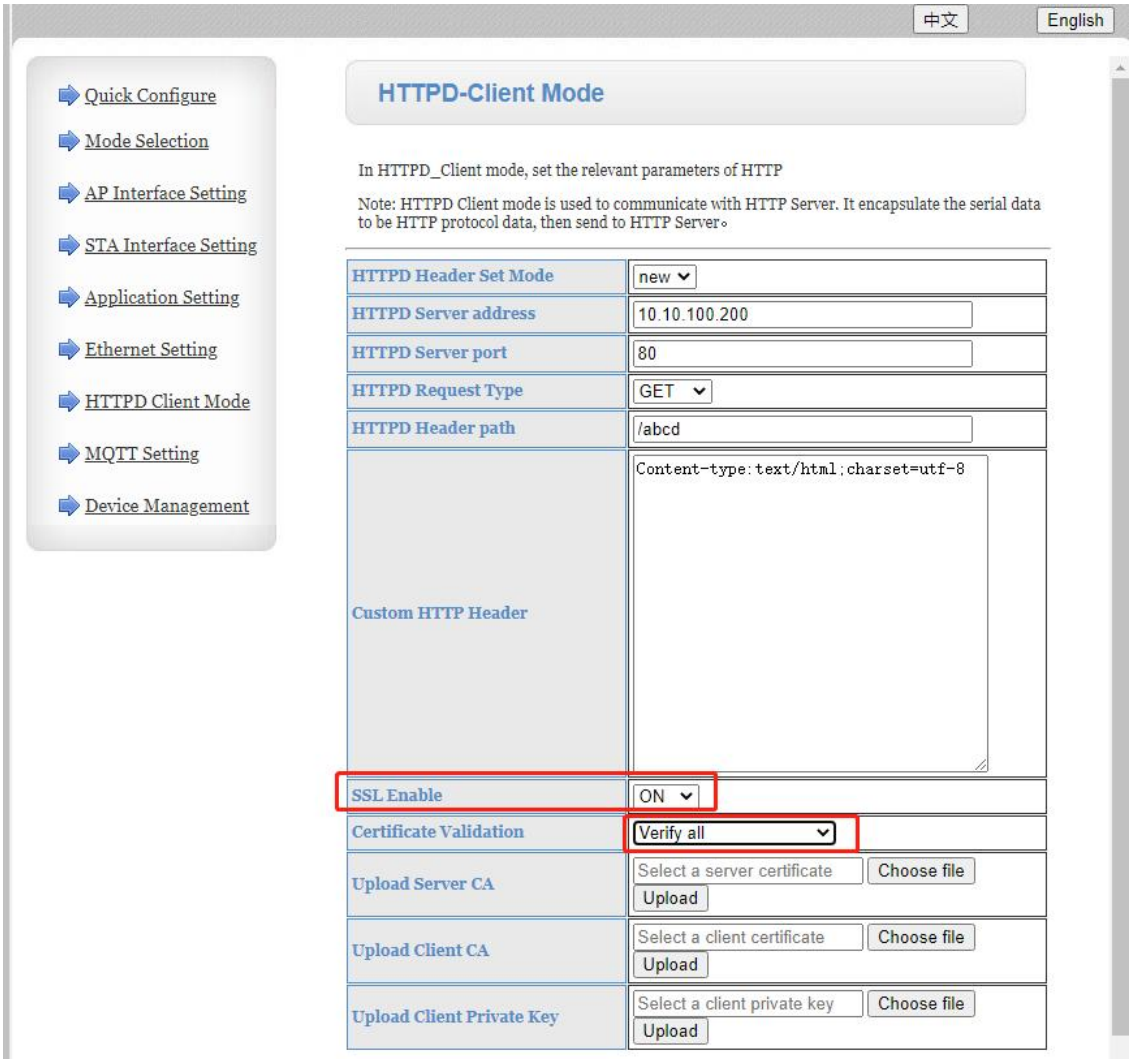
Note: The above definition method is called the old definition method.

In the new version of the setting method, a new HTTP header definition method is added. If you use the AT command to set the HTTP header, please use "<< CRLF >>" instead of carriage return and line feed. There is no need to consider carriage return when setting the built-in web page.

The web page settings are as follows:

If we choose the new header mode, we can set the HTTP header as needed, it’s more flexible compared to the ole HTTP header mode.

In HTTP mode, users can upload the SSL certificate if the SSL function is enabled.



4.1.4. Modbus TCP <=> Modbus RTU

This serial server supports Modbus TCP to Modbus RTU (does not support Modbus ASCII); the network parameters of the module should correspond to the network parameters of the application software. The TCP server corresponds to the TCP client and the port must be the same. For the working mode, select Modbus TCP <=> Modbus RTU.

Figure 13. Modbus RTU/TCP conversion

Setting by AT command:

AT+TMODE=modbus

Setting by web page:

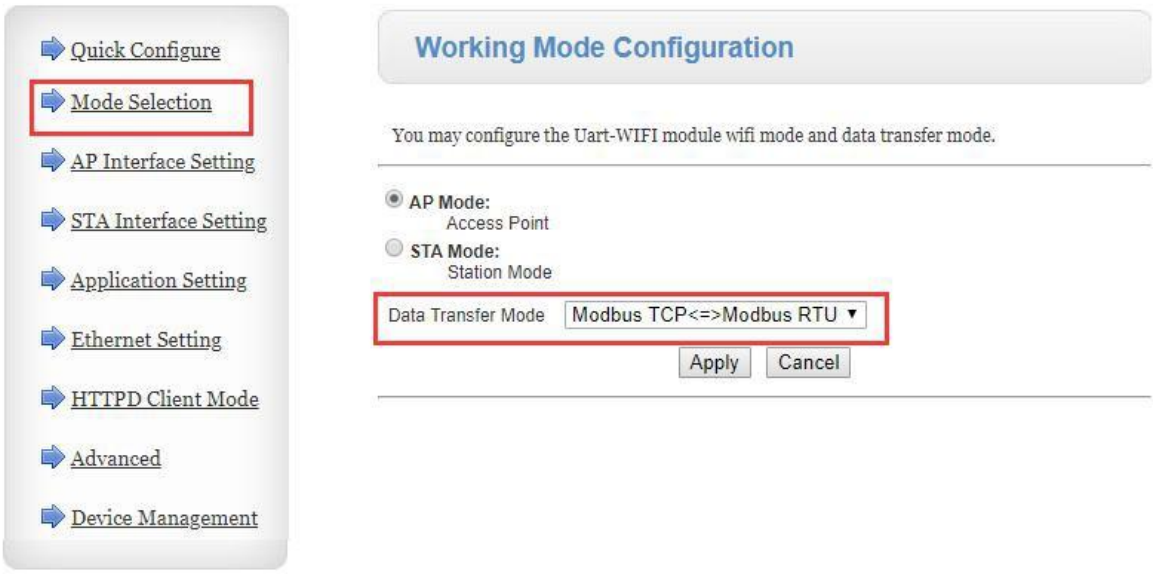


Figure 14. Modbus RTU/TCP setting

4.1.5. AT command mode

Under AT command, send AT command to query the current status and parameters of the W610. For details on the method and timing for entering and exiting the AT command mode, refer to the relevant section of "4.3. Command Configuration" in this manual.

4.2. Socket function

Socket A includes TCP Server, TCP Client, UDP Server, UDP Client and socket B supports TCP Client and UDP client.

When socket A in TCP server, at most supports 24 TCP client to connect. In multi-TCP link connection mode, data transmitted from TCP will be forwarded to the serial port one by one. The data coming from the serial port will be copied into multiple copies, and one copy will be forwarded on each TCP link. The specific data flow chart shows:

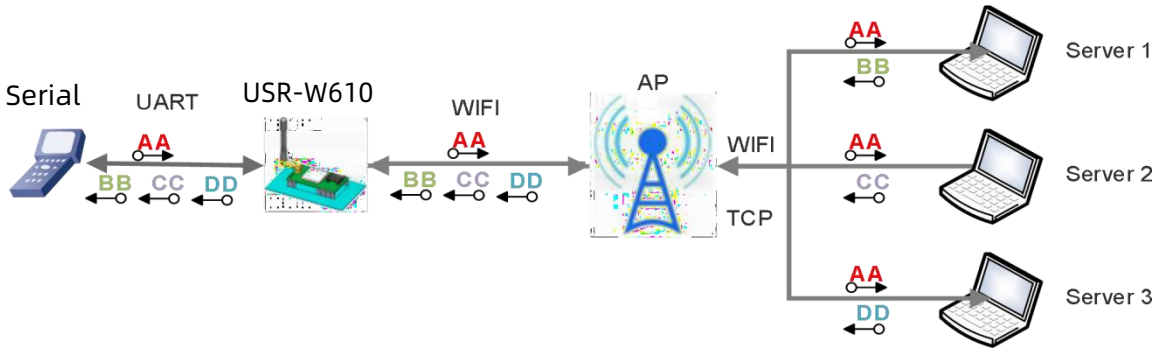
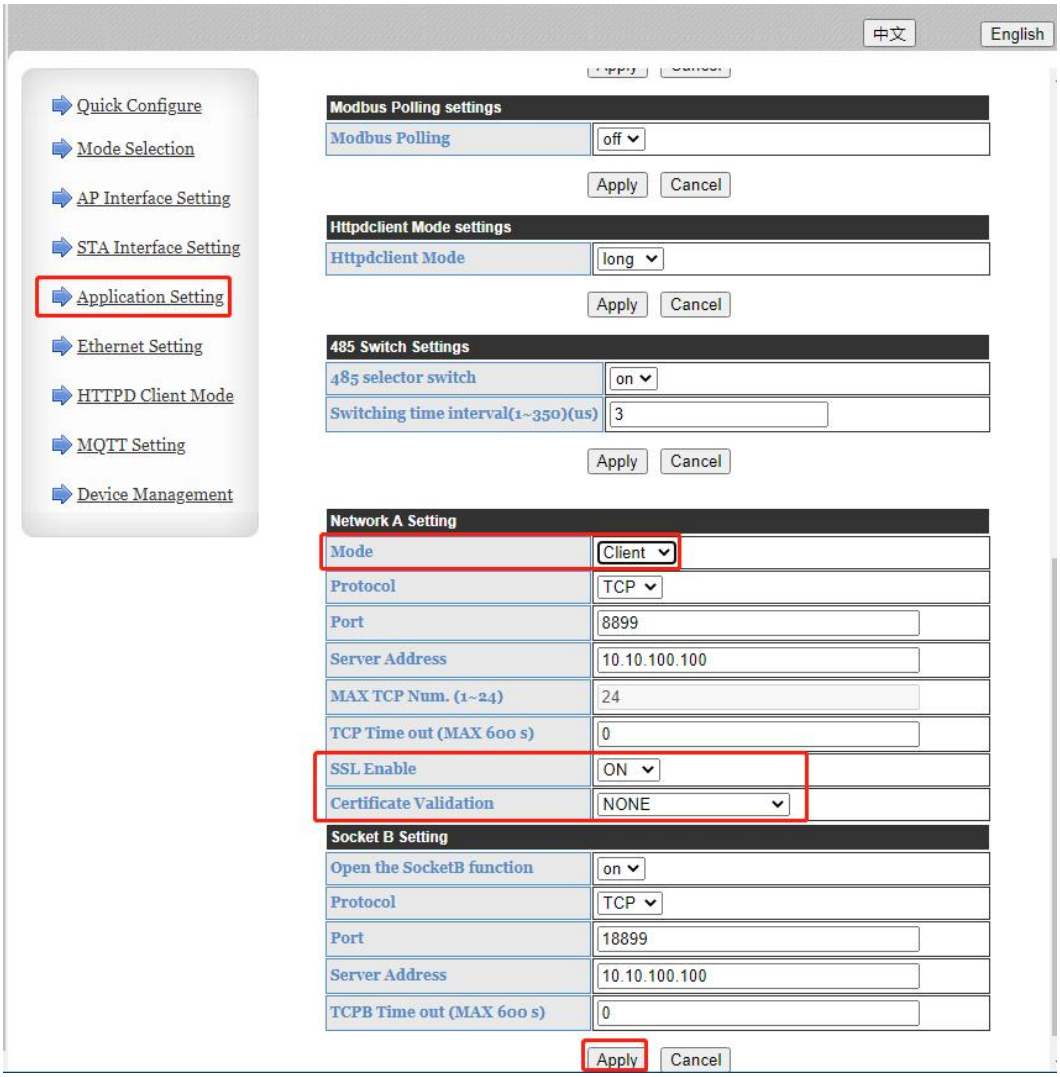


Figure 15. Multi TCP link data transmission diagram

Users can set the parameters on the following page. When W610 work at TCP client mode, it supports SSL/TLS encryption, users can choose whether to enable the SSL/TLS encryption.



Users can also set parameters via AT command.

Socket A settings: AT+NETP/AT+TCPTO/AT+TCPLK/AT+TCPDIS.

	Item	Description
1	NETP	Setting / Query TCPA's network protocol parameters
2	TCPLK	Query whether the TCP link is established
3	TCPTO	Setting/query TCP timeout
4	TCPDIS	Connect / Disconnect TCP (only valid when TCP Client)

Socket B settings: AT+TCPB/AT+TCPPTB/TCPADDB/TCPTOB/TVPLKB/TCPDIS.

	Item	Description
1	TCPB	Enable/disable TCPB
2	TCPPTB	Setting/query TCPB port number

3	TCPADDB	Setting/query TCPB server address
4	TCPTOB	Setting/query TCPB timeout
5	TCPLKB	QuerywhethertheTCPBlinkis established
6	TCPDIS	Connect / Disconnect TCPB

4.3. UART

4.3.1. Parameters

The default UART parameter is 115200, N, 8, 1.

Item	parameter
Baud rate	300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 345600, 460800 RS232：300～460.8Kbps RS485：300～230.4Kbps
Data	5, 6, 7, 8
Stop	1,2
Parity	None, Even, Odd
RS232	NFC: no hardware control

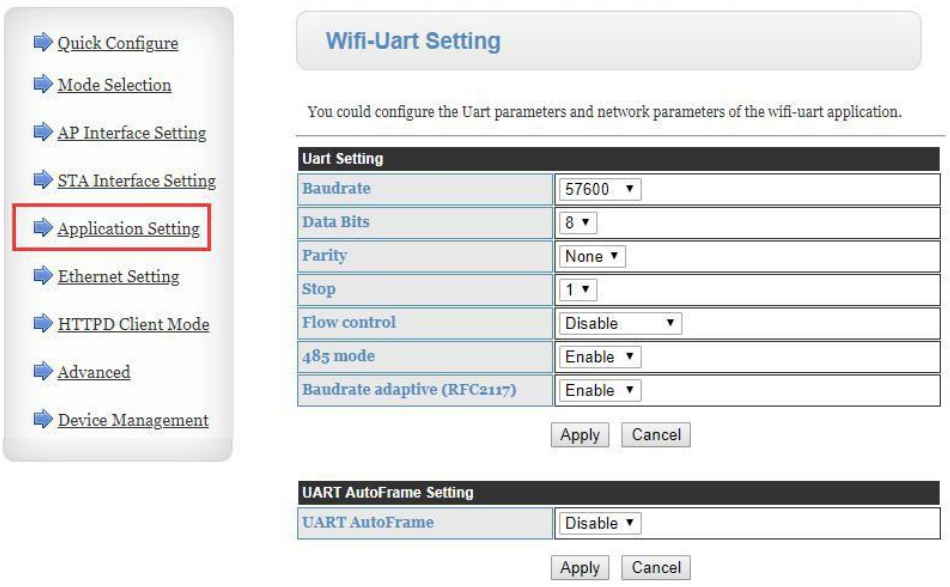
AT command:

If the user needs to modify the baud rate of the DR404 to 115200bps, as follows:

AT+UART= 115200,8,1,None,NFC

Webpage setting:

Log in the build-in webpage, under the "Application Setting" page, as below:



4.3.2. UART Free framing

Take sent data from serial device to the DR404 as an example to show the steps of the free framing: if n is the free frame interval, unit is ms, when T1 >n, T2<n, T3<n, T4<n, T5<n and T6>n, then take byte1 -byte5 as a frame, as bellow:

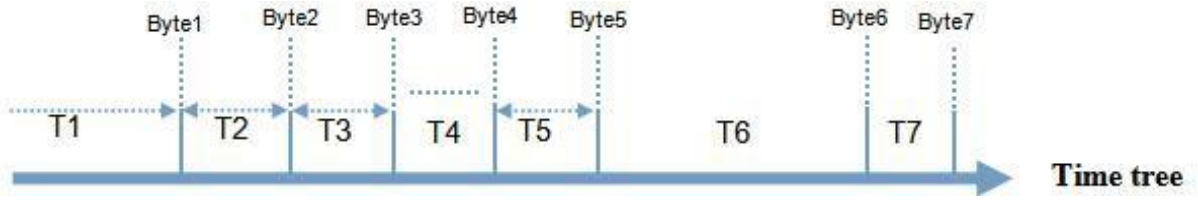


Figure 16. Switching command mode order

Default interval between 2 bytes is 10ms, that means if the time more than 10ms, this frame will be over. And interval can change into 50ms to meet the custom's requirement, setting command are as fellows:

AT+FUARTTE=normal

After setting, restore to the factory default value will enable it.

AT+RELD

Note: AT+RELD can not restore the above setting.

After testing, if the interval set to be 10 ms, and small amount of data, the delay time of the loopback from WIFI->UART->WIFI is about 40~50ms.

If the interval is 10ms and the MCU can not confer to send the next bytes in 10ms, and the serial data might be breaking.

If you want to restore the default interval --10ms, using the below AT command:

AT+FUARTTE=fast

Also need to restore to enable it.

For more AT commands, please refer to "AT command" in this manual.

4.3.3. UART auto-framing mode

For a fixed-length data frame on the serial port, you can turn on the UART auto-frame function and set the auto-frame trigger time and the trigger frame length.USR-DR404 will automatically compose the data received from the serial port and forward it to the network.

1.Auto framing trigger frame length: USR-DR404 receives the specified number of bytes from the serial port, forms a data frame, and forwards it to the network.

2.Auto framing trigger time: if the data received from the serial port is less than the auto framing trigger frame length within the trigger time, USR-DR404 will forward the received data to the network.

The automatic framing time is calculated from the time when the WIFI serial server receives the first byte from the serial port. As shown below:

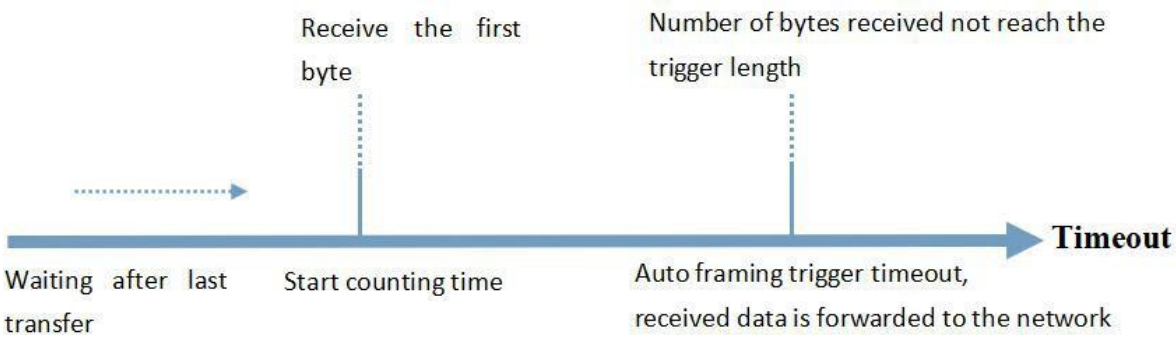


Figure 17. Trigger Length

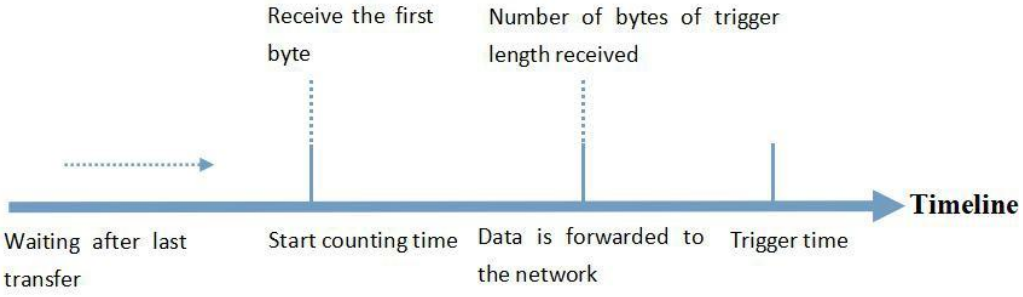


Figure 18. Trigger Time

UART auto framing can be set through the built-in web page "Application Setting -- UART AutoFrame Setting" of DR404 or set by AT command.

4.4. Synchronous Band Rate (RFC2217)

4.4.1. Overview of RFC2217

Synchronous baud rate is named RFC2217. USR Similar RFC2217 make adjustments on the basis of RFC2217 protocol to improve accuracy oftransmission. Enable the baud rate function of WIFI serial server via AT command:

AT+AABR=on

This command takes effect immediately and does not need to be restarted. After restarting, the WIFI serial server will restore the previous baud rate.

4.4.2. RFC2217 Protocol Description

Protocol length is 8 bytes. And values taken for example is in HEX:

Name	Packet Header	Baud Rate	Bits parameter	Parity
Bytes	3	3	1	1

Explanation	reduce misjudgment	High is in front, three bytes represent a baud rate value	data bit, stop bit, parity	Remove 4 bits of header and ignore the high bit
(115200,N,8,1)	55 AA 55	01 C2 00	83	46
(9600,N,8,1)	55 AA 55	00 25 80	83	28

Serial parameter bit:

Bit #	Explanation	Value	Description
1:0	Data bit selection	00	5 bits
		01	6 bits
		10	7 bits
		11	8 bits
2	Stop Bit	00	1 bit
		01	2bits
3	Parity Enable	00	Disable Parity
		01	Enable Parity
5:4	Parity Type	00	ODD
		01	EVEN
		10	Mark
		11	Clear
8:6	NC	000	0

4.5. USR-Link

When works in AP mode, DR404 will open a UDP port which number is 49000 to receive the USR-link. Connected directly to the WIFI of the DR404, phone query the SSID and set the router's SSID and password via the command under the UDP. Then the DR404 will restart automatically and connect the router, now it works in STA mode.

Protocol format description:

	Name	Bytes	Description
1	Packet Header	1	Fixed value: 0xFF

2	Length	2	Number of all bytes after length (excluding length) and before parity (excluding parity)
3	Command	1	Command type, 0x01 is the query command
4	Parity	1	The accumulated sum of all bytes after the header (excluding the header) and before the parity (excluding the parity).

Query Command:

	Name	Bytes	Description
1	Packet Header	1	Fixed value: 0xFF
2	Length	2	Number of all bytes after length (excluding length) and before parity (excluding parity)
3	Command	1	Command type, the reply command corresponding to the query command is 0x81
4	Number of APs	1	Number of APs searched
5	SSID1	Indefinite length	SSID of route 1
6	Terminator	1	Terminator for SSID of Router 1, fixed value is 0x00.
7	Signal strength1	1	The signal strength of router 1 network, ranges from 0 to 100, and the corresponding actual value is 0% to 100%.
8	Terminator	2	Terminator for signal strength 1, 0x0D, 0x0A。
…	…	…	……
M	SSIDn	Indefinite length	SSID of route n
M+1	Terminator	1	Terminator for SSID of Router n, fixed value is 0x00.
M+2	Signal strength n	1	The signal strength of router n network, ranges from 0 to 100, and the corresponding actual value is 0% to 100%.
M+3	Terminator	2	Terminator for signal strength n, 0x0D, 0x0A。
M+4	Parity	1	The accumulated sum of all bytes after the header (excluding the header) and before the parity (excluding the parity).

For example:

Mobile phone sends to WIFI serial server (hexadecimal number): FF 00 01 01 02

WIFI serial server returns to mobile phone (hexadecimal number): FF 00 14 81 02 54 45 53 54 31 00 40 0D 0A 54 45 53 54 32 00 37 0D 0A 1F

Explanation: The mobile phone sends a query command to the WIFI serial server to query the information of the router. The information returned by the WIFI serial server to the mobile phone is: there are 2 routers, the SSID of router 1 is "TEST1" and the signal strength is 64%; the SSID of router 2 is "TEST2" and the signal strength is 55%.

Note: The router information returned by the WIFI serial server is sorted according to the signal strength.

Setting Command:

	Name	Bytes	Description
1	Packet Header	1	Fixed value: 0xFF
2	Length	2	Number of all bytes after length (excluding length) and before parity (excluding parity)
3	Command	1	Command type, 0x02 is the setting command.
4	Reserved words	1	Default is 0x00
5	SSID	Indefinite length	SSID of route
6	Delimiter	2	SSID terminator, fixed values are 0x0D and 0x0A.
7	Password	Indefinite length	Password of route
8	Parity	1	The accumulated sum of all bytes after the header (excluding the header) and before the parity (excluding the parity).

Reply Command:

	Name	Bytes	Description
1	Packet Header	1	Fixed value: 0xFF
2	Length	2	Number of all bytes after length (excluding length) and before parity (excluding parity)
3	Command	1	Command type, 0x82 is the reply command corresponding to the setting command.
4	Parity	1	The parity result of the SSID. If the SSID can be found, the corresponding value is 0x01. If not, the

			value is 0x00.
5	Parity	1	The parity result of the password. If the password is in the correct format, the value is 0x01. If it is incorrect, the value is 0x00.
6	Parity	1	The accumulated sum of all bytes after the header (excluding the header) and before the parity (excluding the parity).

For example:

Mobile phone sends to WIFI serial server (hexadecimal number): FF 00 0F 02 00 54 45 53 54 31 0D 0A 31 32 33 34 35 36 CE.

WIFI serial server returns to mobile phone (hexadecimal number): FF 00 03 82 01 01 87

Explanation: The mobile phone sends a setting command to the WIFI serial server, sets the SSID to "TEST1" and the password to "123456". The information returned by the WIFI serial server to the mobile phone is:

There is a network with SSID "TEST1" and the password format is correct.

4.6. USR Cloud

USR Cloud includes Scada cloud and cloud monitor.

If your serial device supports standard MODBUS RTU data, the cloud platform can display serial device data by establishing a TCP connection with the DR404.

USR Cloud address: https://mp.usriot.com.After registering an account, log in.

USR Cloud server address is: tcp.mp.usriot.com, port 15000. The device number is 20 digits and the communication password is up to 8 digits.

4.7. Heartbeat Packet Function

In the network transparent transmission mode, the user can choose to enable the custom heartbeat packet function. The heartbeat packet can be sent to the network or serial device:

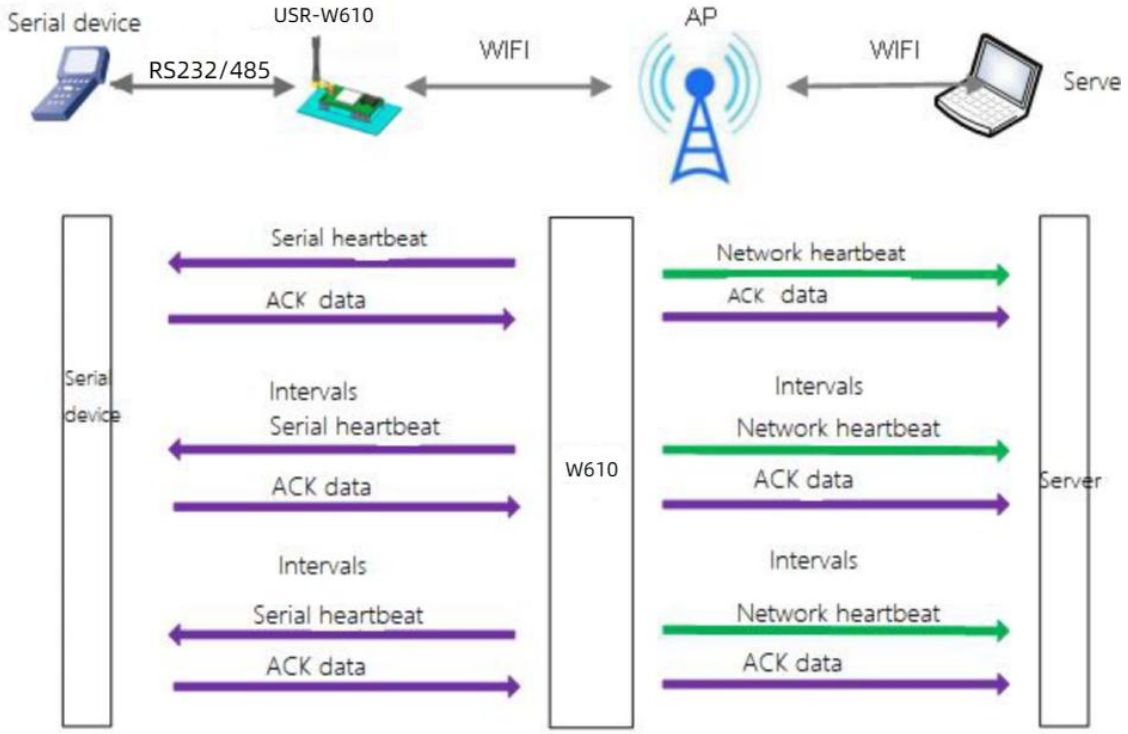


Figure 19. Heartbeat packet

The main purpose of sending to the network is to maintain a connection with the server, and at the same time let the server that is idle for a long time (do not send data to the server for a long time) to detect whether the current connection status is valid.

In applications where the server sends fixed query commands to the device, in order to reduce frequent interactions, users can choose to send heartbeat packets (query commands) to the serial device instead of sending query commands from the server.

Enable the custom heartbeat packet function. AT command settings are as follows:

(1)Enable heartbeat packet function AT+HEARTEN=on

(2)Set the sending direction (NET or COM) of the heartbeat packet, for example, set the heartbeat packet to be sent to the network.

AT+HEARTTP=NET

(3)Set the heartbeat packet data (maximum 40 bytes). For example, to set the data to the string www.usr.cn, you need to first convert the string to hex 7777772E7573722E636E.

AT+HEARTDT=7777772E7573722E636E

(4)Set the interval for sending heartbeat packets. The setting range is 1-65535s, and the default is 30s. For example, set the sending interval to 30 seconds.

AT+HEARTTM=30

Then need to set up network connections such as socket A and socket B, please refer to section 2.4. After

completing the settings, restart the serial server. After socket A or socket B is connected to the server, if there is no data transmission within 30 seconds, the serial server will send the string www.usr.cn to the server.

AT commands:

	Item	Description
1	HEARTEN	Query / Se whether to enable the heartbeat packet function
2	HEARTTP	Query / Set heartbeat packet sending mode
3	HEARTDT	Query / Set heartbeat packet data
4	HEARTTM	Query/ Set heartbeat packet sending interval

4.8. Socket Distribution

Users are allowed to send data to appointed socket connection and take the DR404 packaging the data from the net according to the protocol send to serial device if enabling the socket distribution under the transparent transport.

Users' MCU send data package according to the socket protocol and DR404 will parse the data package. If correspond with the protocol, it will be sent to the appointed socket; if not, it will return related error code and does not send it.

1)Data format from serial device to module

MCU send data package according the below format, module parse and send "n" bytes data to the appointed socket connection. When the data returned, no parse and output from the serial directly.

header	Length	Parameters	Data	Parity
3	2 (n+2)	2	n	1

Header: 0x55 0xFD 0xAA

Length: the total number of bytes from parameters(included) to parity (do not included), the high is in front.

Parameters:

- The first byte: common parameters, it is connecting number(socket A and socket B); 0x61 is all the device connected to the socket A, 0x62 is all the device connected to the socket B.
- The second byte: reserved parameters, default is 0x00. Common parameter is in front of the reserved one.

Data: length can be modify, the whole length is less than 4096 bytes.

Parity: from the parameters(included) to parity(not include), add and take the last bytes as parity.

Below is detailed application:

55 FD AA 00 03 61 00 CC 2D（Hex）

Length: 00 03, the length is 3;

Parameters: 61 00, send data to the socket A Data CC: the data sent is “0xCC”

Parity: 61+00+CC=2D

2)Data format from module to serial device

When the data received from network, module send the data package in the below format to the serial device. When the serial device send data to the module, if wrong, DR404 will send back to the serial device according to this format.

Header	Length	Parameters	Data	Parity
3	2 (n+2)	2	n	1

Header: 0xAA 0xFD 0x55

Length: the total number of bytes from parameters(included) to parity (do not included), the high is in front

Parameters:

- The first byte: common parameters, it is connecting number (socket A and socket B); The data returned by Socket A is 0x61, and the data returned by Socket B is 0x62.
- The second byte: reserved parameters, the seventh bit distinguish the the data from net or the module.(1:returned from module;0:returned from the net)

Data: if the net data, copy the data to the right position, length can be modify, length less than 4096 bytes.

If the DR404 data, return the operating code, details are as fellows:

	Return code	Description	Note
1	0x00	Header error	
2	0x01	Length error	
3	0x02	Parameters error	
4	0x04	Parity error	
5	0x10	Send failed(parameters is right but send failed)	

Parity: from the parameters(included) to parity (not include), add and take the last bytes as parity. Below is detailed application:

AA FD 55 00 03 61 00 CC 2D (HEX)

Length: 00 04, the length is 4

Parameters: 61 00, 61—data from socket A

00-net to serial

Data: CC, the data from the socket A

Sum parity: 61+00+CC= 2D

Below, we take socket A as example, serial send abc to socket A, socket A return 123 to the serial device:

Diagram 26Socket Distribution

AT command to enable the socket: AT+ TCPDPEN =on

Others, if more function for the socket A and socket B, please refer to the 2.4.

3.10.Timeout Restart

Under the transparent transmission mode, enable the timeout restart function. If the DR404 no WIFI connection or connected but no communication in set time, DR404 will restart.

(1)Enable this function:

AT+TIMEOUTEN=on

(2)Setting the time, from 60~65535s default is 3600s, e.g. 100s AT+TIMEOUTT=100

After setting, restart the DR404.

For example: AT+TIMEOUTT=100, if no connection or connected but no communication within 100s, module will restart; if there is connection or communication in 100s, the time will be cleared and regain to time.

NO.ItemDescription

1TIMEOUTENEnable/ disable restart timeout

2TIMEOUTTQuery/ setting the time for restart timeout

Form 17Timeout Restart

3.11.Timing Restart

"Timing restart" is equivalent to "restart after the set time". In the non-serial port command mode, when this function is enabled, the module uses the internal clock for timing. After reaching the set time, the module will be forced to restart.

Related AT command:

1)Enable this function:

AT+REBOOTEN=on

2)Setting the time, can be modified from 1~720h,default is 24h, e.g, 200h AT+REBOOTT=200

The parameter setting is completed, takes effect after the module is restarted, and the module will restart every 200h.

NO.ItemDescription

1REBOOTENEnable/disable timing restart

2REBOOTTQuery/setting time for timing restart

Form 18Timing Restart

3.12.Modbus Polling

(1)Setting by web page

Diagram 27Modbus polling

(2)Setting by AT command:

Enable/disable Modbus polling function, enable this function:

AT+MODBPOLLEN=on/off

Set the polling interval (50 ~ 65535) (ms), taking 200ms as an example: AT+MODBPOLLT=200

3.13.Remote Upgrade

3.13.1Serial server configuration

Setting by AT command:

(1)Setting/ Query remote upgrade parameters, for example, set remote upgrade to off: AT + UPDATE = off, ycsj1.usr.cn, 30001,30Default is off.

Query and set the remote update enable status, remote server address, remote server port, and reporting interval.

(2)Setting/ Query remote upgrade parameters AT+MONITOR=off,10Default is off.

Query and set the remote update enable status and reporting interval.

Setting by web page:

5. MQTT Mode

5.1. Brief introduction of MQTT

MQTT is a client-server-based message publish/subscribe transport protocol. The MQTT protocol is lightweight, simple, open, and easy to implement. These characteristics make it suitable and very extensive.

The MQTT function setting of USR-W610 is very flexible. It supports setting almost all MQTT protocol-related connection parameters, publishing topic parameters and subscription topic parameters.

For public topic, it supports 3 different modes: Pure transparent transmission mode, Special symbol publishing model, and Custom topic publishing mode.

For subscribe topic, it supports 2 different modes: Pure transparent transmission mode, and Carrying topic subscription mode.

5.2. Parameters setting of MQTT

Click MQTT setting tab, we can see the page of MQTT parameters.

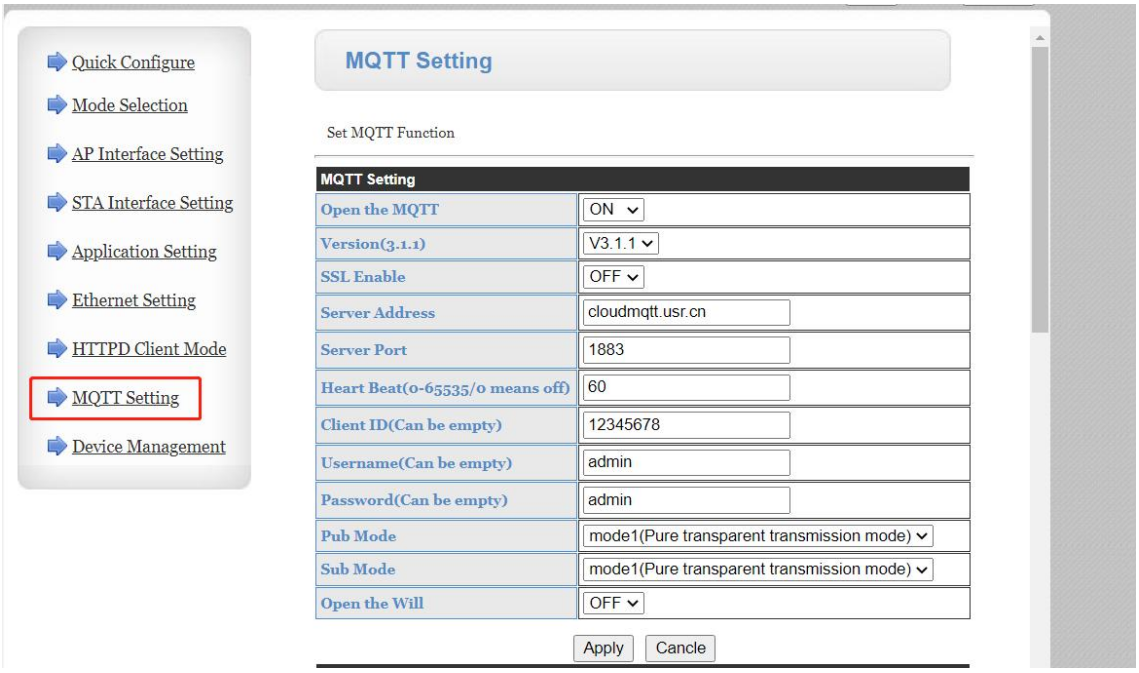


Figure 20. Basic parameters of MQTT

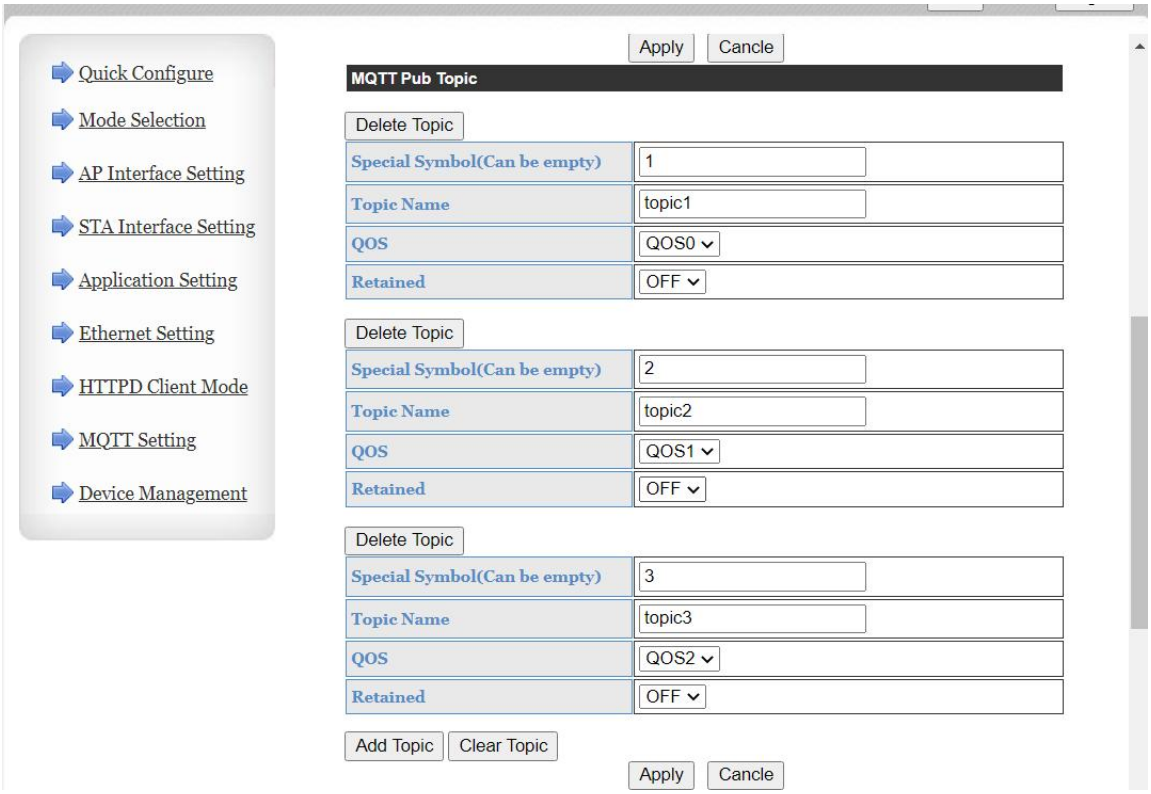


Figure 21. Public topic

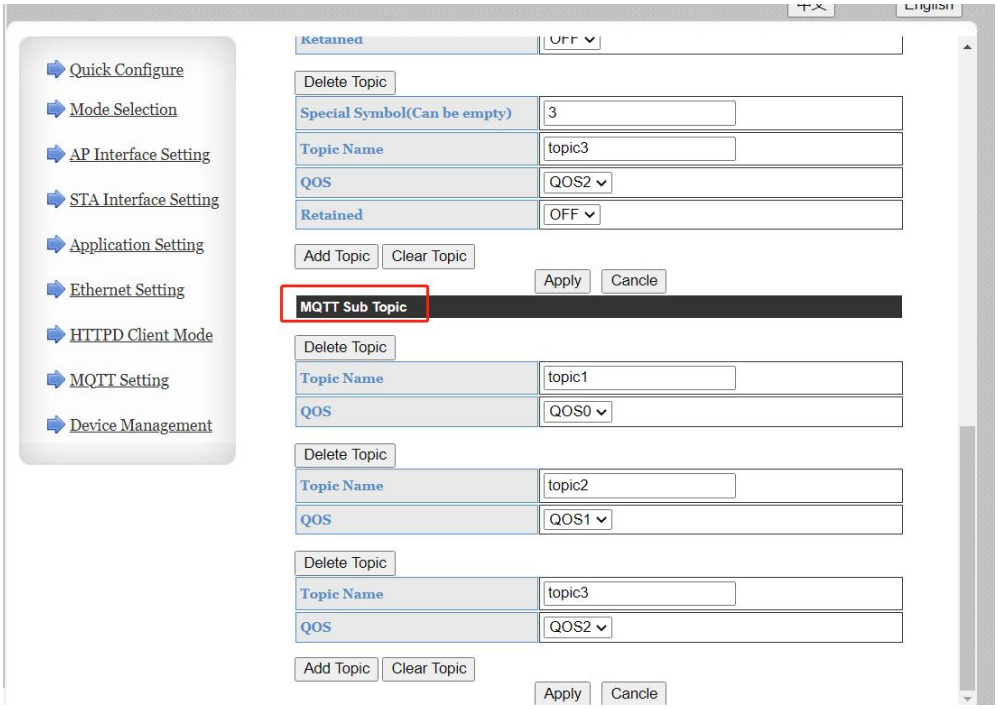
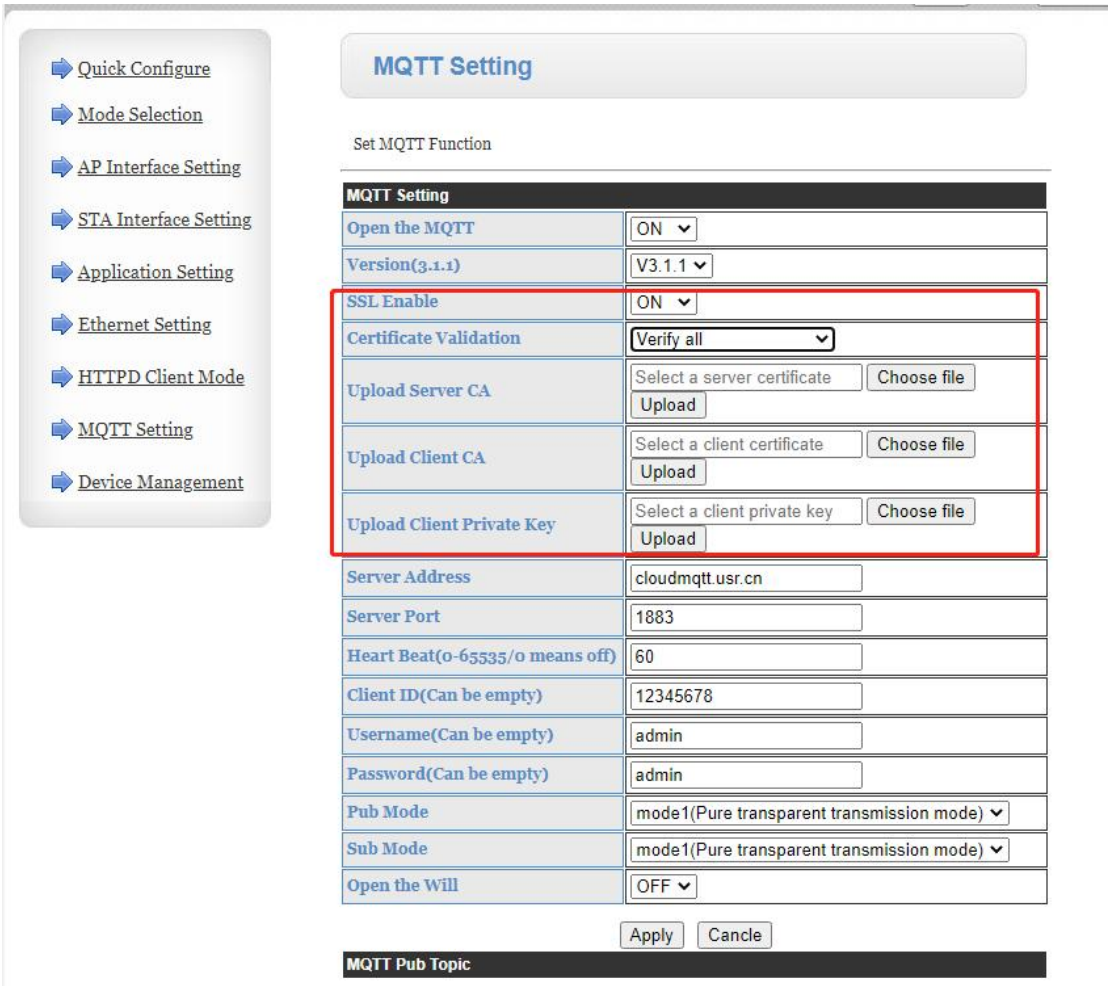


Figure 22. Subscribe topic

In MQTT mode, it also supports SSL encryption which can ensure the security of the data transmission.



6. Contact Us

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