WIFI232 User Manual

Note: This manual is based on the version of the module with firmware V5.01.01 and above. If the module you use is older version, some of the functions cannot be used.

CONTENS

1 Quick Start

WIFI232 series product is used to transmit data between RS232 and WIFI TCPIP transparently, user can update the product to WIFI control without knowing the WIFI and TCPIP detail. All the convert work is done by the module. For users, the RS232 side is only as a serial device, the WIFI side is TCPIP Socket data. User can setup the work detail by sample settings which can setup via inside web pages or RS232 port. The setup work only need do once, then it will save the setting forever.

This chapter is a user guide for WIFI232 series products. We suggest users follow the guide to test module at first, and will have a good understanding of the modules. Users can also choose the chapter which you are interested in to read. For specific details and instructions, please refer to the following chapters

1.1 Hardware connection

In order to test the communication between serial and WIFI network, we need to connect the serial port to PC, and also connect WIFI network to PC. Due to the special need both WIFI and serial, we connect and USB WIFI network Card as below, or you could use laptop which has WIFI.

Figure 1 hardware connection diagram

About the serial connection, because the module is 3.3V TTL level, the computer cannot connect to it directly. Users need to use a TTL to RS232 adapter cable and then connect to PC. In order to facilitate the test, we provide WIFI232 evaluation board for users to choose.

1.2 Network Connection

The following is the WIFI232 module example. Open Wi-Fi, search network, as shown in below, WIFI232 is the default network name (SSID) of the module.

Figure 2 WIFI search

Join the network, choose to automatically obtain IP, WIFI module supports DHCP server and it is enabled by default.

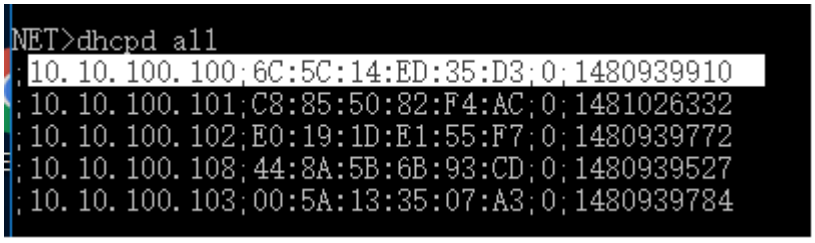


Figure 3 inquiry the address via DHCP Server

Now, the Link led of WIFI232 Evaluation board is lighting.

1.3 Communication test

Default setting of module:

- **SSID:** WIFI232;

- **Encryption mode:** open, none;
- **UART:** 57600, 8, 1, None;
- **Network parameters:** TCP, Sever, 8899, 10.10.100.254;
- **IP:** 10.10.100.254

We just need to follow the corresponding parameters to set the network communication parameters. With the setting, we could make serial <-->WIFI communication. The steps are as below:

1. Open the test software TCP232-test;
2. COM Setting area (left):

Choose COM port which has been used to connect the module, there is COM 10, choose baud rate to 57600, it is the default baud rate of WIFI module. Then click **Open**.

3. Net Settings area (right);

Choose TCP client mode, Server IP write 10.10.100.2554. It is the WIFI default IP address, Server port set 8899, it is the default listen Port of the WIFI module. Click **Connect** to link to the module.

Now we could test send data between RS232 and WIFI.

COM port to WIFI: PC RS232->Module RS232->Module WIFI->PC WIFI.

WIFI to COM port: PC WIFI -> Module WIFI -> Module RS232->PC RS232.

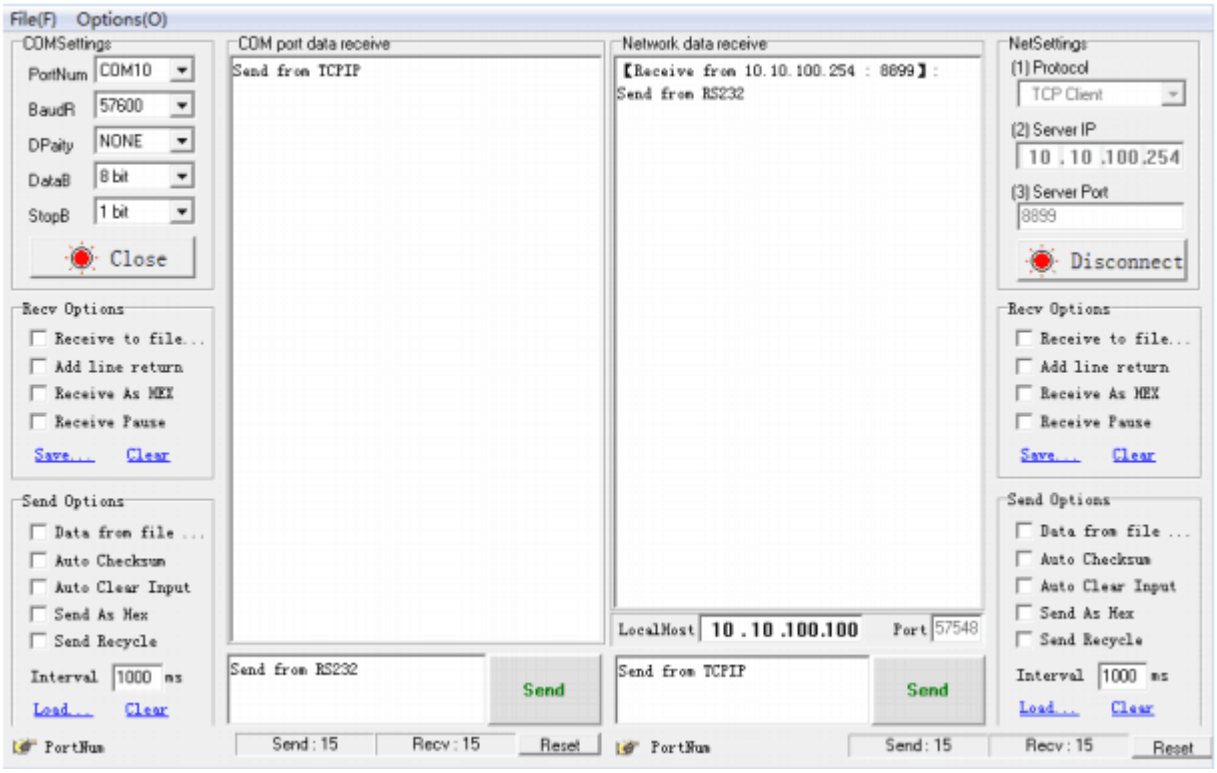


Figure 4 Serial/Network transmission test

2 Overview

2.1 Description

WIFI232 module is an integration of 802.11 b/g/n Wi-Fi module, which provide a wireless interface to any equipment with a Serial interface for data transfer. With this module, traditional serial devices or MCU control device could connect to Wi-Fi network easily,

The module used to MAC, baseband chip, RF transceiver unit, as well as the power amplifier; Embedded firmware support wi-fi protocols and configuration, as well as the network TCP/IP protocol stack.

WIFI232 uses the industry's highest performance embedded industrial structure, and for the application of smart furniture, smart grid, handheld devices, personal medical, industrial control, etc. These data fields, do a professional optimization. WIFI232 as a hot spot can accommodate 32 clients simultaneously wi-fi access, but also can accommodate 32 TCP client.

2.2 Device Features

- **Support IEEE802.11b/g/n Wireless Standards**
- **Support TCP/IP/UDP Network Protocols**
- **Support UART/GPIO/Ethernet Data Interface**
- **Support Router/Bridge Mode Networking**
- **Support Internal/External Antenna Option**
- **Support Transparent Transmission Mode**
- **Support Transparent Transmission Mode**
- **Support AT+ Instruction Set for Configuration**
- **Support Friendly Web Configuration Page**
- **Support Heartbeat Signal, WIFI connected prompting**
- **Support UART auto-Frame Function**
- **Single +3.3V Power Supply**
- **FCC/CE Certificated**

2.3 Device Parameters

	Item	Parameters
Wireless Parameters	Certification	FCC/CE
	Wireless standard	802.11 b/g/n
	Frequency range	2.412GHz-2.484GHz
	Transmit Power	802.11b：+19dBm(Max.@11Mbps)
		802.11g：+18dBm(Max.@54Mbps)
		802.11n：+17dBm(Max.@HT20,MCS7)
		802.11n：+17dBm(Max.@HT50,MCS7)
		Configurable
Hardware Parameters	Receiver Sensitivity	802.11b: -89dBm
		802.11g: -81dBm
		802.11n: -73dBm
	Antenna Option	External: 1-PEX Connector
		Internal: On-Board chip antenna
	Data Interface	UART: 300bps – 460800bps
		Ethernet: 100Mpbs
		GPIOs

	Operating Voltage	3.3V~3.6V
	Operating Current	165mA~305mA
	Operating Temperature	-25℃~85° C
	Storage Temperature	-40℃~125℃
	Dimensions	25x40x8 mm
Software Parameters	Wireless Network Type	Station/AP mode
	Security Mechanisms	WEP/WAP-PSK/WPA2-PSK/WAPI
	Encryption	WEP64/WEP128/TKIP/AES
	Work Mode	Transparent Mode/Serial command/HTTPD Client Mode/GPIO Mode
	AT Command	AT+ Instruction Set
	Network Protocol	TCP/UDP/ARP/ICMP/DHCP/DBS/HTTP
	Max. TCP Connection	32
	User Configuration	Web Server + AT command config.
	Customized application	Supports users customize App

Table 1 WIFI232 Module Technical Specifications

2.4 Key Application

- ✧ Smart lighting
- ✧ Smart plug
- ✧ Industrial controls
- ✧ Remote equipment monitoring
- ✧ IOT applications

2.5 Package Information

2.5.1 Recommended Reflow Profile

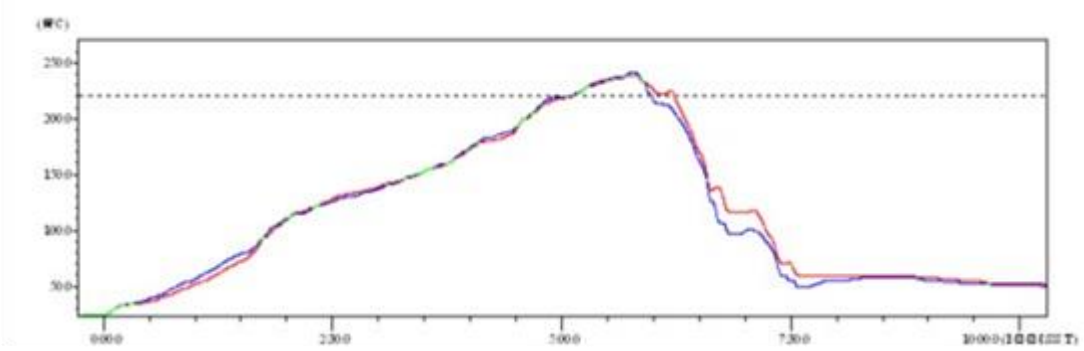


Figure 5 Reflow Soldering Profile

NO.	Item	Temperature	Time (Sec)
1	Reflow Time	above 220°C	35~55 sec
2	Peak-Temp	260 max	

Table 2 Reflow Soldering Parameter

Note:

1. Recommend to supply N2 for reflow oven
2. N2 atmosphere during reflow (O2 < 300ppm)

2.5.2 Device Handing Instruction

- Shelf life in sealed bag: 12 months, at <30°C and <60%relative humidity (RH)
- After bag is opened, devices that will be re-baked required after last baked with window time 169 hours.
- Recommend to oven bake with N2 supplied
- Baked required with 24 hours at 125±5°C before rework process for two modules, one is new module and two is board with module.
- Recommend to store at ⩽10% RH with vacuum packing
- If SMT process needs twice reflow

(1) Top side (2) Bottom side
Case 1: Wi-Fi module mounted on top side. Need to bake when bottom side process over 168 hours window time, no need to bake within 168 hours.
Case 2: Wi-Fi module mounted on bottom side, follow normal bake rule before process.
Note:
Window time means from last bake end to next reflow start that has 168 hours space

2.5.3 Shipping information

Figure 6 Shipping Information

TRAY Size: 420x245x34mm

Note:

1 tray = 5x20 pcs = 100 pcs
1 box = 2 trays = 2x100 pcs = 200 pcs
1 carton = 4 boxes = 4x200 pcs = 800 pcs

3. Hardware Introduction

3.1 Pins Definition

3.1.1 WIFI232 Pins Definition

Figure 7 WIFI232

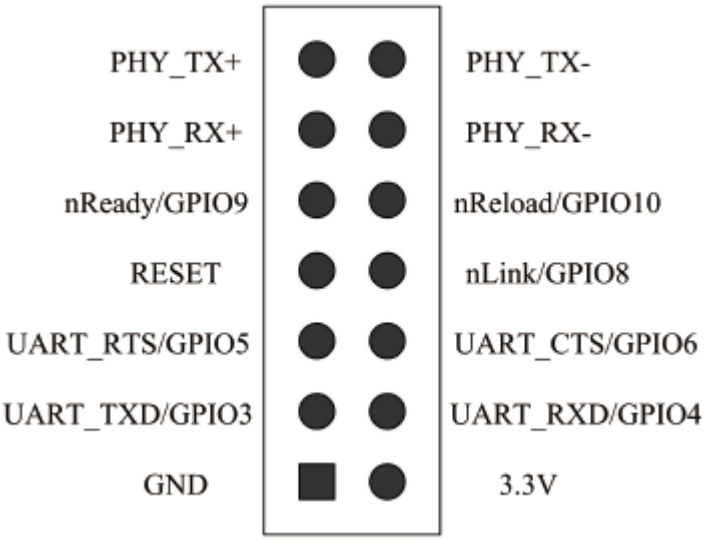


Figure 8 WIFI232 Pins Map

Pin	Description	Name	Direction	Note
1	GND	GDN	Power	Ground
2	Vcc 3.3V@350mA	3.3V	Power	External Power: 3.3V@mA
3	UART Data Transmit	UART_TXD	O	If not use UART function, this 4 pins can be configured as GPIO pins, and can change GPIO pin
	GPIO	GPIO3	I/O	
4	UART Data Receive	UART_RXD	I	
	GPIO	GPIO4	I/O	

5	UART send request of data transmission	UART_RTS	O	status through AT command
	GPIO	GPIO5	I/O	
6	UART receives data transmission permission	UART_CTS	I	
	GPIOGPIO6	I/O		
7	Module reset signal	RESET	I	“Low (0)” effective reset input The reset duration should be kept more than 300ms
8	WiFi status Indication	nLink	O	“0”-WIFI connection available “1”-Module boot up not finish Can be configured as GPIO
	GPIO	GPIO8	I/O	
9	Indicate the module status of power on process	nReady	O	“0” or “ Plmodic Signal”-Finish module boot up process. “1”- Module boot up not finish. Can be configured as GPIO
	GPIO	GPIO9	I/O	
10	Restore configuration	nReload	I	Module will Restore configuration after set this pin “o” more than 1s, then set “1”
	GPIO	GPIO10	I/O	
11	Ethernet Input+	PHY_RX+	I	+1.8V Ethernet Data Interface Support transformer and direct connection (AC couple) mode.
12	Ethernet Input-	PHY_RX-	I	
13	Ethernet Output+	PHY_TX+	O	
14	Ethernet Output-	PHY_TX-	O	

Table 3 WIFI232 Pins Definition

3.2 Mechanical Size

Physical size of WIFI232 modules is 25x40mm as below:

3.2.1 Dimension of WIFI232

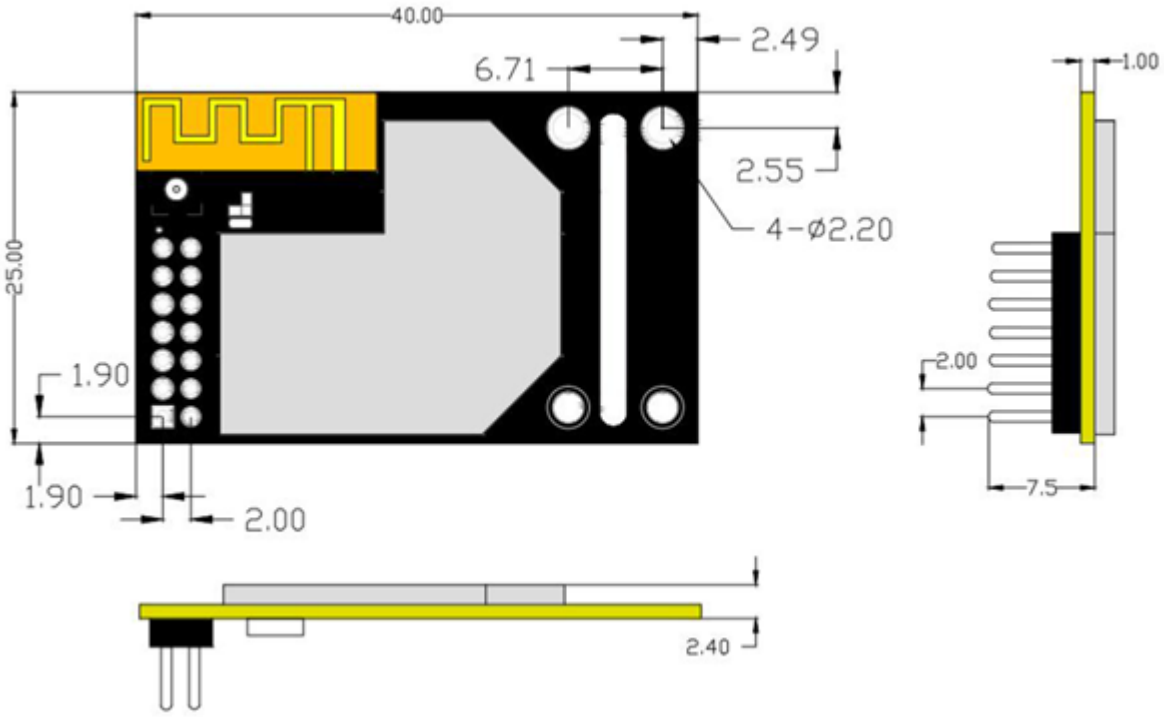


Figure 9 WIFI232 Mechanical Size

3.3 Antenna

3.3.1 On-board Chip Antenna

WIFI232 supports a built-in antenna options, when customers choose a built-in antenna, must comply with the following built-in antenna module placement of notes and general rules:

- Antennal must away from the metal, at least to the distance around the higher components above 10MM
- Antenna cannot be shielded by any meal enclosure; All cover, include plastic, shall away from antenna at least 10MM;
- Make sure the antenna mounted on the edge of user's PCB. The corresponding area cannot have any component placed and cannot have any wires routed
- If it has plastic case, make sure the antenna is on open area or edge to receive signals.

We suggest that the WIFI232 module be placed in the following areas of user board, in order to reduce the antenna and a wireless signal influence.

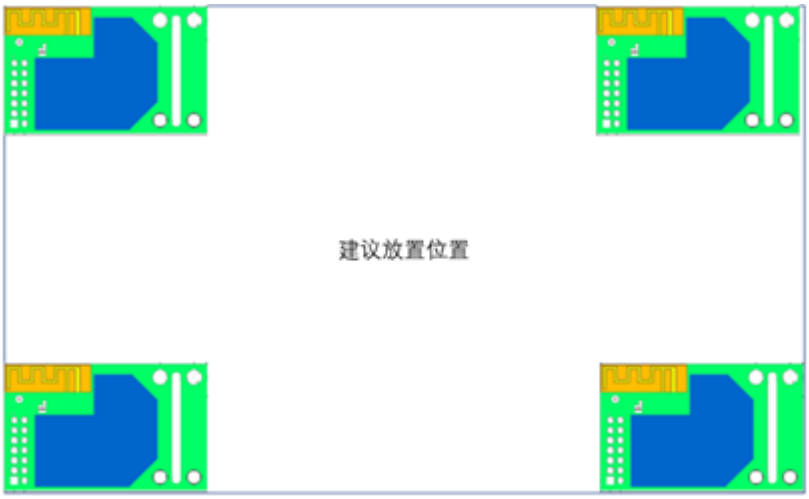


Figure 10 Suggested Module Placement Region

3.4 Evaluation Kit

Waveshare provides the evaluation kit to promote user to familiar the products and develop the detailed application. The evaluation kit shown s below, user can connect to WIFI232 module with the UAER poet, 100M Eth port or Wireless port to configure the parameters, manage the module or do some functional tests.

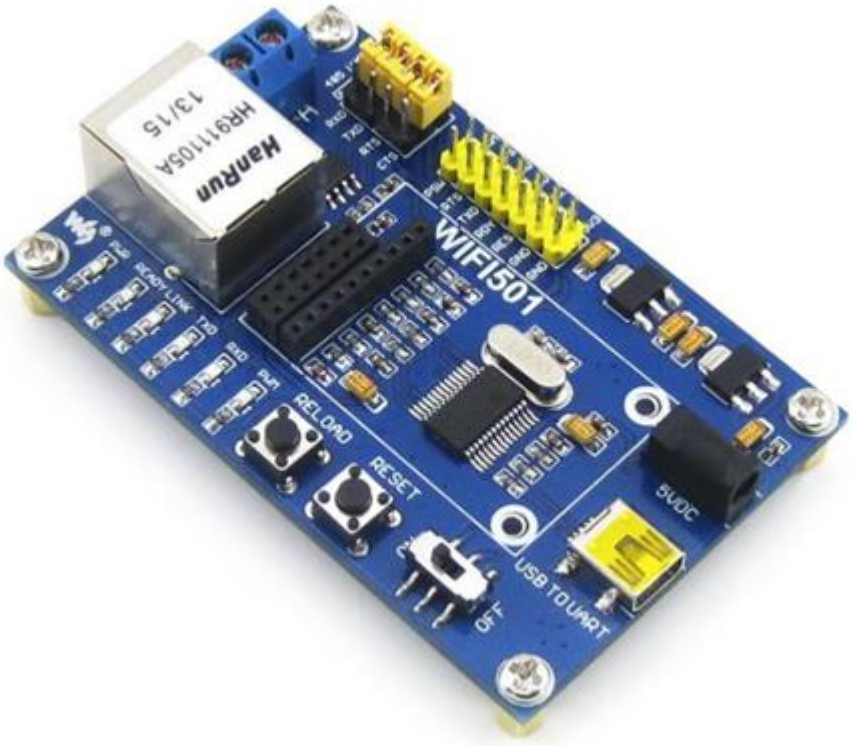


Figure 11 WIFI501 Evaluation board

3.5 Hardware Reference Design

3.5.1 Hardware Typical Application

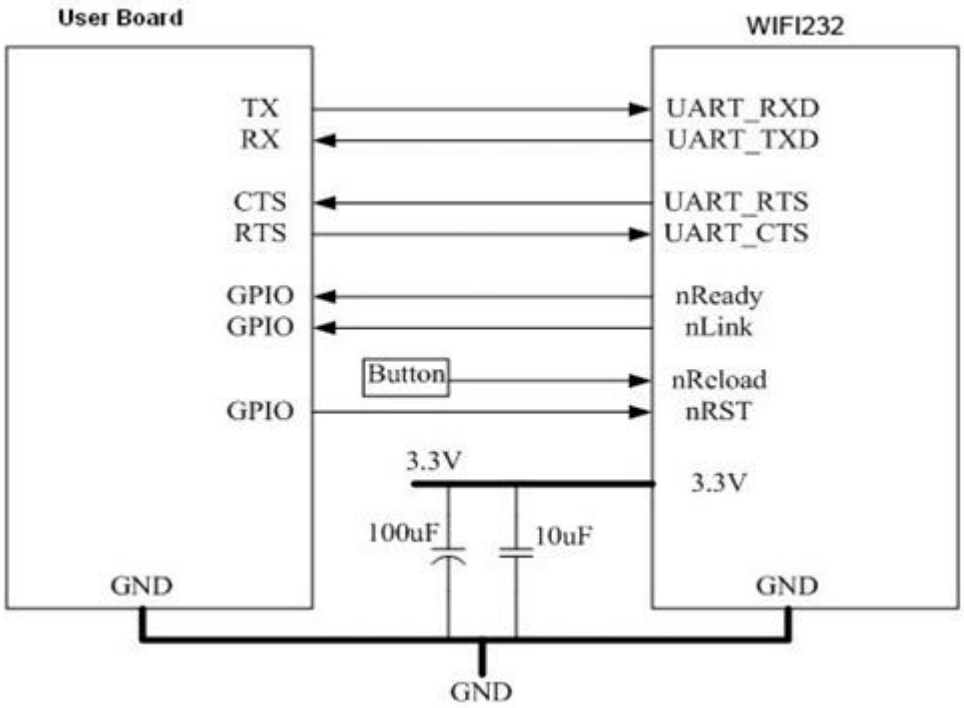


Figure 12 WIFI232 Hardware Typical Application

Note:

nRST- Module hardware reset signal. Input. Logics "0" effective
There is 100K Ohm pull-up resister internal up to 3.3V. When module power up or some issue happened, MCU need assert nRST signal "0" at least 300ms, then set "1" to keep module fully reset

nReadt- Module boot up ready signal. Output. Logics "0" effective.
There is 4.7K Ohm pull-up resister internal up to 3.3V. Then module will output "0" or "Heartbeat Signal" after normal boot up. This signal used to judge if module finish boot up and ready for application or working at normal mode

nLink- Module WIFI connection indication. Output
There is 4.7K Ohm pull-up resister internal up to 3.3V. When module connect to AP or some WIFI STA connect to module (AP mode), the module will output "0". This signal used to judge if module already at WIFI connection status.

nReload- Module restore to factory default configuration. Input. Logics "0" effective
User can assert nReload signal "0" more than 3's through button or MCU pin, then

release, module will restore to factory default configuration and re-start boot up process. User need add 4.7K~10K Ohm pull-up resister external the module

UART_TXD/RXD- UART port data transmit and receive signal

3.5.2 10/100M Ethernet Interface

WIFI232 modules provide one 10/100M Ethernet PHY layer interface for data transition. This Ethernet support with transformer and without transformer (PHY-to-PHY) 2 kinds of connection

3.5.2.1 Ethernet Connection with Transformer

User board put Ether transformer and RH-45 connector. This is a general 10/100M Ethernet PHY layer connection. The reference design as following:

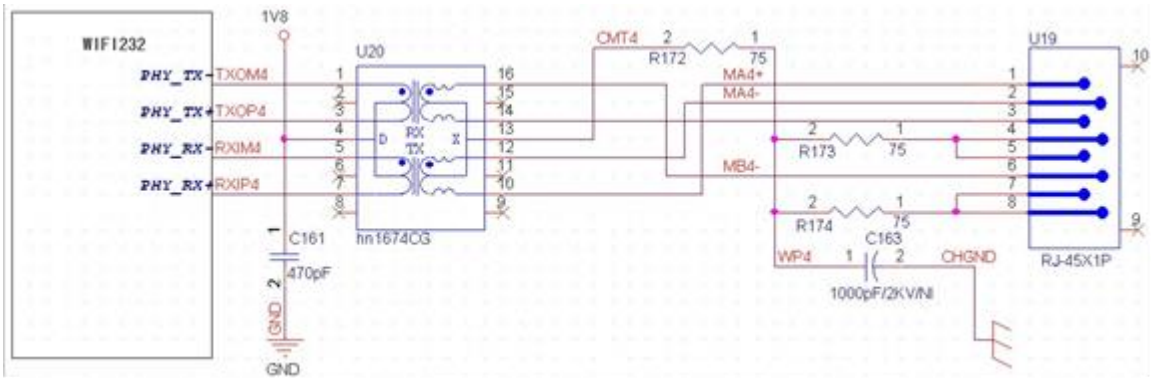


Figure 13 PHY Layer Connection Reference Design

3.5.2.2 Ethernet Connection without Transformer

For this application, Ethernet will work as internal data transmission interface and save one transformer and RJ45 connector. Ethernet PHY-to-PHY connection will use AC coupled connection. This is a space and cost optimized solution. Hardware reference design as followingL

Note: VCC signal at reference design shall base on user board PHY chipset voltage level, such as 2.5V power supply for general Ethernet PHY chipset.

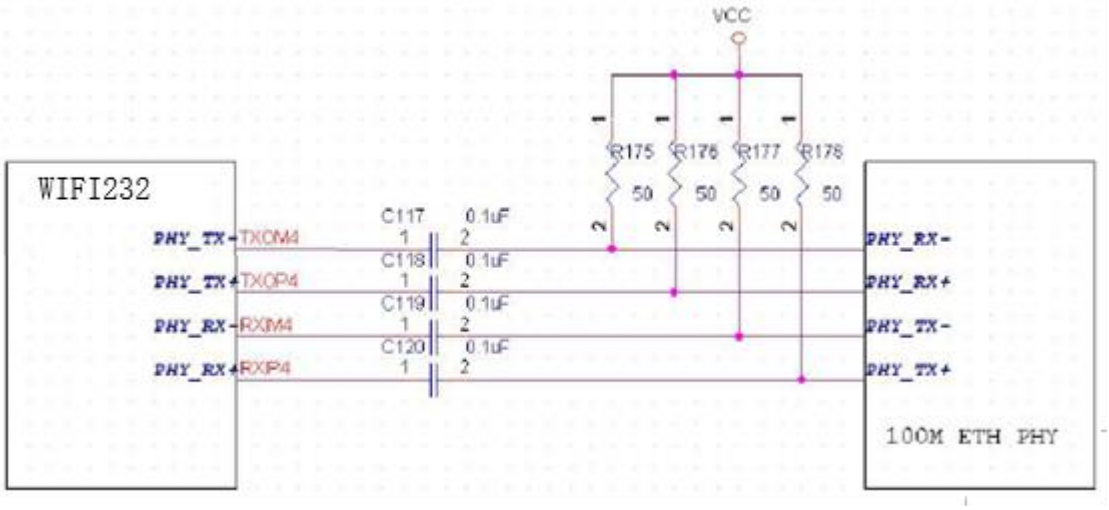


Figure 14 Reference Design for Module Without Transformer

This module Ethernet interface default is for the application with transformer connection. If you need PHY-PHY directly connection, please refer to the Ethernet connection with transformer design and take AT+FEPTP command as reference.

The commands required:

AT+VEW=enable<CR> to open ethernet WAN port function (reset to default configuration by Reload)
AT+FVEW=enable<CR> to open ethernet WAN port function (Reload is unavailable)

Remark:
1. Only when ethernet as WAN, this command is needed. Module default LAN port.
2. After this command, make sure module WAN IP and LAN IP in different segment. (Modify the LAN IP in AP Settings, modify the WAN IP in STA Settings)

AT+FEPTP=om<CR> Quey/set default ethernet PHY-PHY on/off
AT+FEPGT=on<CR> Open ethernet function permanently
AT+RELD<CR> Command with "F" need to be affective after AT+RELD
After module reset, command effect, and will not impact by Reload.

For user's design, please note:

1. Cable connection should be AC coupling, your cable need be pulled up to VCC (fit with PHY chip level)
2. Cable TX connected to RX. In PHY-PHY direct connection, PHY chip does not support direct/cross self-adaption
3. Your PHY chip on board should better to be forced into 100M work mode

4. You could configure the AT command of module by UART port or WIFI. The detailed setting please refer to the AT command of reference manual of chip.

3.5.3 UART Interface

UART interface is the serial data transmission interface mainly used for WIFI232 module. User can add RS-232 chipset on user board and convert the signal to RS-232 voltage to communicate with outside equipment or sensors. WIFI232 modules UART interface include 4 general signals: TXD/RXXD/RTS/CTS. The hardware reference design with RS-232 chipset as following:

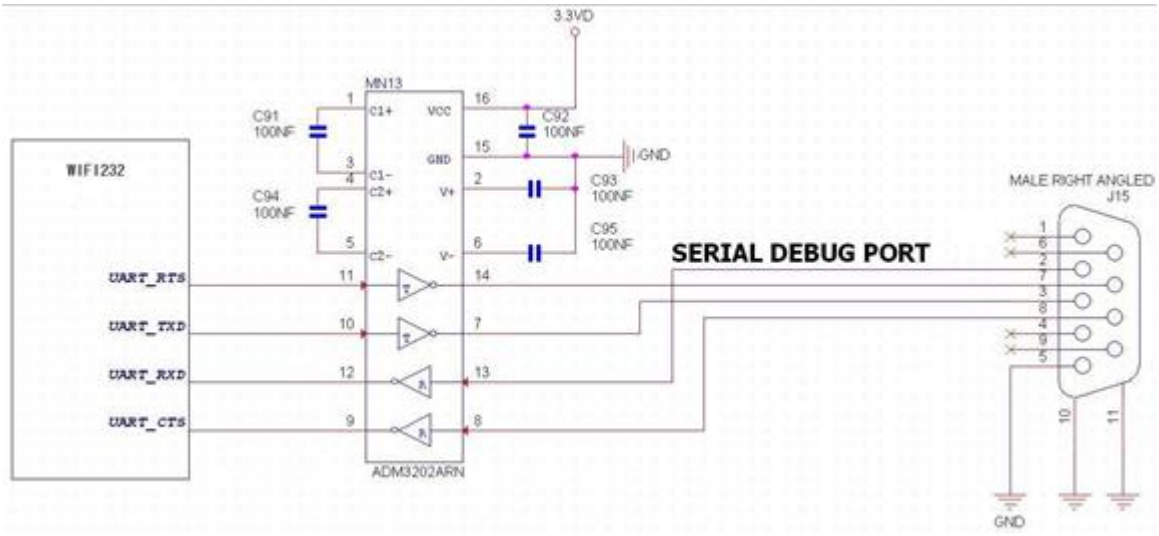


Figure 15 UART Interface Reference Design

Note:

TXD pin is also the hardware configuration pin internal module. So this pin must pull-down during module power up. WIFI232 modules provide internal pull-down resister, user cannot add pull-up/pull-down resister on user board, which may cause module cannot work.

3.5.4 Power Interface

WIFI232 module support single 3.3V power supply. The peak current shall about 350mA and normal WiFi working current shall about 200mA. The power saves (WiFi OFF) mode will about 100mA

Decoupling at power pin suggested, at least one 100uF and one 10uF capacitor required at user board and put near module power input pin will increase the reliability and performance.

4 Modules Function Description

4.1 User configuration process

After WIFI232 module electric started, based on user pre-set parameters, automatically connect to wireless network and servers, and enter the working mode is set to open in accordance with the default serial port parameters.

The parameters which need to configure include:

- Work Mode
  - Transparent mode/Serial command mode/HTTD Client mode/GPIO mode
- Wireless Network Parameters
  - Wireless Network Name (SSID)
  - Security Mode
  - Encryption Key
- TCP/UDP Linking Parameters
  - Protocol Type
  - Link Type (Server or client)
  - Target Port ID Number
  - Target Port IP Address
- Serial Port Parameters
  - Baud Rate
  - Data Bit
  - Parity (Check) Bit
  - Stop Bit
  - Hardware Flow Control

The following sections will introduce specific to each part in detail

4.2 Working Mode

Module has five working modes: transparent mode, serial command mode, GPIO mode, HTTPD Client mode and AT command mode. Except AT command mode, user can change the mode on internal web page of module. Detailed about how to change the mode, please refer to chapter 5.

4.2.1 Transparent Mode

WIFI232 modules support serial interface transparent transmission mode. The benefit of this mode is that achieves a plug and play serial data port, and reduces user complexity furthest. In this mode, user should only configure the necessary parameters. After power on, module can automatically connect to the default wireless network and server.

In this mode, the module's serial port always works in the transparent transmission mode, so users only need to think of it as a virtual serial cable, send and receive data as using a simple serial. In other words, the serial cable of user's original serial devices is directly replaced with the module.

The transparent transmission mode can fully compatible with user's original software platform and reduce the software development effort for integrate wireless data transmission.

Note:

Transparent transmission mode is much simple. User also could also open the serial port hardware flow control (CTS/RTS) function, so that we can make the bit error to minimum. If the user doesn't need hardware flow control function, only need to hung up the corresponding pin (CTS/RTS)

4.2.2 Serial Command Mode

In this mode, the user can send the serial data to a different server address, in this pattern, client can use UDP or TCP to send data to the server.

Customer MCU send packets according to the following format, parsing module is finished, only the n bytes of data sent to the destination address. When data is returned, not analytical data output from serial port directly.

Framer header	Length	Function byte	Backup data area	Destination port	Target address	Data	Sum check
2	2 (n+m+5)	1	2	2	m	n	1

Framer header:

0x55 0xAA (Constant)

Length:

Starting from the function byte to Sum check (doesn't contain the sum check) Hight byte at the front.

Function byte:

Bit0: (UDP: 0; TCP: 1)

Bit1: (Short connection: 0; Long connection: 1)

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

Bit7: (cut protocol: 0; full protocol: 1) currently only supports cut protocol

Notes:

✧ Bit1: If it is short connection, it sends data, and then will be disconnected. If it is long connection, it sends data, connection will remain, until re-change the target address.

✧ Bit2: Indicates that the target address is IP or domain name. If it is IP, the target address is 4 bytes; if it is domain name, the target address length for the entire domain name string length (the last byte address is "\0", that is the end of the string).

✧ Bit7: Under the cut protocol, reply frame contains only data; Under the full protocol, reply frame has "failed to send', "waiting for", "UDP radio response equipment IP" frame data.

Backup data area:

➢ First byte: If it is a short connection, this position is TCP waits for the timeout time (1-255), if the send command is completed, did not receive a response, then wait a few seconds and the corresponding, if 5, said to wait for the 5S to disconnect if the sending command, immediately receive the returned data, then immediately disconnected; if it is long connection, this position is 0x00.

➢ Second byte: Reserve

Destination port:

Little endian, low byte in the former, such as port 23, here are 0x17 0x00

Target address:

If it is IP, is 4 bytes. For example, 192.168.0.7 said 0x07 0x00 0xA8 0xC0; If it is a domain name, then the address of indefinite length, ending with the '\0'.

Data:

Variable length, the maximum not exceeding 1000bytes.

Sum check:

From the function word to check byte (doesn't contain a check byte), add Sum check. The following is an example of a specific application:

Send data: 0x55 0xaa 0x00 0x0a 0x00 0x00 0x00 0x21 0x00 0x85 0x00 0xa8 0xc0 0x01 0x0f

Length: 0x00 0x0a (It is n+m+5, here is 10)

Function byte: 0x00 (UDP; Short connection; IP; cut protocol)

Destination port: 0x21 0x00(33)

Target address: 0x85 0x00 0xA8 0xC0 (192.168.0.0133)

Data: 0x01 (data length: 1)

Sum check: 0x0f

(0x00+0x00+0x00+0x21+0x00+0x85+0x00+0xA8+0xC0+0x01=0x0f)

4.2.3 GPIO Mode

WIFI232 module support GPIO mode. In GPIO mode, UART (TXD/RXD/CTS/RTS) defined as GPIO and others (nReady/nLink) also defined as GPIO pin.

When module works at GPIO mode, PC and other equipments can setup connection (TCP/UDP) through WiFi, then read/write GPIO information through command.

- ✧ GPIO n IN: Set GPIOn as input, Response **GPIO OK** or **GPIO NOK**;
- ✧ GPIO n OUT 0: Set GPIOn as output and output '0', Response **GPIO OK** or **GPIO NOK**;
- ✧ GPIO n OUT 1, Set GPIOn as output and output '1', Response **GPIO OK** or **GPIO NOK**;
- ✧ GPIO n SW: Set GPIOn as output as output and switch the output status, Response **GPIO OK** or **GPIO NOK**;
- ✧ GPIO n PWM m1 m2: Set GPIOn output a wave. m1 is 'high' duration and m2 is 'low' duration (Time unit is 'ms' and minimal is 10 ms). Response **GPIO OK** or **GPIO NOK**;
- ✧ GPIO n GET, Read GPIOn status. Response I0, I1, O0, O1 means "input low", "input high", "output low" and "output high" separately.

Notes:

n can be 3, 4, 5, 6, 8, 9 corresponding module pin. GPIO 4 can only defined as input and GPIO 3 can only defined as output.

GPIO READ returns all current IO status, and GPIO n GET said method. Such as, I1I1I0I0I0I0O1. I stand for input, and O for output. 0 means low and 1 means high.

Pin 4 is negated. So if you read 1, it actual 0 and if you read 0, it actual 1.

4.2.4 HTTPD Client Mode

This mode is used to send data to the HTTP server or request data from server.

After setting the HTTP header format by webpage or AT command, the data sent each time by UART will add the HTTP header automatically. Convenient for the user directly submit data or read data from the HTTP server.

Below is the specific application, for example:

The first set HTTP parameters using AT instructions:

AT+HTTPURL=192.168.1.1,80 The server address and port settings

AT+HTTPTP=POST Set the HTTP type, GET, PUT or POST

AT+HTTPPH=/set Set the path of header, longest 50 bytes

AT+HTTPCN=keep-alive Set the Connection of header, longest 20bytes

AT+HTTPUA=lwip13.2 Set the User-Agent of header, longest 20bytes

If sending data 1234. In the 80 ports of 192.168.1.1 will receive the following data

POST /set HTTP /1.1

Connection: keep-alive

User-Agent: lwip1.3.2

Content-Length: 0

Host: 192.168.1.1:80

Data received from server will be directly sent to the serial port without any treatment.

Detailed about how to configure header of HTTP protocol please refer to chapter 5.2.2.45-5.2.2.59

4.2.5 AT Command Mode

In AT command mode, user could query the current status and set the module parameter by sending AT commands.

4.3 Wireless Networking

WIFI232 module can be configured as both wireless STA and AP based on network type. Logically there are two interfaces in WIFI232. One is for STA, and another is for AP. When WIFI232 works as AP, other STA equipment are able to connect to wireless LAN via WIFI232 mode. Wireless Networking with WIFI232 is very flexible. Following figure shows the functional architecture of WIFI232 mode:

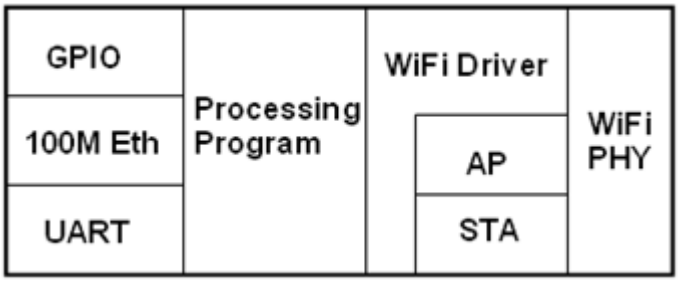


Figure 16 WIFI232 Functional Architecture

Notes:

AP: Wireless Access Point. Founder of a wireless network and the center of the network nodes. Generally, the wireless router we use at home or in office is an AP.

STA: Wireless Station. Each terminal connects to a wireless network (such as laptops, PDA and other networking devices) can be called with a STA device.

4.3.1 STA

WIFI232 can work as STA (use AP CLI interface) and connect to other AP, in this way, it could build a basic network. AP is the center of this basic network, and all communication between STAs is transmitted through the AP. The figure following shows such type of networking.

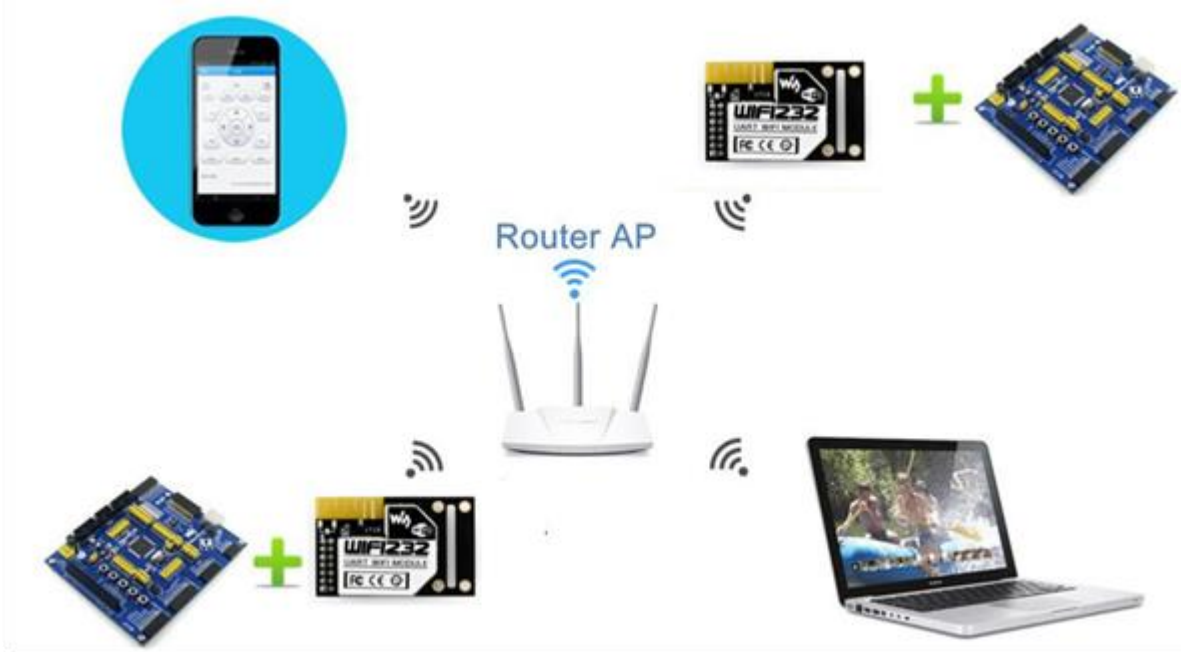


Figure 17 WIFI232 Basic Wireless Network Structure

4.3.2 AP

Because WIFI232 can be set to AP, can also be set to STA, so the WIFI232 can be achieved easily wireless ad hoc network.

As showing in the figure below, WIFI232 (1) can be treat as an AP, and WIFI232 (2), WIFI232 (3) and the laptop are STAs connected to WIFI232 (1). Meanwhile, all WIFI232 modules can be connected to user device via UART interface. All WIFI232 modules can be operated and managed through the laptop. So it is convenient to O&M all WIFI232 modules. Moreover, in such Adhoc network structure, the whole coverage of a wireless

network can be extended easily.

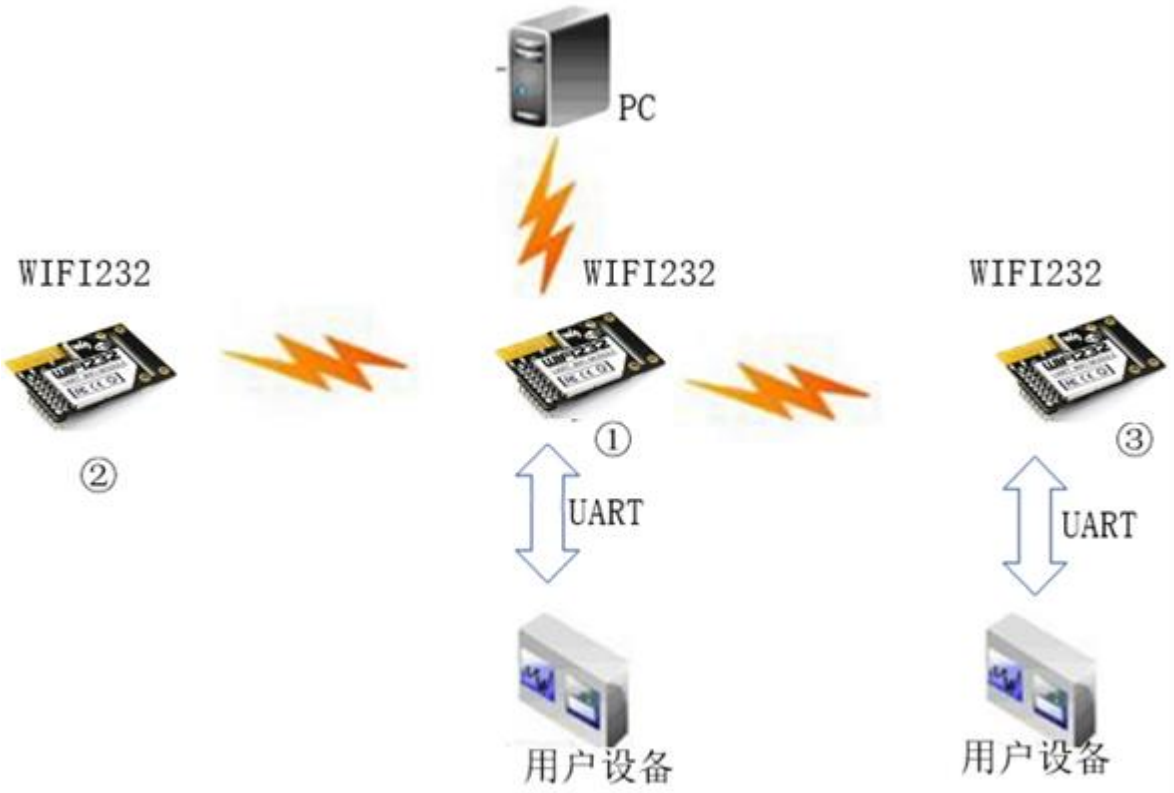


Figure 18 WIFI232 STA Network Structure

4.3.3 AP+STA

WIFI2323 module support AP+STA network mode, means module support one AP interface and one STA interface at the same time, as following figure:

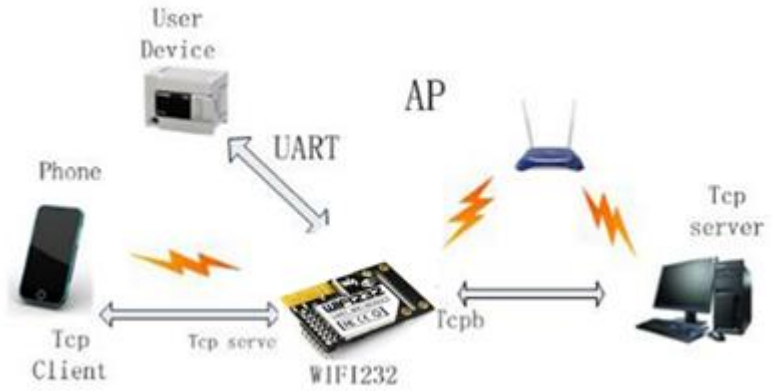


Figure 19 WIFI232 AP+STA Network Structure

Module enable AP+STA function, module's STA interface can connect with router and connect to TCP server in the network. At the same time, module's AP interface is

also active and permit phone/PAD to connect through TCPB, then phone/PAD can control user device and setting the module parameters.

The advantages of AP+STA mode are:

✧ Users can easily set and track user device through Phone/PAD and not change the original network setting

✧ Users can easily set module's parameters through WIFi when module works as AP+STA mode

AP+STA Mode Setting:

AP+STA mode need serial AT command to enable as follows:

✧ AF+FAPSTA=on, Enable AP+STA mode

✧ Then configure the module that, keep AP interface active when work in STA mode

AP+STA Mode Notes:

Wen user enable AT+STA function, the STA port need to keep connecting with other router (AP), or it will scan the AP frequently, which will affect AP port function and may cause some data loss.

So, if user confirm STA port cannot connect with AP at some time, user can disable the STA scan through the following command:

✧ AT+STTC=on/off, on: scan AP. off: not scan AP. (This command is invalided after re-powert)

✧ AT+FSTTC=on/off. This command is valid after re-power.

4.4 Ethernet Interface Communication

WIFI232 module provides one 100M Ethernet interface. With this Ethernet interface, user can easily realize the three interface (WIFI, UART and Ethernet) intercommunication and networking. WIFI2332 module can be configured as Bridge Mode or Router Mode base on different networking technology.

Notes: As the Ethernet mode will increase additional consumption, so it is default closed。 If you need this function, please use AT_FEPHY=on to open it and RELD cannot change this. For different application, WIFI232 need version switch via commands (such as following description of N-Ver and Z-Ver). With command AT+FVER=n to switch to N-Ver and with command AT+FVER=z to switch to Z-ver.

4.4.1 WIFI232 Ethernet Interface Networking (AP)

Figure 20 WIFI232 Ethernet Interface Networking (AP)

WIFI232 module works as AP and the center of this network. All devices' IP address in this network shall use the same network segment with WIFI232 and they can intercommunication with this method.

4.4.2 WIFI232 Ethernet Interface Networking (STA N-Ver)

Figure 21 WIFI232 Ethernet Interface Networking (STA N-Ver)

WIFI232 module works as STA (Software is N-Version), and module set as router mode. When module connect to AP, it will get wireless port IP address from AP (For example: 192.168.1.101). At the same time, module also from a subnet (Default 10.10.100.254) and all devices connected to module Ethernet interface will get assigned IP address (For example: 10.10.100.101). So as shown, PC1 at internal subnet can initiate a connection to PC2 (For WIFI232 works as router mode), but PC2 cannot active initiate a connection to PC1.

4.4.3 WIFI232 Ethernet Interface Networking (STA, Z-Ver)

Figure 22 WIFI232 Ethernet Interface Networking (STA, Z-Ver)

For above networking, WIFI232 module works as STA (Firmware is Z-Version), and module configured as bridge mode. When module connect to AP. all devices connected to module Ethernet interface will get assigned IP addressed IP address from AP (For example: 192.168.1.101). For module works as bridge mode, it can be treated as a transparent device and PC1, PC2 can communicate without any limit. But in this networking, WIFI232 module needs assign a static LAN IP address (For example: 192.168.1.10) if module also communication with AP or configuration through web page.

4.5 WI-FI parameter setting

4.5.1 Auto-Frequency Function

When module works as STA, WIFI232 will adjust its wireless channel to keep the same channel with associated AP and connect in.

When module works as AP and WIFI32 enable Auto-frequency function, then when module boot up, it will select the best wireless channel based on surrounding environment

4.5.2 Security

WIFi232 module supports multiple wireless encryption mechanisms, and enables to protect the security of user's data transmission, the mechanisms include:

- WEP
- WPA-PSK/TKIP
- WPA-PSK/AES
- WPS2-PSK/TKIP

- WPS2-PSK/AES

Note: When use WEP encryption, the password is 10 bits or 26 bits in HEX, or 5 bits or 13 bits in ASCII. The password of WPA-PSK and WPA2-PSK is at least 8 bits.

4.5.3 Search Function for STA

When using web configuration STA Interface Setting Page, user can push "Search" button to find surrounding AP, and find a AP to associate

Figure 23 Search Button in STA Setting

Site Survey

	SSID	BSSID	RSSI	Channel	Encryption	Authentication	Network Type
○	TP-LINK_waveshare	78:a1:06:40:09:a2	39%	11	AES	WPA2PSK	Infrastructure
○	360WiFi-7544	00:36:76:37:75:44	20%	1	AES	WPA2PSK	Infrastructure
○	ChinaNet-YK9f	b4:41:7a:55:05:a0	5%	1	TKIP	WPA2PSK	Infrastructure
○	MERCURY_814	74:ea:3a:1b:65:e2	5%	1	TKIP	WPA2PSK	Infrastructure
○	TP-LINK_1014A	6c:e8:73:50:f4:40	0%	1	TKIP	WPA2PSK	Infrastructure
○	ChinaNet-Fira	a8:ad:3d:77:bf:6c	0%	1	TKIP	WPA2PSK	Infrastructure
○	ADSL-WIFI	c8:3a:35:58:07:60	0%	6	AES	WPAPSK	Infrastructure

Apply Refresh

Figure 24 Search Page in STA Setting

After choosing router, it will return to the original page. In this page, the encryption type and encryption algorithm has readied, you just need to input the password as prompt.

4.5.4 Address Binding

WIFI232 module supports the feature of binding the BSSID address of target network. According to the provisions of 802.11 protocol, different wireless networks can have a same network name (i.e. SSID/ESSID). But must correspond to a unique BSSID address (i.e. MAC address). Illegal intruders can create a wireless network with the same SSID/ESSID, it will make STAs in the network to join to the illegal AP, thereby and then network leakage happen.

User can prevent STA from joining to illegal network by binding the BSSID address, to improve wireless network security.

4.6 UART Frame Scheme

4.6.1 UAER Free-Frame

WIFI232 support UART free-frame function. If user select open this function, module will check the intervals between any two bytes when receiving UART data. If this interval time exceeds defined value (50ms default), WIFI232 will think it as the end of one frame and transfer this free-frame to WIFI port, or WIFI232 will receive UART data until 4K bytes, then transfer 4KB frame to WIFI port.

WIFI232's default interval time is 500ms. User can also set this interval to fast (10ms) through AT command. But user have to consider that if user MCU can send UART data with 10ms interval, or the UART data may be divide as fragment.

Through AT command: AT+FUARTTE=fast/normal, user can set the interval time: fast (10ms) and normal (50ms). This command is factory default setting command and AT_RELA cannot change its value.

4.6.2 UART Auto-Frame

WIFI232 support UART auto-frame function. If user open this function and setting auto-frame trigger length and auto-frame trigger time parameters, then module will auto frame the data which received from UART port and transmitting to the network as pre-defined data structure

✧ Auto-Frame trigger length: The fixed data length that module used to transmitting to the network.

✧ Auto-Frame trigger time: After the trigger time, if UART port received data cannot reach auto-frame trigger length, then module will transmitting available data to the network and bypass the auto-frame trigger length condition.

Auto-Frame trigger time is calculated when the module receive first byte from UART port as below:

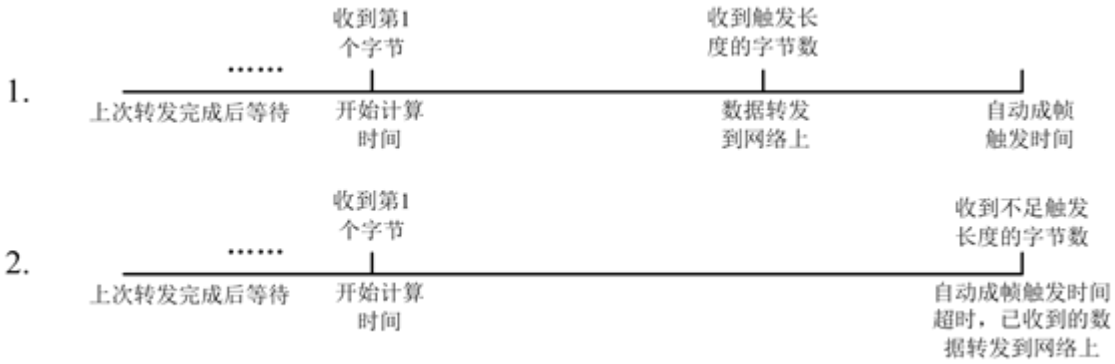


Figure 25 Auto-Frame Trigger Time

Detailed UART auto-frame function can refer to AT+ instruction set "UARTF/UARTFT/UARTFL" introduction.

4.7 Network Setting

WIFI232 module has two TCP/UDP Socket: Socket A and Socket B. Serial data written to the module, will be sent to the Socket A and B simultaneously; TCP/UDP data that module receives through either Socket A or B, will be sent to the serial port.

Dual Socket through different settings, you can achieve a variety of network interconnect. When the module shipped only open Socket A, Socket B default is not to connect, if the user needs to use, please set by AT commands.

4.7.1 Socket A

Socket A has three work mode: TCP Server, TCP Client, UDP. The setting method, please refer to the AT+NETP command instruction.

When Socket A configured as TCP Server, it supports Multi-TCP link connection, and maximum Multi-TCP link connection will work as following structure:
Upstream: All data from different TCP connection or client will be transmitted to the serial port as a sequence.
Downstream: All data from serial port (user) will be duplicate and broadcast to every TCP connection or client.
Detailed Multi-TCP link data transmission structure as following figure:

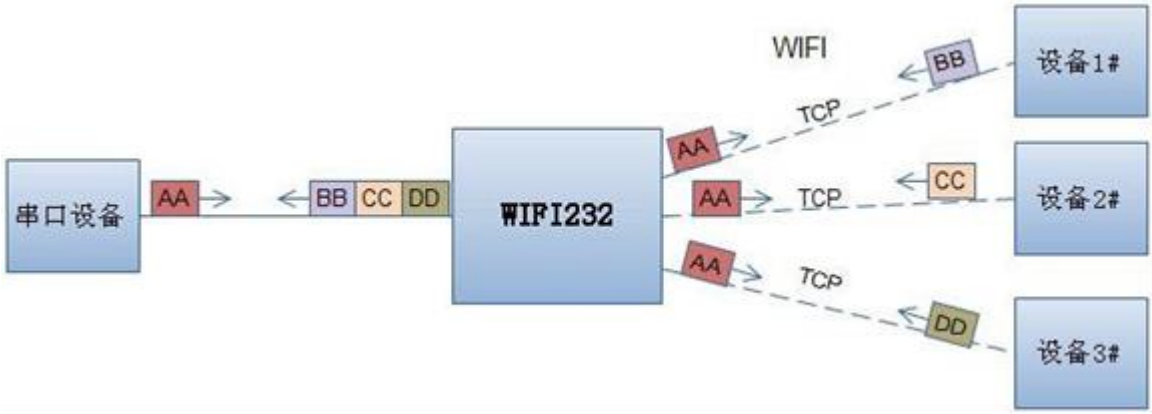


Figure 26 Multi-TCP Link Data Transmission Structure

4.7.2 Socket B

Socket B has one work mode: TCP Client, please refer to the AT+TCPB command or the AT+TCPADDB/TCPTOB/TCPLKB command instruction.

With variety work mode, socket B can provide users with flexible data transfer methods. For example, Socket B can connect to ta remote server in order to achieve remote control.

4.8 New Function

4.8.1 TCP password authentication

The feature is available only when the module works as a TCP server, when the TCP client connection module, the module will authenticate each connected TCP. Each TCP client first data is the “password+0x0d+0x0a” (the password is Webpage authentication password). The default password is “admin”, so the first piece of data should be “0x61 0x64 0x6D 0x69 0x6E 0x0D 0x0A” (HEX). If the password is correct, the module returns “OK”, in the other hand, return to the “No” and disconnect. This function can be enabled or disabled in “TCP connection password authentication”, For more detailed information, please refer to specific section 5.1.6.

4.8.2 Upload ID

This function only applies to the module as a TCP client, in front of the data when module connected to the server with two bytes ID (ID range is 0~65535, the high byte before, and low byte behind) plus two bytes ID radix-minus-one complement. For example, if the module’s ID is 1111 by default, the first four bytes it sends to server are “0x04, 0x57, 0xFB, 0xA8”

There are two ways to upload their own id: one is to upload their own id at the first time it connects to server; The other is a plus id in front of each data.

ID number related parameter is set in the “Serial port and other Settings” section of the web, build joint function of ID for the first time, and each data with the function of ID are opened by default.

ID can also use the AT command to set the related parameters, specific refer to 5.2.2.2.32-5.2.2.2.34 section.

4.8.3 WEB-IO

This function only works for “GPIO mode”

When the module is in the “GPIO mode”, enter the Webpage in “ERB IO”, you can click on the corresponding button to control module pin level. Without the need to download and install app, any platform, any equipment, as long as you can into the built-in Webpage of module through the browser, you can control the IO of module.

4.8.4 Keepalive

When the TCP connection mechanism it ass keepalive function. When the module of network anomalies, timely diagnose abnormal to the network and disconnect, when the network has resumed after, and just in time to connect to the server.

4.8.5 Multiple STA Parameters.

In the STA mode, if the current network signal is too low, it will automatically switch to the other AP network (automatically restart while switching network)

This feature provides a signal threshold, when the current network signals is lower than the critical value, the module will automatically switch network and restart. If the signal value is set to 100, module will not switch network. Even if the current network signal is not exist, it will keep searching, instead of connecting to other networks. Specific settings of this function please refer to section 4.5.3.

You can also set this function with AT command refer to section 5.2.2.2.50-5.2.2.56.

4.8.6 Websocket Function

This module can realize the function of the websocket server, allowing serial real-time interaction with the web module, replace the previous HTTP GET, PST, corresponding faster. This module provides the corresponding websocket test page for user testing, specific page is as follows: (Webpage: 10.10.100.254/websicketen.html)

Figure 27 Websocket Page

Click on the “Connect” page and then implements a connection, then the serial port and web page can send or receive data from each other. This module websocket server supports 8 clients connecting at the same time. This function can be used for

web applications, and for web users with higher response speed, if you want to customize the corresponding web page, you can contact with us.

4.8.7 Fast access Wi-Fi (usr-link)

When the module work in AP mode, it will open an UDP port to receive fast access Wi-Fi command with the port number 490000. The phone can directly connect to WI-FI network of the module, then use command to search router list and set SSID SSID and password. After setting, module will automatically restart, connect to router and work in the STA mode.

Protocol format:

✧ **Inquiry command**

No	Name	Num of Bytes	Description
1	head	1	fixed value: 0xFF
2	length	2	Sum of data bytes from length byte to check byte (Not contain length bytes and check byte)
3	cmd	1	Command type, 0x01
4	check	1	Sum of bytes from head byte (not contain) to check byte (not contain)

Table 4 Fast access WI-FI Inquiry command

✧ **Response for searching**

No	Name	Num of Bytes	Description
1	head	1	fixed value: 0xFF
2	length	2	Sum of data bytes from length byte to check byte (not contain length byte and check byte)
3	cmd	1	Command type, 0x81
4	AP num	1	The number of AP what module scans
5	SSID1	Unsized	The SSID of router1
6	separator	1	Separator of SSID1, fixed value: 0x00
7	Signal strength1	2	Separator of signal strength1, fixed value: 0x0D, 0x0A
8	Separator	2	Separator of SSID n, fixed value: 0x00
..	…	…	……
M	SSID n	Unsized	The SSID of router n
M+1	Separator	1	Separator of SSID n, fixed value: 0x00

M+2	Signal strength	1	Signal strength of router n, 0~100: 0%-100%
M+3	Separator	2	fixed value: 0x0D, 0x0A
M+4	check	1	Sum of bytes from head (not contained) byte to check byte (not contained)

Table 5 Fast access WI-FI Response for searching

Example:

Data from phone to module (HEX): FF 00 01 01 02

Data from module to phone (HEX): 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 phone send searching command to module, the response from module is: SSID of router1 is “TEST1”, signal strength of router1 is 64%; SSID of router2 is “TEST2”, signal strength of router2 is 55%

Note: The information of routers is ordered by signal strength.

✧ Setting command

No	Name	Num of Bytes	Description
1	head	1	fixed value: 0xFF
2	length	2	Sum of data bytes from length byte (not contained) to check byte (not contained)
3	CMD	1	Command type, 0x02
4	reserve	1	0x00
5	SSID	unsized	SSID of router
6	separator	2	fixed value: 0x0D, 0x0A
7	password	unsized	password of router
8	check	1	Sum of data bytes from length byte (not contained) to check byte (not contained)

Table 6 Fast access WI-FI Setting Command

✧ Response for setting

No	Name	Num of Bytes	Description
1	head	1	fixed value: 0xFF
2	length	2	Sum of data bytes from length byte (not contained) to check byte (not contained)
3	CMD	1	command type, 0x82

4	check for SSID	1	check of SSID. If the SSID is exist, check value is 0x01, otherwise is 0x00
5	check for password	1	check of password. if the form of password is correct, the check value is 0x01, otherwise is 0x00
6	check	1	Sum of bytes from head byte (not contained) to check byte (not contained)

Table 7 Fast access WI-FI Response for Setting

Example:

Data from phone to module (HEX): FF 00 0F 02 00 54 45 53 54 31 0D 0A 31 32 33 34 35 36 CE

Data from module to phone (HEX): FF 00 03 82 01 01 87

Explanation:

The phone set setting command to module, set the SSID to “TEST1”, password is “123456”. The information response from module is that: the network which SSID is “TEST1” is exist, and the form of password is correct.

4.8.8 Ready Pin Signal Indication

According to the factory setting, the nReady signal have two statuses:

Status 1: High before module finish booting, Low after finishing boot. User devices can inquiry this signal to check whether the module have finished booting.

Status 2: High before module finish booting, output Heartbeat signal after finishing boot. The wave pattern of Heartbeat signal is 0.5Hz square wave which duty ratio is 1:1. User devices ccan query this signal to judge if modules active “live” or need to reboot. When module switches to command mode, it will output “0”, which used to distinguish work mode and command mode.

4.8.9 Similar RFC2217 Auto-adapt Baud Rate Function

RFC2217 is a standard protocol that user ethernet to change the parameter of ports. This module supports a protocol which is similar to RFC2217, which has same function as RFC2217 but much simply. Could use AT command to open the auto-adapt baud rate function:

AT+AABR=on

This command take effect immediately without reboot. Once reboot, the change of this command is invalided and restore to default value.

RFC2217 protocol description:

The length is 8 bytes as below. (In HEX for example):

Name	Head	Baud Rate	Bit	CHK
Bytes	3	3	1	1
Description	Reduce erroneous	3 bytes for one baud rate vale. High byte in the front	Refer to addendum	The check sum of the font 4 bytes. Ignore the carry
Example 1	55 AA 55	01 C2 00	83	46
Example 2	55 AA 55	00 25 80	83	28

Table 8 RFC2217 Protocol

Addendum:

Bit	Note	Value	Description
1:0	Choose data bit	00	5 bits
		01	6 bits
		10	7 bits
		11	8 bits
2	stop bit	0	1 bit stop bit
		1	2 bit stop bit
3	parity bit enable	0	disable parity bit
		1	enable parity bit
5:4	parity bit type	00	ODD parity
		01	EVEM parity
		10	Mark 1
		11	Clear
7:6	NC	00	set 0

Table 9 Addendum of RFC2217 Protocol

4.8.10 Parameters Configuration

WIFI232 module supports two methods to configuration parameters: Web Accessing and AT+ Instruction set.

Web accessing means user can configure parameters through built-in webpage. When WIFI232 module connected to wireless network, parameter configuration is done on a PC connected to the same wireless network. AT+ Instruction set configuration means user configure parameters through serial interface command. Refer to “AT+ Instruction set” chapter for more detail.

4.8.11 Firmware Upgrade

WIFI232 module supports firmware upgrade online

4.9 Parameter Setting

4.9.1 Web Management Page

When fist user WIFI232 module, user may need some configuration. User can connect the AP interface of WIFI232 module to PC, then configure it on Web Management Page.

By default, the SSID of AP interface of WIFI232 module is WIFI232. And the IP address, user name and password are as below:

Parameters	Default Setting
SSID	WIFI232
IP Address	10.10.100.254
Subnet Mask	255.255.255.0
User Name	admin
Password	admin

Table 10 WIFI232 Web Management Default Setting

4.9.2 Open Web Management Page

- Connect laptop to WIFI232 which SSID is "WIFI232" via wireless LAN card.
- After wireless connection is OK. Open browser and access http://10.10.100.254;
- Then input user name and password in the page as following and click "OK" button.

Figure 28 Open Web Management Page

The WIFI232 web management page supports English and Chinese language. User can select language environment at the top right corner and click “Apply” button

The main menu includes ten pages: “Quick configure”, “Mode Selection”, “AP Interface Setting”, “STA Interface Setting”, “Application Setting”, “Ethernet Setting”, “HTTPD Client Mode”, “WEB IO”, “Advanced” and “Device Management”.

4.9.3 Quick Configure

The Quick Configure provides users with a method of rapid configuration module. User follows the steps to configure the parameters and restart, could make the module work normally. With this way, user can reduce the configuration steps and time. Of cause the option on this page is less, if you need more detailed configuration, you can go to corresponding configuration page.

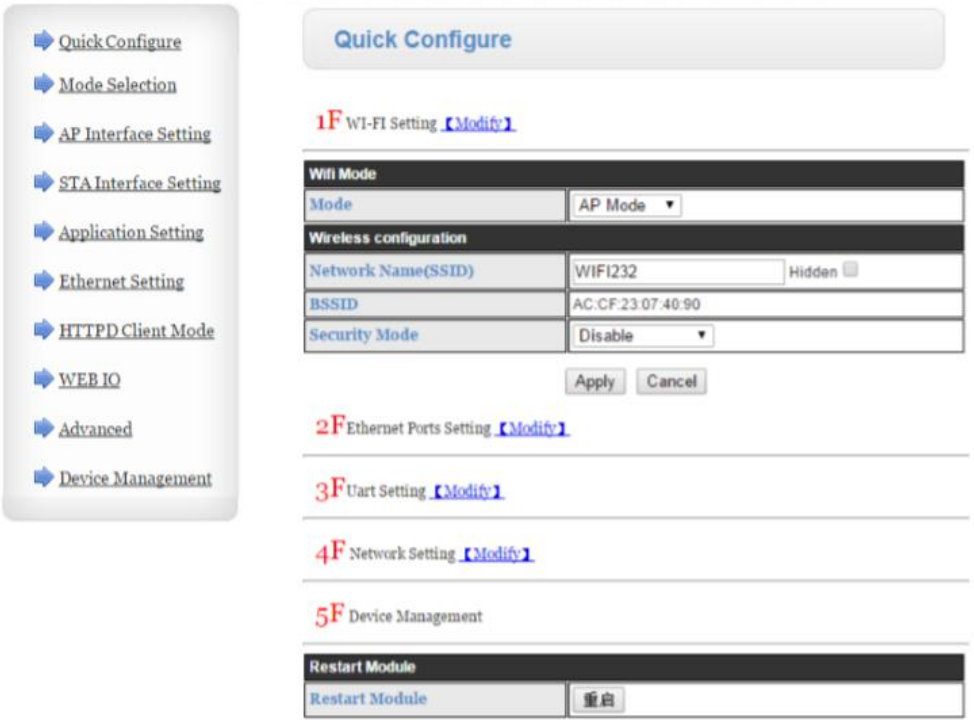


Figure 29 Quick Configure Page

This page has four configuration options and a restart.

✧ WI-FI Setting: Configure the working mode of WIFI, it can be configured as AP or STA.

✧ Ethernet Ports Setting: Enable/Disable the Ethernet port, and set up the corresponding work mode.

✧ UART Setting: Configure the serial port parameters, including baud rate, parity bit, 485 functions and so on.

✧ Network Setting: Setting the network parameters, only TCPA related parameters.

✧ Device Management: After complete the configuration above, click reset module

4.9.4 Mode Selection Page

This page is used to setting the wireless networking mode (AP and STA mode). “Data transmission mode” is used to select the working mode of module to “Transparent Mode”, “Serial Command Mode”, “HTTPD Client Mode” or “GPIO Mode”.

“TCP Connection Password Authentication” can select whether open TCP password authentication.

Note: This authentication only works when the module is set as TCP server. After opening this function, the fist data sent to module is password plus newline when TCP client connect to TCP server of module. The password is default “admin” which is used to login web. For example, the first data is “0x61 0x64 0x6D 0x69 0x6E 0x0D 0x0A” (HEX)

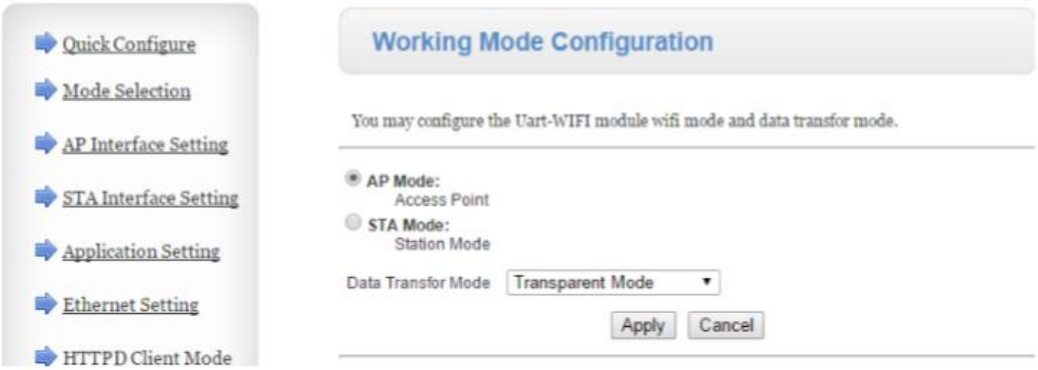


Figure 30 Mode Selection Page

4.9.5 AP Interface Setting Page

WIFI232 module supports AP interface, with this interface, users can manage module easily as well as realize network. This page is used to setting the parameters when WIFI232 module work as AP.

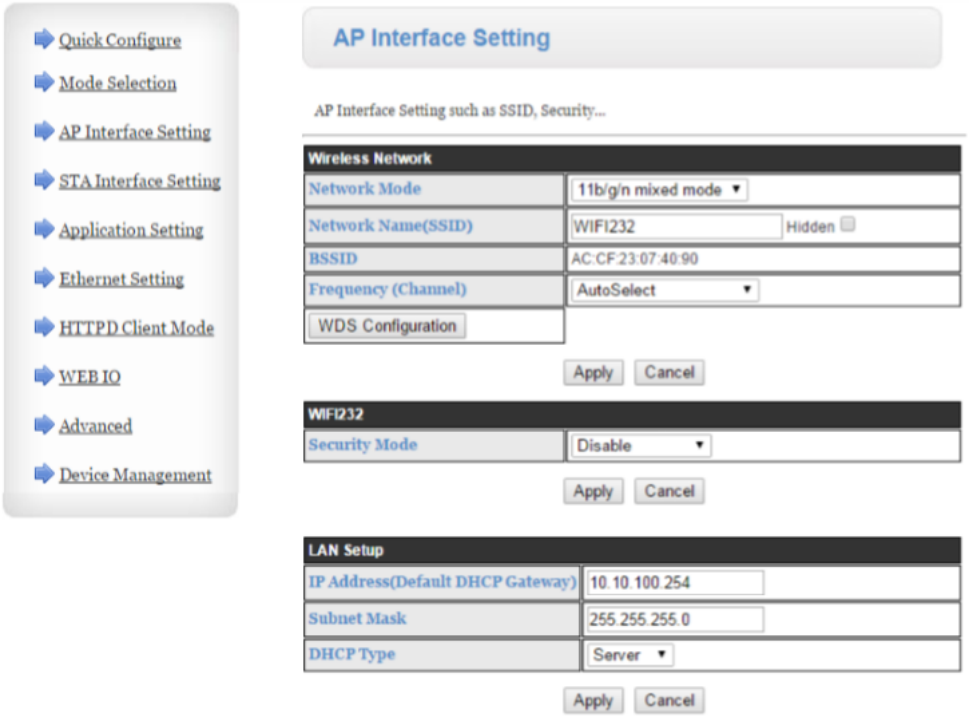


Figure 31 AP Interface Setting Page

4.9.6 STA Interface Setting Page

This page is used to set the parameters when WIFI232 works as STA. There are two table on this page, the first one is setting for STA, including the SSID of AP which need to connect to, security setting and son on. The other table is used for setting networking type: DHCP or static IP address.

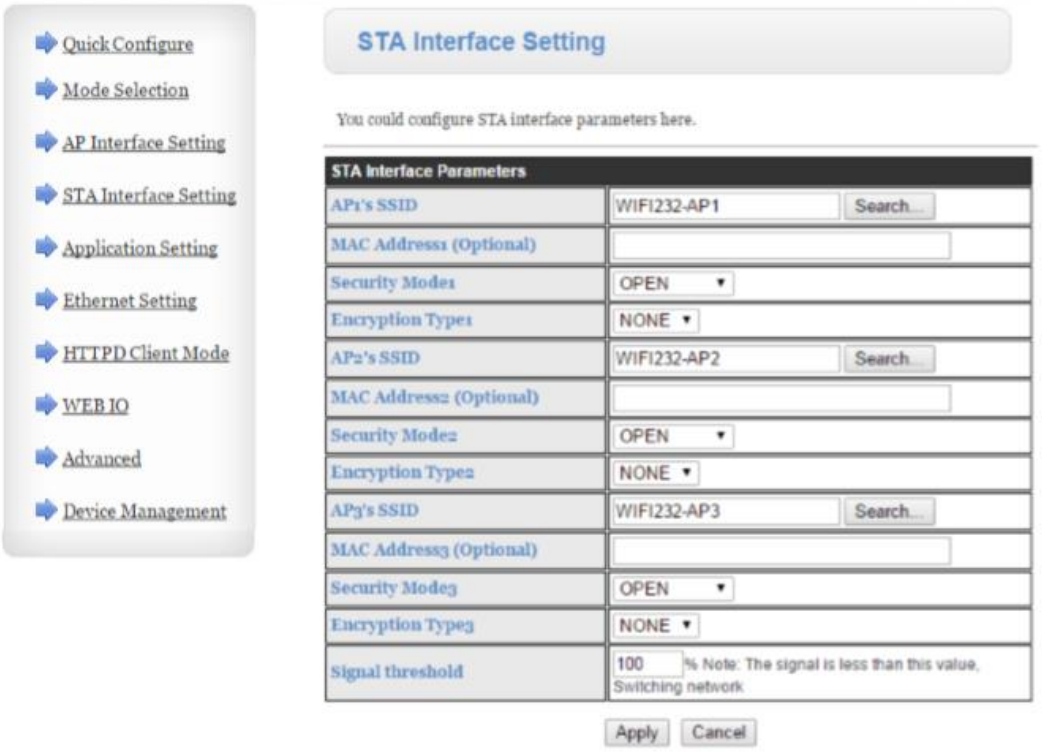


Figure 32 STA Interface Setting Page

4.9.7 Application Setting Page

This page is used to setting the parameters of serial port communication, such as UART setting, UART Auto-Frame Setting, Ethernet function, Device ID setting and high layer network protocol setting.

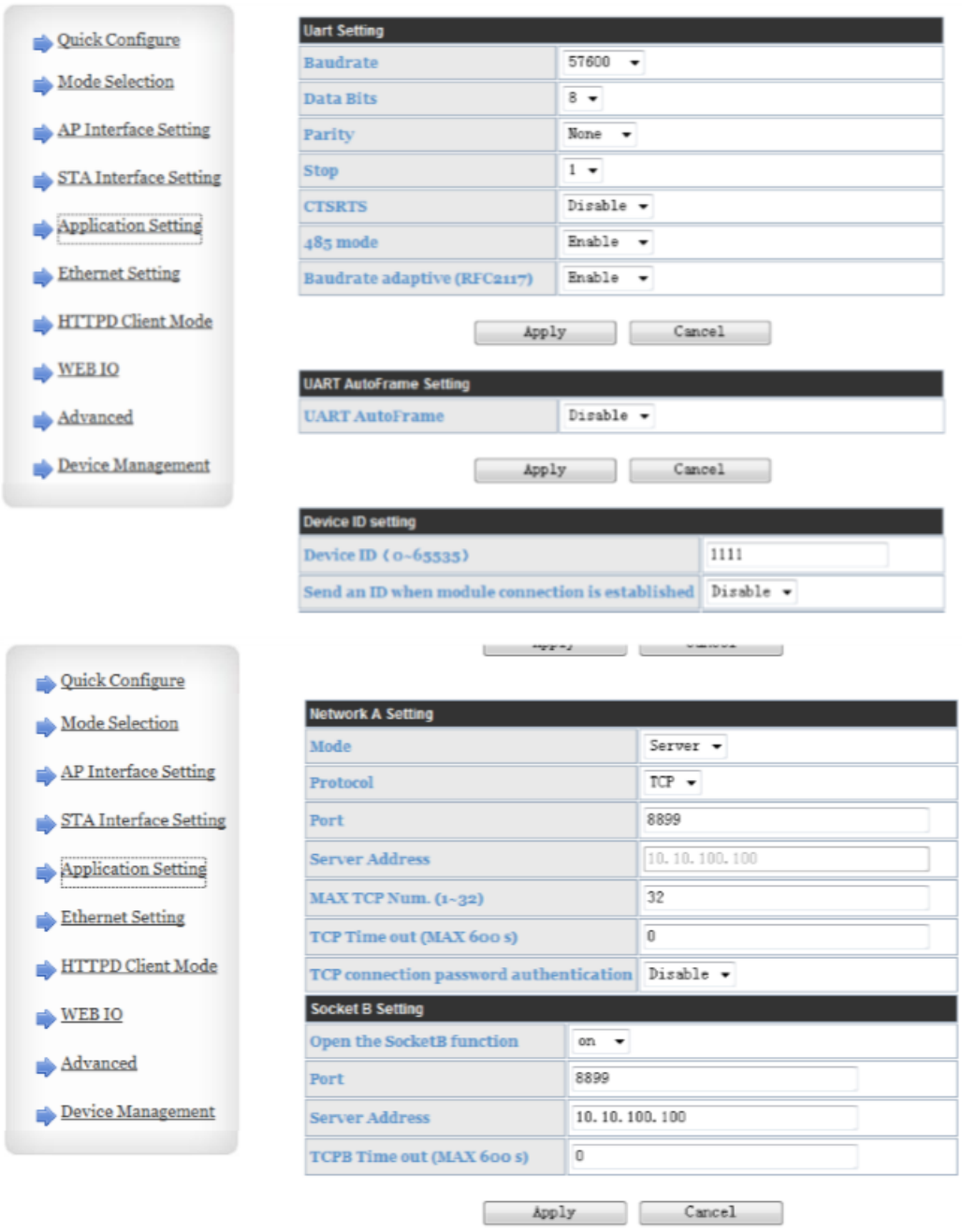


Figure 33 Application Setting Page

Notes:

Generally, Network protocol supports four modes: TCP Server, TCP Client, UDP Server and UDP Client.

When the module is set as UDP Server, module we remember the UDP Client of last communication, and communicate with this UDP client. If the module is work as UDP Client, it could only communicate with target IP address. If the module works as TCP Server, IP address is not required in this mode. Beside these, use must set the IP address of the device which need communicate with WIFI232 module. And the Port ID between two sides of the communication devices must keep the same.

TCP connecting password authentication: When the WIFI232 work in TCP Server mode, it will authenticate the password of client which connected.

Note: This authentication only works when the module is set as TCP server. After opening this function, the fist data sent to module is password plus newline when TCP client connect to TCP server of module. The password is default “admin” which is used to login web. For example, the first data is “0x61 0x64 0x6D 0x69 0x6E 0x0D 0x0A” (HEX)

4.9.8 Ethernet Setting

This page is used to set Ethernet port of module. The Ethernet port can be opened or closed. And can be configured as WAN port. So the module can work as secondary router, making it easy for users to network. The specific setting page is as below:

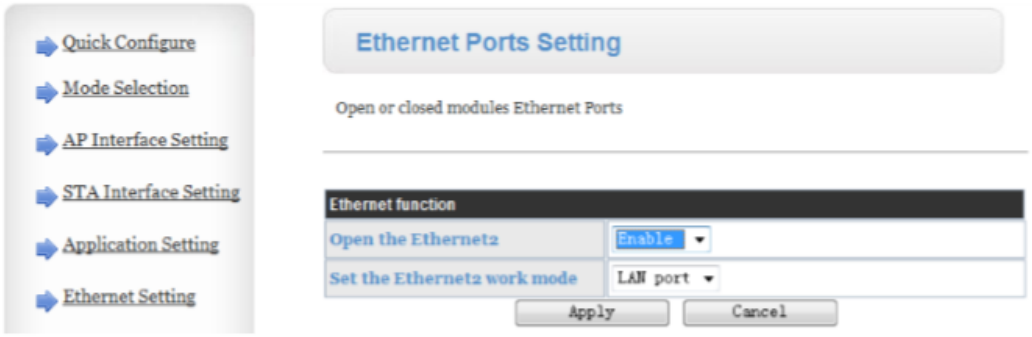


Figure 34 Ethernet Setting Page

4.9.9 HTTD Client Mode

This page sets the HTTP header in the HTTPD Client mode. Including: the address pf the server, the server port, request type, protocol header path, protocol header Connection and protocol header User-Agent.

HTTPD Client Mode supports POST, PUT and GET three HTTP request types. With POST and PUT type, serial data will be followed the HTTP header. If the request is GET, serial data will be followed path of HTTP header. The specific way of sending data can consult section 4.2.4

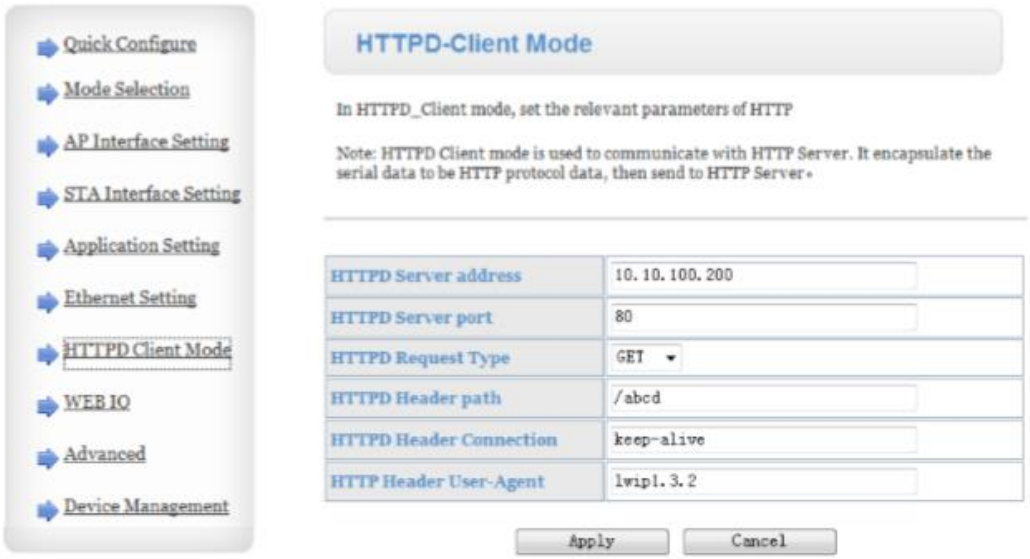


Figure 35 HTTPD Client Mode Page

4.9.10 WEB IO Page

Web IO page only be available when the module works in GPIO Mode. This page sets the IO of module.

Figure 36 WEB IO Page

4.9.11 Advanced Setting Page

Under the advanced Settings page, the user can set the port mapping and function of DDNS without having to go on a router Settings, reduce the complexity of setting, the port mapping and DDNS, can be in the public environment, by entering the peanut shell domain name and port, can quickly and easily find the module.

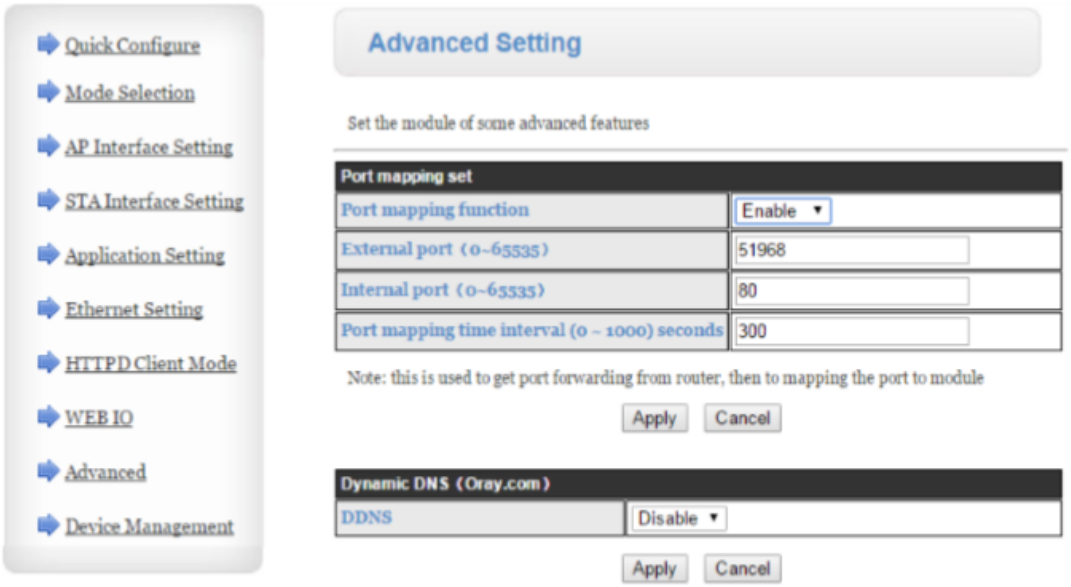


Figure 37 Advanced Setting Page

4.9.12 Device Management Page

This page is used to manage WIFI232 module general setting, such as administrator setting, restart module button, restore factory default setting button, and update firmware through webpage.

Figure 38 Device Management Page

Notes:

Restart Module Button: When use setting the parameters of different web pages, could click "**Apply**" button to confirm the setting, but the setting take effect only after user click the "**Restart**" Button here, the module will re-boot up and refresh the memory information with new changes.

4.9.13 Module Working Mode

WIFI232 has various working mode. By default (Starting), the module will enter transparent transmission mode. Use can use serial port command to switch to configuration mode. WIFI232 UART default parameters setting as below:

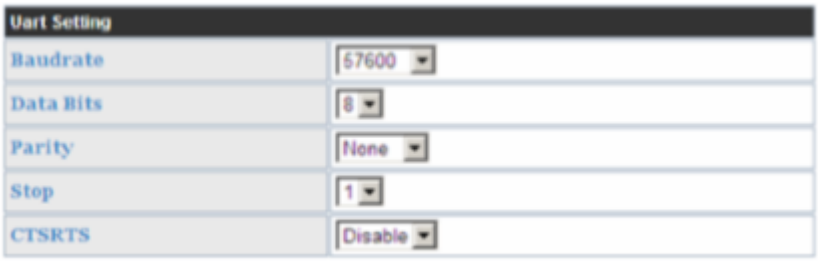


Figure 39 WIFI232 Default UART Port Parameters

In configuration mode, user can set the module through AT+ Instruction set, which covers all of web page setting function.

4.9.14 Switch to Configuration Mode

The steps to switch to configuration mode from transparent transmission mode:

- UART input “+++”, after module receives “+++”, it will feedback “a” as confirmation.
- UART input “a” for confirming, after module receives “a”, it will feedback “+ok” to go into AT+ instruction set configuration mode.

Figure 40 Switch to Configuration Mode

Notes:

When user input “+++” and confirmation “a”, the UART port will not echo as above figure. User need to input “+++” and “a” as fast as possible to reduce the probability that module error to enter configuration mode when it in working mode.

In configuration mode, user can use AT+ instruction on UART port to setting, inquiry or restart the module. User can also use AT+ instruction to back to transparent transmission mode.

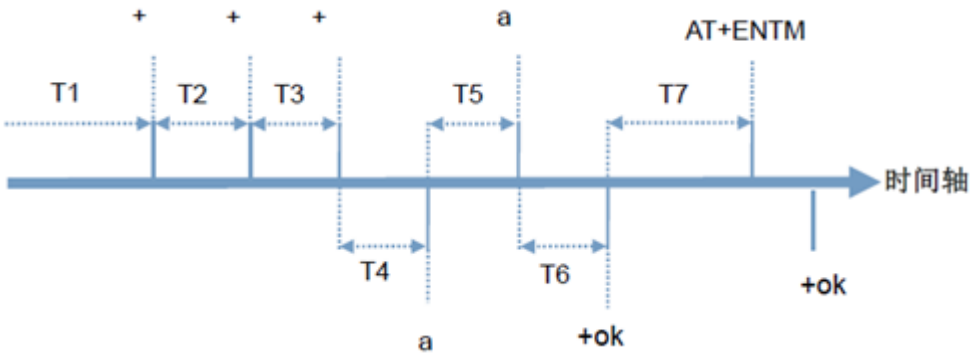


Figure 41 Command Input Interval

5 AT+ Instruction Set Overview

5.1 AT+ Instruction Set Overview

5.1.1 AT+ Instruction Set and WIFI232-Setup

User can input AT+ Instruction through hyper terminal or other serial debug terminal, also can program the AT+ Instruction to script. User can also input “AT+H” to list all At+ Instruction and description.

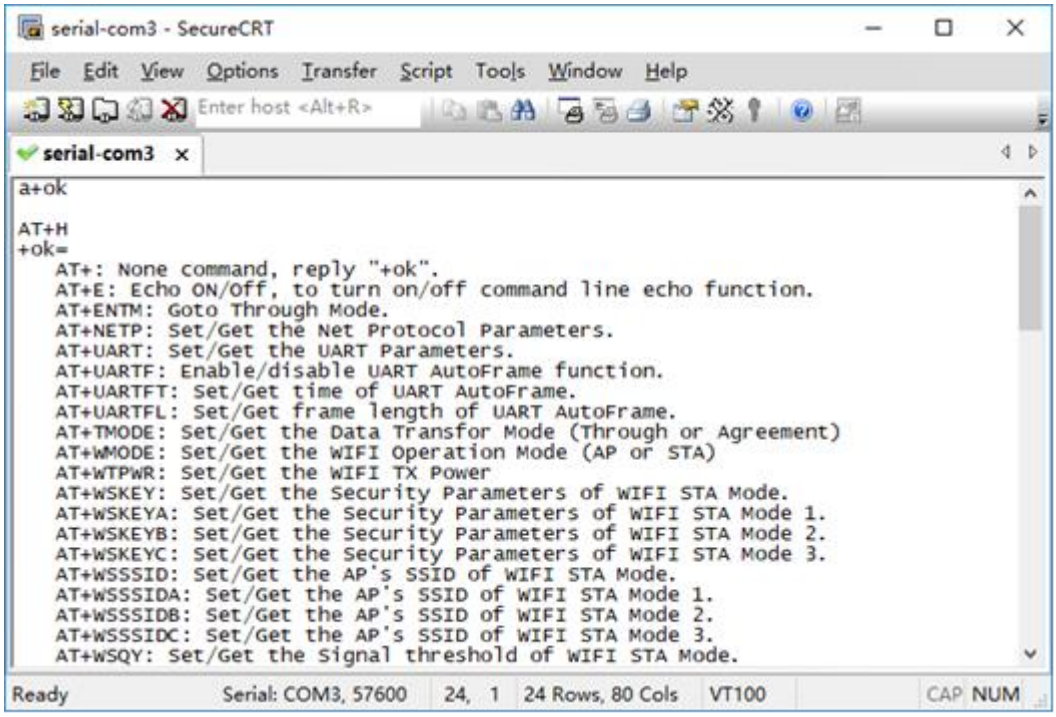


Figure 42 "AT+H" Instruction for Help

We supply software WIFI232-Setup to send command easily:

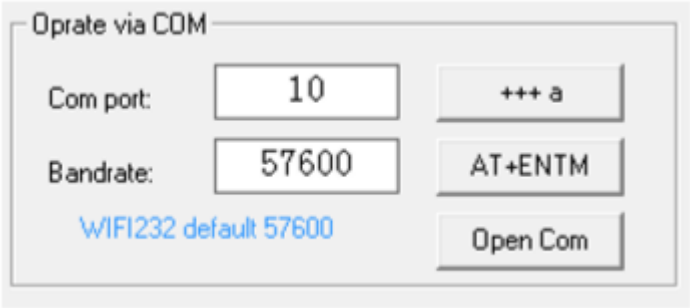


Figure 43 Serial Port Parameters

Click “Open Com”, send “+++a”, it will reply “+ok” in left side. Then type in and send the command on the right side, after setting, click “AT+RELD” to restore.

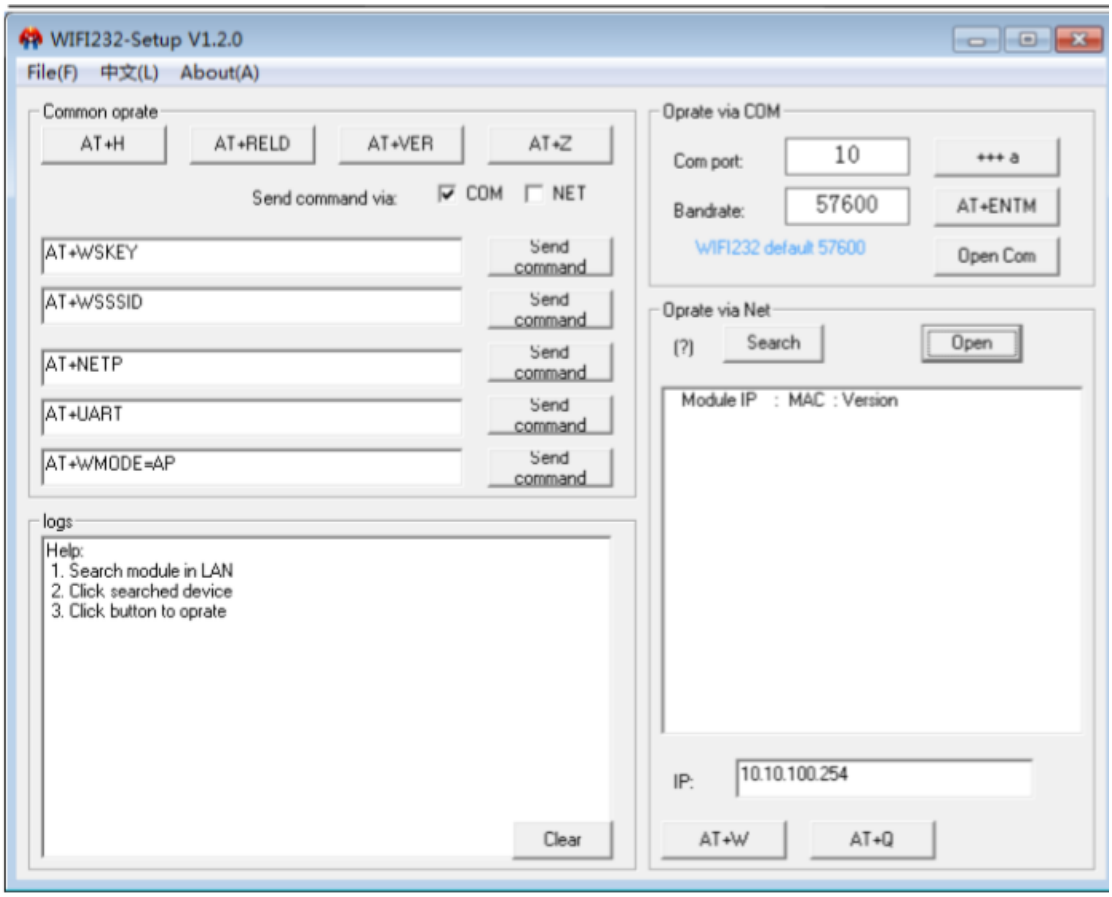


Figure 44 Software of WIFI232-Setup

The setting above is done by COM, you can also send by WIFI. Firstly, connect module to PC via WIFI, open the software:

Figure 45 Search Module

Click “Search”, the text box will show the module searched, click module then you can send command as COM.

5.1.2 Instruction Syntax Format

AT+ Instruction protocol is based on the instruction of ASCII command style, the description of syntax format as follow

- Format Description
  - <>: The parts must be included
  - [ ]: The optional part
- Command Message
  - AT+: Prefix of command message
  - CMD: Command string
  - [op]: Symbol of command operator
    - “=”: The command requires parameters setting;
    - “NULL”: Query the current command parameters setting
  - [para-n]: Parameters input for setting if required
  - <CR>: “Enter” Key, it is 0x0a or 0x0d in ASCII

Notes: When input AT+ Instruction, “AT+<CMD>” character will display capital letter automatic and other parts will not change as you input.

- Response Message

  +<RSP>[op]ppara-1, para-2, para-3, para-4, para-4, ···]<CR><LF><CR><LF>
  - +: Prefix of response message
  - RSP: Response string;
    - “ok”: Success

- "ERR": Failure

- [op]: =
- [para-n]: parameters if query command or Error code when error happened
- <CR>: ASCII 0x0d
- <LF>: ASCII 0x0a

➢ Error Code

Error Code	Description
-1	Invalid Command Format
-2	Invalid Command
-3	Invalid Operation Symbol
-4	Invalid Parameter
-5	Operation Not Permitted

Table 11 Error Code Description

5.1.3 AT+ Instruction Set

Instruction	Description
<null>	NULL
E	Enable/Disable echo function
ENTM	Set module into transparent transmission mode
NETP	Set/Query network protocol parameters
UART	Set/Query serial port parameters
UARTF	Enable/Disable UART auto-frame function
UARTFT	Set/Query UART auto-frame trigger time
UARTFL	Set/Query UART auto-frame trigger length
TMODE	Set/Query data transmission mode (transparent transmission or agreement transmission)
WMODE	Set/Query WIFI mode (AP or STA)
WSKEY	Set/Query security parameter as STA
WSSSID	Set/Query WIFI target AP SSID parameters as STA
WSLK	Query WIFI link status as STA
WEBU	Set/Query login parameters of WEB page
WAP	Set/Query parameters as AP
WAKEY	Set/Query security parameters as AP

MSLP	Set modules into power save mode (turn off WIFI)
WSCAN	Seek AP when module work as STA mode
TCPLK	Query if TCP link already build-up
TCPDIS	Enable/Disable TCP (only available as TCP Client)
WANN	Set/Query WAN setting, only effective as STA mode
LANN	Set/Query LAN setting, only effective as AP mode
TCPTO	Set/Query TCP timeout
MAXSK	Set/Query maximum TCP connection
TCPB	Enable/Disable TCPB function
TCPPTB	Set/Query TCP port number
TCPADDB	Set/Query TCP server address
TCPTOB	Set/Query TCP timeout
TCPLKB	Query TCPB link status
EPHY	Enable/Disable ETH interface
RELD	Restore to factory default setting
FUDLX	Enable/Disable 485 function
MMID	Set module ID
IDFIR	Enable/Disable function that send ID at first connection
IDEVE	Enable/Disable function that send ID every data
DHCPDEN	Enable/Disable LAN port DHCP Server function
HIDESSID	Set/Query hide SSID of AP
DOMAIN	Set/Query domain of the module login WEB
Z	Restart
MID	Query module MID
VER	Query software
H	Help
AABR	Enable/Disable Auto-Baud function
HTPDMODE	Switch New/Older setting of HTTP header (HTTPD Client)
HTTPURL	Set/Query IP and Port number of HTTP Server
HTTPTP	Set/Query HTTP request type
HTTPPH	Set/Query path of HTTP protocol header
HTTPCN	Set/Query Connection of HTTP protocol header

HTTPUA	Set/Query User-Agent of HTTP protocol header
HTPSV	(New) Set/Query address and IP of Server (HTTPD Client)
HTPTP	(New) Set/Query request type (HTTPD Client)
HTPURL	(New) Set/Query path of request (HTTPD Client)
HTPHEAD	(New) Set/Query HTTP header (HTTPD Client)
REGEN	Set/Query Registration Kit type
REGTCP	Set/Query Registration Kit method
WSSSIDA	Set/Query the first STA's SSID of three STA parameters settings
WSSSIDB	Set/Query the second STA's SSID of three STA parameters settings
WSSSIDC	Set/Query the third STA's SSID of three STA parameters settings
WSKEYA	Set/Query the first STA's encryption of three STA parameters settings
WSKEYB	Set/Query the second STA's encryption of three STA parameters settings
WSKEYC	Set/Query the third STA's encryption of three STA parameters settings.
WSQY	Set/Query the critical value of network switching
TCPDPEN	Enable/Disable sockets distribute function
HEARTEN	Enable/Disable customized heartbeat page function
HEARTTP	Set/Query customized heartbeat packet transmit position.
HEARTDT	Set/Query customized heartbeat packet data
HEARTTM	Set/Query interval of sending heartbeat page
REBOOTEN	Enable/Disable Restart at regular time
REBOOTT	Set/Query The time of Restart
TIMEOUTEN	Enable/Disable restart if timeout function
TIMEOUTT	Set/Query the timeout of restart
WTPWR	Set the transmitted power of module

Table 12 AT+ Instruction Set List

Note: WIIF232 module can works as AP or STA, users have to use different AT+ Instruction to set WIFI parameters when module works as AP or STA mode.

5.2 AT+ Instruction Set Description

5.2.1 Description of AT+ Instruction

5.2.1.1 AT+E

Function: Enable/Disable echo function.
Format:

AT+E<CR>
+ok<CR><LF><CR><LF>

After switch to configuration mode from transparent transmission mode, the echo function is opened by default. The first time you use this command is to close the function.

5.2.1.2 AT+ENTM

Function: Set module enter transparent transmission mode
Format:

AT+ENTM<CR>
+ok<CR><LF><CR><LF>

With this command, the module switch to transparent transmission mode form configuration mode. You can input "+++" and confirmation code to back to configuration mode again.

5.2.1.3 AT+ENTP

Function: Set/Query network protocol parameters

Format:

Query Operation
AT+NETP<CR>
+ok=<protocol, CS, port, IP><CR><LF><CR><LF>

Set Operation:
AT+NETP=<protocol, CS, port, IP><CR>
+ok<CR><LF><CR>LF>

Parameters:

- protocol:
  - ✧ TCP
  - ✧ UDP
- CS:
  - ✧ SERVER
  - ✧ CLIENT
- port: protocol port ID, Decimal digit and less than 65535
- IP: Server's IP address when module works as TCP client or UDP (IP address or the domain of server)

Effective after restart module.

5.2.1.4 AT+UART

Function: Set/Query serial port parameters

Format:

Query Operation:
AT+UART<CR>
+ok=<baudrate, data_bits, stop_bit, parity, flowctrl><CR><LF><CR><LF>

Set Operation:
AT+UART=<baudrate, data_bits, stop_bit, parity, flowctrl><CR>
+ok<CR><LF><CR><LF>

Parameters:

- baudrate:
  - ✧ 300, 600, 1200, 1800, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 345600, 460800
- data_bits:
  - ✧ 5, 6, 7, 8
- stop_bit:
  - ✧ 1, 2
- parity:
  - ✧ NONE, EVEN, ODD, MARK, SPACE

5.2.1.5 AT+UARTF

Function: Enable/Disable auto-frame function

Format:

Query Operation:
AT+UARTF<CR>
+ok=<para><CR><LF><CR><LF>

Set Operation:
AT+UARTF=<para><CR>
+ok<CR><LF>CR><LF>

Parameters:

- para:
  - enable
  - disable

5.2.1.6 AT+UARTFT

Function: Set/Query auto-frame trigger time

Format:

Query Operation:
AT+UARTFT<CR>
+ok=<time><CR><LF>CR><LF>

Set Operation:
AT+UARTFT=<time><CR>
+ok<CR><LF><CR><LF>

Parameters:

- time:
  - 100~10000 (ms)

5.2.1.7 AT+UARTFL

Function: Set/Query auto-frame trigger length

Format:

Query Operation:
AT+UARTFL<CR>
+ok=<len><CR><LF><CR><LF>

Set Operation:
ST+UARTFL=<len><CR><LF>
+ok<CR><LF><CR><CL>

Parameters:

- len:
  - 16~4096 (byte)

5.2.1.8 AT+TMODE

Function: Set/Query data transmission type

Format:

Query Operation:
AT+TMODE<CR>
+ok=<tmode><CR><LF><CR><LF>

Query Operation:
AT+TMODE=<tmode><CR>
+ok<CR><LF><CR><LF>

Parameters:

- tmode:
  - Through
  - Agreement
  - GPIO
  - Httpdclient

Effective after restart module.

Note: Without CMD, the module will not work in the AT command mode after power on.

5.2.1.9 AT+WMODE

Function: Set/Query WIFI work mode (AP or STA)

Format:

Query Operation:
AT+WMODE<CR>
ok+=<mode><CR><LF><CR><LF>

Set Operation:
AT+WMODE=<mode><CR>
+ok<CR><LF><CR><LF>

Parameters:

- mode
  - AP
  - STA

Effective after restart the module

5.2.1.10 AT+WSKEY

Function: Set/Query WIIFI encryption parameters as STA

Format:

Query Operation:
AT+WSKEY<CR>
+ok=<auth, encry, key><CR><LF><CR><LF>

Set Operation:
AT+WSKEY=<auth, encry, key><CR>
+ok<CR><LF><CR><LF>

Parameters:

- auth:
  - OPEN
  - SHARED
  - WPAPSK
- encry:
  - NONE: available when auth=OPEN
  - WEP-H: available when auth=OPEN or SHARED (WEP, HEX)
  - WEP-A: available when auth=OPEN or SHARED (WEP, ASCII)

- ✧ TKIP: available when auth=WPAPSK
- ✧ AES: available when auth=WPAPSK

- key:
  - ✧ 16/26 bits (HEX): when encry=WEP-H
  - ✧ 5/13 bits (ASCII): when encry=WEP-A

Note: key must be larger than 8 bits and less than 64 bits, and it is available only in STA mode. It is effective after restart the module, can be set in AP mode.

5.2.1.11 AT+WSSSID

Function: Set/Query WIFI target AP SSID parameters as STA

Format:

Query Operation:
AT+WSSSID<CR>
+ok=<ap's ssid><CR><LF><CR><LF>

Set Operation:
AT+WSSSID=<ap's ssid><CR>
+ok<CR><LF><CR><LF>

Parameters:

- ap's ssid: SSID of AP

Note: This parameter only be available at STA mode. It is effective after restart module. Can only be set at AP mode.

5.2.1.12 AT+WSLK

Function: Query link status at STA mode (only available at STA mode)

Format:

AT+WSLK<CR>
+ok=<ret><CR><LF><CR><LF>

Parameters:

- ret:
  - ✧ "Disconnected": No WIFI connection
  - ✧ "AP's SSID": WIFI connection available

- “RF Off”: WIFI is off

5.2.1.13 AT+WEBU

Function: Set/Query WEB Page login parameters

Format:

Query Operation:

```
AT+WEBU<CR>
+ok=<user, password><CR><LF><CR><LF>
```

Set Operation:

```
AT+WEBU=<user, password><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

- user: user name for WEB page access
- password: password for WEB page access

5.2.1.14 AT+WAP

Function: Set/Query WIFI parameters as AP

Format:

Query Operation:

```
AT+WAP<CR>
+ok=<wifi_mode, ssid, channel><CR><LF><CR><LF>
```

Set Operation:

```
AT+WAP=<wifi_mode, ssid, channel><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

- wifi_mode
  - 11BG
  - 11B
  - 11G
  - 11BGN
  - 11N

- ssid: SSID when module works as AP
- channel:
  - ✧ AUTO
  - ✧ CH1~CH11

Note: This instruction only available for WIFI232 works as AP. It is effective after restart the module. Can be set at STA mode.

5.2.1.15 AT+WAKEY

Function: Set/Query WIFI encryption parameters at AP mode

Format:

Query Operation:
AT+WAKEY<CR>
+ok=<auth, encry_key><CR><LF><CR><LF>

Set Operation:
AT+WAKEY=<auth, encry_key><CR>
+ok<CR><LF><CR><LF>

Parameters:

- auth
  - ✧ OPEN
  - ✧ SHARED
  - ✧ WPAPSK
- encry
  - ✧ NONE: available only auth=OPEN
  - ✧ WEP-H: available only auth=OPEN or SHARED (WEP, HEX)
  - ✧ WEP-A: available only auth=OPEN or SHARED (WEP, ASCII)
  - ✧ TKIP: available only auth=WPAPSK
  - ✧ AES: available only auth=WPAPSK
  - ✧ TKIPAES: available only auth=WAPAPSK
- key:
  - ✧ 16/26 bits (HEX): when encry=WEP-H

- 5/13 bits (ASCII): when encry=WEP-A

Note: key must be larger than 8 bits and less than 64 bits, and it is available only in AP mode. It is effective after restart the module, can be set in STA mode.

5.2.1.16 AT+MSLP

Function: Set/Query Module sleep mode. (WIFI stop working whether it is at AP or STA mode)

Format:

Query Operation:

```
AT+MSLP<CR>
+ok<sta><CR><LF><CR><LF>
```

Set Operation:

```
AT+MSLP=<on/off><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

- sta
  - on
  - off

Notes: Set "off" make the module enter sleep mode. Set "on" to exit from sleep mode. If the module is at sleep mode, use can input AT+MSLP=on to exit and back to configuration mode.

5.2.1.17 AT+WSCAN

Function: Search AP at STA mode

Format:

```
AT+WSCAN<CR>
+ok=<ap_site><CR><LF><CR><LF>
```

Parameter:

- ap_site: The first line of the response is "RSSI, SSID, BSSID, Channel, Encryption, Authentication". They are signal strength, network name, MAC address, channel, mode of authentication and encryption algorithm separately.

5.2.1.18 AT+TCPLK

Function: Query if TCP link already build-up

Format:

AT+TCPLK<CR>
+ok=<sta><CR><LF><CR><LF>

Parameters:

- sta
  - on
  - off

5.2.1.19 AT+TCPDIS

Function: Set/Query TCP link status (only available as TCP Client)

Format:

Query Operation:
AT+TCPDIS<CR>
+ok=<sta><CR><LF><CR><LF>

Set Operation:
AT+TCPDIS=<on/off><CR>
+ok<CR><LF><CR><LF>

Parameters:

- sta
  - on: TCP link available. Module will connect to TCP server right now.
  - off: TCP link unavailable. Module will disconnect with TCP server and not connect again.

5.2.1.20 AT+WANN

Function: Set/Query WAN Setting (available at STA mode)

Format:

Query Operation:
AT+WANN<CR>
+ok=<mode, address, mask, gateway><CR><LF><CR><LF>

Set Operation:

AT+WANN=<mode, address, mask, gateway><CR>
+ok<CR><LF><CR><LF>

Parameters:

- mode
  - ✧ static: static IP
  - ✧ DHCP: Dynamic IP
- address: IP address of WAN port
- mask: subnet mask of WAN port
- gateway: gateway address of WAN port

5.2.1.21 AT+LANN

Function: Set/Query LAN port setting (available at AP mode)

Format:

Query Operation:

AT+LANN<CR>
+ok=<address, mask><CR><LF><CR><LF>

Set Operation:

AT+LANN=<address, mask><CR>
+ok<CR><LF><CR><LF>

Parameters:

- address: IP address of LAN port
- mask: subnet mask of LAN port

Note: AT+WANN check the WAN port address, and the AT+LANN check the LAN port of module. You can set these two IP address on the same network segment, otherwise the module will work abnormally.

5.2.1.22 AT+TCPTO

Function: Set/Query TCP timeout

Format:

Query Operation:

AT+TCPTO<CR>

+ok=<time><CR><LF><CR><LF>

Set Operation:

AT+TCPTO=<time><CR>

+ok<CR><LF><CR><LF>

Parameters:

- time: <= 600s, >=0s. It is 300s by default.

TCP timeout: Begin accounting when the TCP channel doesn't receive any data and clear when receive. If the account is bigger than the TCPTO value, the module will disconnect. If the module works as TCP Client, it will initiatively reconnect to TCP Server. If the module works as TCP server, it requires TCP Client to reconnect to module initiatively.

5.2.1.23 AT+MAXSK

Function: Set/Query the maximum TCP connection

Format:

Query Operation:

AT+MAXSK<CR>

+ok=<num><CR><LF><CR><LF>

Set Operation:

AT+MAXSK=<num><CR>

+ok<CR><LF><CR><LF>

Parameters:

- num: Maximum number of TCP connection. Supports 1~32. It is 32 by default

Note: If the module works as TCP Server, it supports connect to up to 32 clients. If users needn't to connect so much client, can reduce this value.

5.2.1.24 AT+TCPB

Function: Enable/Disable TCPB function

Format:

Query Operation:

AT+TCPB<CR>

+ok<CR><LF><CR><LF>

Set Operation:

AT+TCPB=<on/off><CR>

+ok<CR><LF><CR><LF>

Parameters:

- on: enable the TCPB function
- off: disable the TCPB function

Note: The setting is effective after restart the module.

5.2.1.25 AT+TCPPTB

Function: Set/Query the port number of the TCPB

Format:

Query Operation:

AT+TCPPTB<CR>

+ok=<port><CR><LF><CR><LF>

Set Operation:

AT+TCPPTB=<port><CR>

+ok<port><CR><LF><CR><LF>

Parameters:

- port: less than 65535 (DEC)

Note: The setting is effective after restart the module

5.2.1.26 AT+TCPADDB

Function: Set/Query the Server of TCPB

Format:

Query Operation:

AT+TCPADDB<CR>

+ok=<add><CR><LF><CR><LF>

Set Operation:

AT+TCPADDB=<add><CR>

+ok<CR><LF><CR><LF>

Parameters:

- add: address of TCPB Server (Can be IP address of Server or its domain name)

Note: The setting is effective after restart the module

5.2.1.27 AT+TCPTOB

Function: Set/Query timeout of TCPB

Format:

Query Operation:

AT+TCPTOB<CR>

+ok=<time><CR><LF><CR><LF>

Set Operation:

AT+TCPTOB=<time><CR>

+ok<CR><LF><CR><LF>

Parameters:

- time: <=600s and >=0s. it is 300 by default.

5.2.1.28 AT+TCPLKB

Function: Query the link status of TPCB

Format:

AT+TCPLKB<CR>

+ok=<sta><CR><LF><CR><LF>

Parameters:

- sta
  - ✧ on
  - ✧ off

5.2.1.29 AT+EPHY

Function: Enable/Disable Ethernet port

Format:

AT+EPHY=<on/off><CR>
+ok<CR><LF><CR><LF>

Parameters:

To reduce the consumption, the Ethernet port is closed by default. With this command, the Ethernet port will be opened immediately, and it is invalid after restart. If you want to open the Ethernet permanently, please use he command AT+FRPHY=on. We recommend you to close the port for reducing consumption.

Use command AT+FVEW=disable/enable and switch the module to work at LAN port (disable) or WAN port (enable). It is effective after restart.

5.2.1.30 AT+FUDLX

Function: Enable/Disable RS485

Format:

AT+FUDLX=<on/off><CR>
+ok<CR><LF><CR><LF>

Note: This command is used to enable or disable the RS485 function. RS485 is default closed. The control pin of RS485 is RTS. The setting is effective after restore factory setting.

5.2.1.31 AT+MMID

Function: Set ID of module

Format:

AT+MMID=<ID><CR>
+ok<CR><LF><CR><LF>

Parameters:

- ID: 0~65535

5.2.1.32 AT+IDFIR

Function: Enable/Disable “Send an ID when module connection is established” function

Format:

```
AT+IDFIR=<on/off><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

- on/off: It is off by default

5.2.1.33 AT+IDEVE

Function: Enable/Disable "Send and ID every time to send data" function

Format:

```
AT+IDEVE=<on/off><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

Enable or disable function that add ID every time send data. It is default disable

Note: The ID function should be handled on server. When the module connects to server, it will plus two-bytes ID (0~65535, high byte first and low byte follow) and two-bytes radix-minus-one complement of ID. For example, if the ID of module is 1111, the first four-bytes sent to server is that "0x04 0x57 0xFB 0xA8"

5.2.1.34 AT+AABR

Function: Enable/Disable auto-baud function

Format:

```
AT+AABR=<on/off><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

It is enable by default

5.2.1.35 AT+DHCPDEN

Function: Enable/Disable DHCP Server function of LAN port

Format:

```
AT+DHCPDEN=<on/off><CR>
+ok<CR><LF><CR><LF>
```

Parameters:

It is enable by default

5.2.1.36 AT+HIDESSID

Function: Enable/Disable hid the SSID of AP

Format:

AT+HIDESSID=<on/off><CR>
+ok<CR><LF><CR><LF>

Parameters:

It is disable by default

5.2.1.37 AT+DOMAIN

Function: Set/Query domain name of WEB page login

Format:

Query Operation:
AT+DOMAIN<CR>
+ok=<name><CR><LF><CR><LF>

Set Operation:
AT+DOMAIN=<name><CR>
+ok<CR><LF><CR><LF>

Parameters:

- name: the domain name of WEB Page

5.2.1.38 AT+RELD

Function: Restore to factory setting

Format:

AT+RELD<CR>
+ok=rebooting... <CR><LF><CR><LF>

Note: Module auto-restart after restoring.

5.2.1.39 AT+Z

Function: Restart module

Format:

AT+Z<CR>

5.2.1.40 AT+MID

Function: Query the MID of module

Format:

AT+MID<CR>
+ok=<module_id><CR><LF><CR><LF>

Parameters:

- module_id: A11-yymmddnnn
  - yymmdd: Production Data. Year, Month, Day
  - nnnn: Production Serial Number

5.2.1.41 AT+VER

Function: Query software version

Format:

AT+VER<CR>
+ok=<ver><CR><LF><CR><LF>

Parameters:

- ver: version of software

5.2.1.42 AT+H

Function: Command help

Format:

AT+H<CR>
+ok=<command help><CR><LF><CR><LF>

Parameters:

- command help: Command explanation

5.2.1.43 AT+HTTPURL

Function: Set/Query IP and port of HTTP server

Format:

Query Operation:

AT+HTTPURL<CR>

+ok=<ip>,<port><CR><LF><CR><LF>

Set Operation:

AT+HTTPURL=<ip>,<port><CR>

+ok<CR> <LF><CR><LF>

Parameters:

- ip: ip of HTTP server
- port: port of HTTP

5.2.1.44 AT+HTPMODE

Function: Switch setting type of HTTP socket header (HTTPD Client)

Format:

Query Operation:

AT+HTPMODE<CR>

+ok=<type><CR>< LF ><CR>< LF >

Set Operation:

AT+HTPMODE=<type><CR>

+ok<CR>< LF ><CR>< LF >

Parameters:

- type
  - ✧ new: setting type of new version
  - ✧ old: setting type of old version

Note: The setting only valid at HTTPD Client mode. It is effective after restart module. Can be set at other mode as well.

5.2.1.45 AT+HTTPTP

Function: Set/Query request type of HTTP

Format:

Query Operation:

AT+HTTPTP<CR>

+ok=<type><CR>< LF ><CR>< LF >

Set Operation:

AT+HTTPTP=<type><CR>

+ok<CR>< LF ><CR>< LF >

Parameters:

- type
  - ✧ GET
  - ✧ PUT
  - ✧ POST

5.2.1.46 AT+HTTPPH

Function: Set/Query path of HTTP protocol header

Format:

Query Operation:

AT+HTTPPH<CR>

+ok=<path><CR>< LF ><CR>< LF >

Set Operation:

AT+HTTPPH=<path><CR>

+ok<CR>< LF ><CR>< LF >

Parameter:

- path

5.2.1.47 AT+HTTPCN

Function: Set/Query Connection of HTTP protocol header

Format:

Query Operation:

AT+HTTPCN<CR>

+ok=<connection><CR>< LF ><CR>< LF >

Set Operation:

AT+HTTPCN=<connection><CR>

+ok<CR>< LF ><CR>< LF >

Parameters:

- connection

5.2.1.48 AT+HTTPUA

Function: Set/Query User-Agent of HTTP protocol header

Format:

Query Operation:

AT+HTTPUA<CR>

+ok=<User-Agent><CR>< LF ><CR>< LF >

Set Operation:

AT+HTTPUA=<User-Agent><CR>

+ok<CR>< LF ><CR>< LF >

Parameters:

- User-Agent: User-Agent of HTTP protocol header

5.2.1.49 AT+HTPSV

Function: Set/Query IP and Port number of HTTP Server (New)

Format:

Query Operation:

AT+HTPSV<CR>

+ok=<ip>,<port><CR>< LF ><CR>< LF >

Set Operation:

AT+HTPSV=<ip>,<port><CR>

+ok<CR>< LF ><CR>< LF >

Parameters:

- ip
- port

Note: This setting only valid at HTTPD Client mode, and it is effective after restart module. Can be set at other modes.

5.2.1.50 AT+HTPTP

Function: Set/Query request type of HTTP (New)

Format:

Query Operation:
AT+HTPTP<CR>
+ok=<type><CR>< LF ><CR>< LF >

Set Operation:
AT+HTPTP=<type><CR>
+ok<CR>< LF ><CR>< LF >

Parameters:

- type:
  - GET
  - PUT
  - POST

Note: This setting only valid at HTTPD Client mode, and it is effective after restart module. Can be set at other modes.

5.2.1.51 AT+HTPURL

Function: Set/Query path of HTTP protocol header (New)

Format:

Query Operation:
AT+HTPURL<CR>
+ok=<path><CR>< LF ><CR>< LF >

Set Operation:
AT+HTPURL=<path><CR>
+ok<CR>< LF ><CR>< LF >

Parameters:

- path: path of HTTP protocol header

5.2.1.52 AT+HTPHEAD

Function: Set/Query header of HTTP (New)

Format:

Query Operation:
AT+HTPHEAD<CR>
+ok=<head><CR>< LF ><CR>< LF >

Set Operation:
AT+HTPHEAD=<head><CR>
+ok<CR>< LF ><CR>< LF >

Parameters:

- head: content of HTTP header. Please use "<<CRLF>>" as ENTER for newline. Its maximum length is 200 bytes

5.2.1.53 AT+WSSSIDA

Function: Set/Query the first AP's SSID of three STA parameters settings

Format:

Query Operation:
AT+WSSSIDA<CR>
+ok=<ap's ssid><CR><LF><CR><LF>

Set Operation:
AT+WSSSIDA=<ap's ssid><CR>
+ok<CR><LF><CR><LF>

Parameters:

- ap's ssid: SSID of AP

Note: This setting is only valid at STA mode, and it is effective after restart module

5.2.1.54 AT+WSSSIDB

Function: Set/Query the second AP's SSID of three STA parameters settings

Format:

Query Operation:
AT+WSSSIDB<CR>
+ok=<ap's ssid><CR><LF><CR><LF>

Set Operation:
AT+WSSSODN=<ap's ssid><CR>
+ok<CR><LF><CR><LF>

Parameters:

- ap's ssid: SSID of AP

Note: This setting is only valid at STA mode, and it is effective after restart module

5.2.1.55 AT+WSSSIDC

Function: Set/Query the third AP's SSID of three STA parameters settings

Format:

Query Operation:
AT+WSSSIDC<CR>
+ok=<ap's ssid><CR><LF><CCR><LF>

Set Operation:
AT+WSSSID=<ap's ssid><CR>
+ok<CR><LF><CCR><LF>

Parameters:

- ap's ssid: SSID of AP

Note: This setting is only valid at STA mode, and it is effective after restart module

5.2.1.56 AT+WSKEYA

Function: Set/Query the first AP's password of three STA parameters settings

Format:

Query Operation:
AT+WSKEYA<CR>
+ok=<auth, encry, key><CR><LF><CR><LF>

Set Operation:
AT+WSKEYA=<auth, encry, key><CR>
+ok<CR><LF><CR><LF>

Parameters:

- auth: Authentication mode
  - ✧ OPEN
  - ✧ SHARED
  - ✧ WPAPSK

- encry: Encryption algorithm
  - NONE: valid when auth=OPEN
  - WEP-H: valid when auth=OPEN/SHARED (WEP, HEX)
  - WEP-A: valid when auth=OPEN/SHARED (WEP, ASCII)
  - TKIP: valid when auth=WPAPSK
  - AES: valid when auth=WPAPSK
- key: password
  - if encry=WEP-H: 10bits or 26bbits (HEX)
  - if encry=WEP-A: 5bits or 13 bits (ASCII)
  - >8 bits and <64 bits

Note: The setting is valid at STA mode, it is effective after restart module. Can be set at AP mode as well.

5.2.1.57 AT+WSKEYB

Function: Set/Query the second AP's password of three STA parameters settings

Format:

Query Operation:
AT+WSKEYB<CR>
+ok=<auth, encry, key><CR><LF><CR><LF>

Set Operation:
AT+WSKEYB=<auth, encry, key><CR>
+ok<CR><LF><CR><LF>

Parameters:

- auth: Authentication mode
  - OPEN
  - SHARED
  - WPAPSK
- encry: Encryption algorithm
  - NONE: valid when auth=OPEN
  - WEP-H: valid when auth=OPEN/SHARED (WEP, HEX)

- ✧ WEP-A: valid when auth=OPEN/SHARED (WEP, ASCII)
- ✧ TKIP: valid when auth=WPAPSK
- ✧ AES: valid when auth=WPAPSK

- key: password
  - ✧ if encry=WEP-H: 10bits or 26bbits (HEX)
  - ✧ if encry=WEP-A: 5bits or 13 bits (ASCII)
  - ✧ >8 bits and <64 bits

Note: The setting is valid at STA mode, it is effective after restart module. Can be set at AP mode as well.

5.2.1.58 AT+WSKEYC

Function: Set/Query the third AP's password of three STA parameters settings

Format:

Query Operation:
AT+WSKEYC<CR>
+ok=<auth, encry, key><CR><LF><CR><LF>

Set Operation:
AT+WSKEYC=<auth, encry, key><CR>
+ok<CR><LF><CR><LF>

Parameters:

- auth: Authentication mode
  - ✧ OPEN
  - ✧ SHARED
  - ✧ WPAPSK
- encry: Encryption algorithm
  - ✧ NONE: valid when auth=OPEN
  - ✧ WEP-H: valid when auth=OPEN/SHARED (WEP, HEX)
  - ✧ WEP-A: valid when auth=OPEN/SHARED (WEP, ASCII)
  - ✧ TKIP: valid when auth=WPAPSK
  - ✧ AES: valid when auth=WPAPSK

- key: password
  - ✧ if encry=WEP-H: 10bits or 26bbits (HEX)
  - ✧ if encry=WEP-A: 5bits or 13 bits (ASCII)
  - ✧ >8 bits and <64 bits

Note: The setting is valid at STA mode, it is effective after restart module. Can be set at AP mode as well.

5.2.1.59 AT+WSQY

Function: Set/Query the critical value (percentage) of three STA parameters setting

Format:

Query Operation:
AT+WSQY<CR>
+ok=<ret><CR><LF><CR><LF>

Set Operation:
AT+WSQY=<ret><CR>
+ok<CR><LF><CR><LF>

Parameters:

- ret: percentage of signal strength.

Note: If you set the parameters to 100, module will not switch to WIFI automatically. If you use only one parameter, please set the parameters to 100.

5.2.1.60 AT+TCPDPEN

Function: Enable/Disable sockets distribute function

Format:

Query Operation:
AT+TCPDPEN<CR>
+ok=<sta.><CR><LF><CR><LF>

Set Operation:
AT+TCPDPEN=<sta.><CR>
+ok<CR><LF><CR><LF>

Parameters:

- on: The sockets distribute function is enable

- off: The sockets distribute function is disable

Note: The setting is effective after restart module

5.2.1.61 AT+HEARTEN

Function: Enable/Disable heartbeat packet function

Format:

Query Operation:
AT+HEARTEN<CR>
+ok=<sta.><CR><LF><CR><LF>

Set Operation:
AT+HEARTEN=<sta.><CR>
+ok<CR><LF><CR><LF>

Parameters:

- sta.
  - ✧ on: the heartbeat packet function is enable
  - ✧ off: the heartbeat packet function is disable

Note: The setting is effective after restart module.

5.2.1.62 AT+HEARTTP

Function: Set/Query heartbeat packet transmit position

Format:

Query Operation:
AT+HEARTTP<CR>
+ok=<sta.><CR><LF><CR><LF>

Set Operation:
AT+HEARTTP=<sta.><CR>
+ok<CR><LF><CR><LF>

Parameters:

- sta.:
  - ✧ NET: heartbeat packet is transmitted to Ethernet
  - ✧ COM: heartbeat packet is transmitted to serial port

5.2.1.63 AT+HEARTDT

Function: Set/Query the data of heartbeat packet

Format:

Query Operation:
AT+HEARTDT<CR>
+ok=<usr><CR><LF><CR><LF>

Set Operation:
AT+HEARTDT=<usr><CR>
+ok<CR><LF><CR><LF>

Parameters:

- usr: the length much less than 40 bytes. (HEX)

5.2.1.64 AT+HEARTTM

Function: Set/Query interval of heartbeat packet transmission

Format:

Query Operation:
AT+HEARTTM<CR>
+ok=<time><CR><LF><CR><LF>

Set Operation:
AT+HEARTTM=<time><CR>
+ok<CR><LF><CR><LF>

Parameters:

- time: 1-65535s. It is 30s by default

5.2.1.65 AT+REBOOTEN

Function: Enable/Disable Boot Timing function

Format:

Query Operation:
AT+REBOOTEN<CR>
+ok=<sta.><CR><LF><CR><LF>

Set Operation:

AT+REBOOTEN=<sta.><CR>

+ok<CR><LF><CR><LF>

Parameters:

- sta.
  - ✧ on: enable
  - ✧ off: disable

Note: This setting is effective after restart module

5.2.1.66 AT+REBOOTT

Function: Set/Query the time of Boot Timing

Format:

Query Operation:

AT+REBOOTT<CR>

+ok=<time><CR><LF><CR><LF>

Set Operation:

AT+REBOOTT=<time><CR>

+ok<CR><LF><CR><LF>

Parameters:

- time: 1~720h. It is 24h by default

5.2.1.67 AT+TIMEOUTEN

Function: Enable/Disable Timeout Reboot function

Format:

Query Operation:

AT+TIMEOUTEN<CR>

+ok=<sta.><CR><LF><CR><LF>

Set Operation:

AT+TIMEOUTEN=<sta.><CR>

+ok<CR><LF><CR><LF>

Parameters:

- sta.:

- ✧ on: enable (module will reboot if timeout)
- ✧ off: disable

Note: This setting is effective after restart module

5.2.1.68 AT+TIMEOUTT

Function: Set/Query timeout

Format:

Query Operation:
AT+TIMEOUTT<CR>
+ok=<time><CR><LF><CR><LF>

Set Operation:
AT+TIMEOUT=<time><CR>
+ok<CR><LF><CR><LF>

Parameters:

- time: 60~65535s. It is 3600s by default.

6 Module Debug and Use Cases

6.1 Mode Debug

6.1.1 Software Debug Tools

In order to facilitate the use, please use TCP232-Test which is the serial and network debugging two-in-one function.

6.1.2 Network Connection

In order to test the serial port to the WIFI network address conversion, we will module serial connected with the computer, network and computer links to WIFI.

Due to the need to have both a WIFI and serial special requirement, you can use the desktop with a USB card, or the laptop. To test, we connect the module to the mother board, and connect the USB interface of mother board to PC. Connect the WIFI of module to PC as well.

Figure 46 Connection Diagram

On the serial connection, module pin leads to 3.3V TTL level, not directly connected with the computer, need to bring the bottom or users are TTL to RS232 connecting line connected to the computer, in order to facilitate the user to test the use of module. We provide a variety of floor for the user to choose, here in the case of WIFI232.

Hardware connectivity, for module power supply, the red power indicator light, wait for about 6s (internal system boot). Ready lights, said system start up completely, can operate, entering the next step.

6.2 Debugging

As shown above, opened in PC program, set the COM export and open the serial port connection

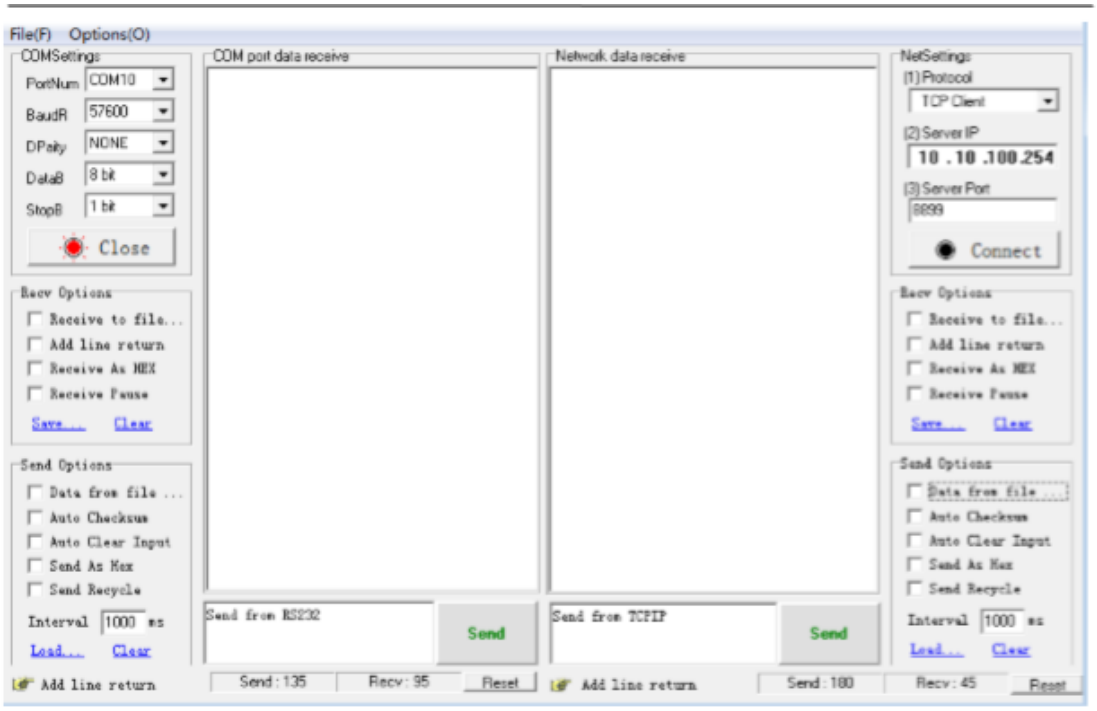


Figure 47 "COMM Tools" Serial Debug Tools

Open test software TCP232-Test.exe, selection of hardware attached to the computer's serial number, this is COM10. Choose 57600 baud rate, such as the WIFI module serial default baud rate, open the serial port.

Network settings in TCP client mode, the server IP address input 10.10.100.254, this is WIFI module default IP address, server port number 8899, this module default monitor TCP port number, click the link to establish TCP connection. Then click the create connection.

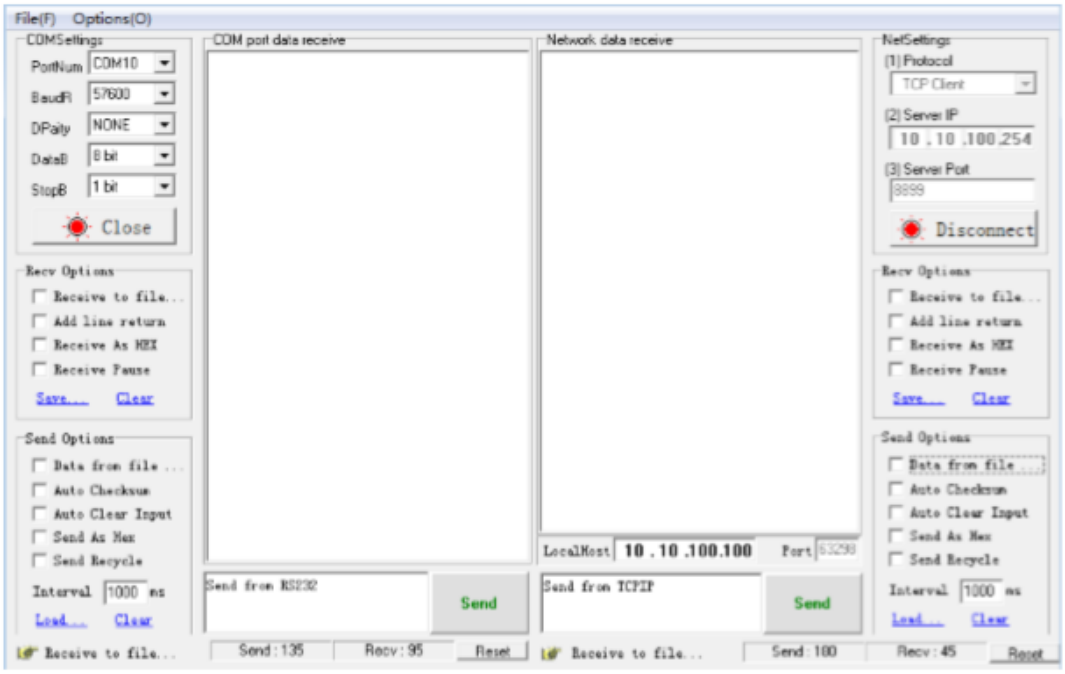


Figure 48 "TCP UDPDbg" Tools Create Connection

Because of the WIFI232 module default support for transparent transmission mode, so now you can debug tools two-way data, all data will be wholly intact transmission to the other side of display. The testing process can be seen in module TXD and RXD indicator lights in the data through the flashing.

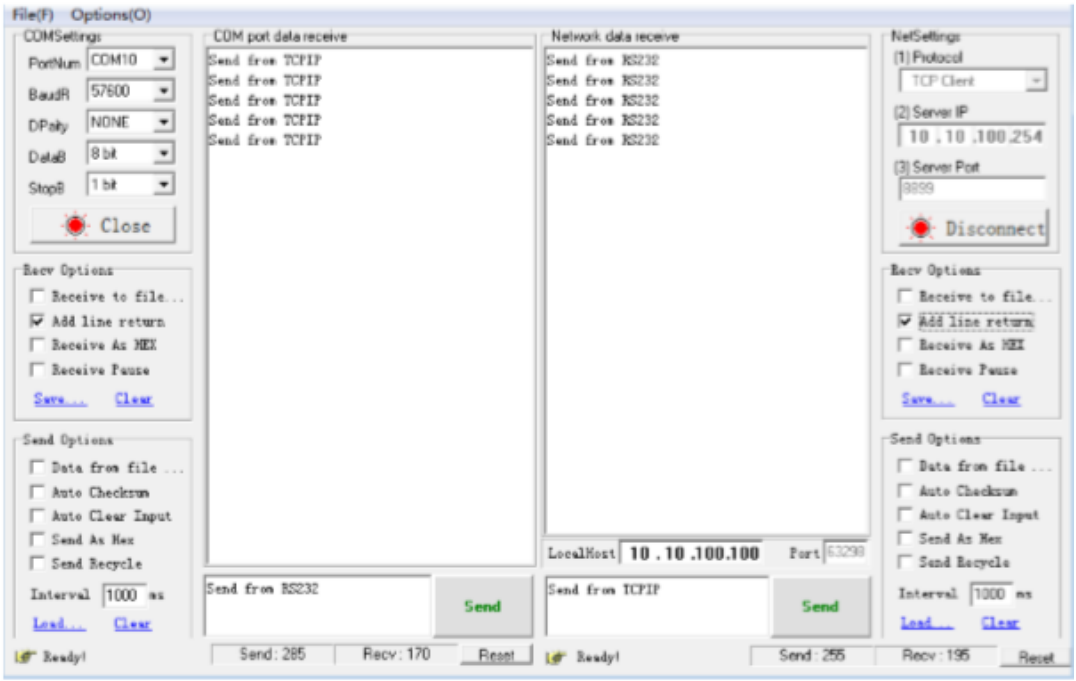


Figure 49 WIFI to Serial Data Transmission

Note: Because of the RTS/CTS pin processing difference, currently available on the part of the serial debugging software for the module of the system is not available, please be sure to want to use TCP232-Test we provide testing, ort just RXD TXD GND connected the three lines to the computer, please notice.

6.3 Use Cases

6.3.1 Wireless Control Application

Figure 50 Wireless Control Application

For this wireless control application, WIFI232 works as AP mode. Module's serial port connects to user device. So, control agent (Smart phone for this examples) can manage and control the user device through the wireless connection with WIFI232 module.

6.3.2 Remote Management Application

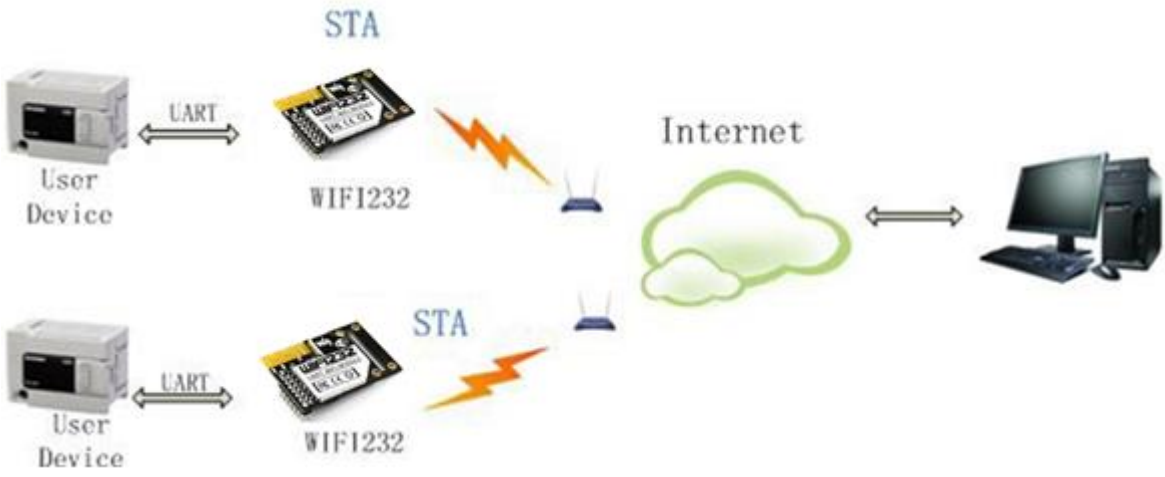


Figure 51 Remote Management Application

For this remote management application, WIFI232 works as STA mode and connects to Internet through wireless AP. Module configured as TCP Client and communicates with remote TCP server at Internet. Module's serial port connects to user device.

So, user device's data or sampling information can send to remote TCP server for storage or processing. Also remote TCP server can send command to control and manage the user device through the wireless network.

6.3.3 Transparent Serial Port Application

For this transparent serial port application, two WIFI232 modules connect as below figures to build up a transparent serial port connection.

Figure 52 Transparent Serial Port Application

For left side WIFI232 module, configured as AP mode and use default SSID and IP address, network protocol configured as TCP/Server mode, and protocol port ID: 8899.

For right side WIFI232 module, configured as STA mode and setting the same SSID ("WIFI232" for this examples) with left side WIFI232 module, enable DHCP network and network protocol configured as TCP/Client mode, protocol port ID:8899. Target IP address part setting the same IP address with left side WIFI232 module ("10.10.100.254" for this example).

When right side WIFI232 boot up, it will find wireless AP (SSID, WIFI232 for this example) and open TCP/Client network protocol to connect with left side module's TCP/Server. All these operations will be automatic and after finished, the two user devices connected to WIFI232 module through serial port can communicate each other and think the connection between them is fully transparent.

Notes: IP address of LAN port and WAN port should in different segment, as picture shown, we change to 10.10.99.254 (the address get from left module WAN port DHCP is 10.10.100.xxx)

6.3.4 Wireless Data Acquisition Card Application

For this wireless data acquisition card application, one PC works as data server and every data acquisition card connects with a WIFI232 module to support wireless connection function.

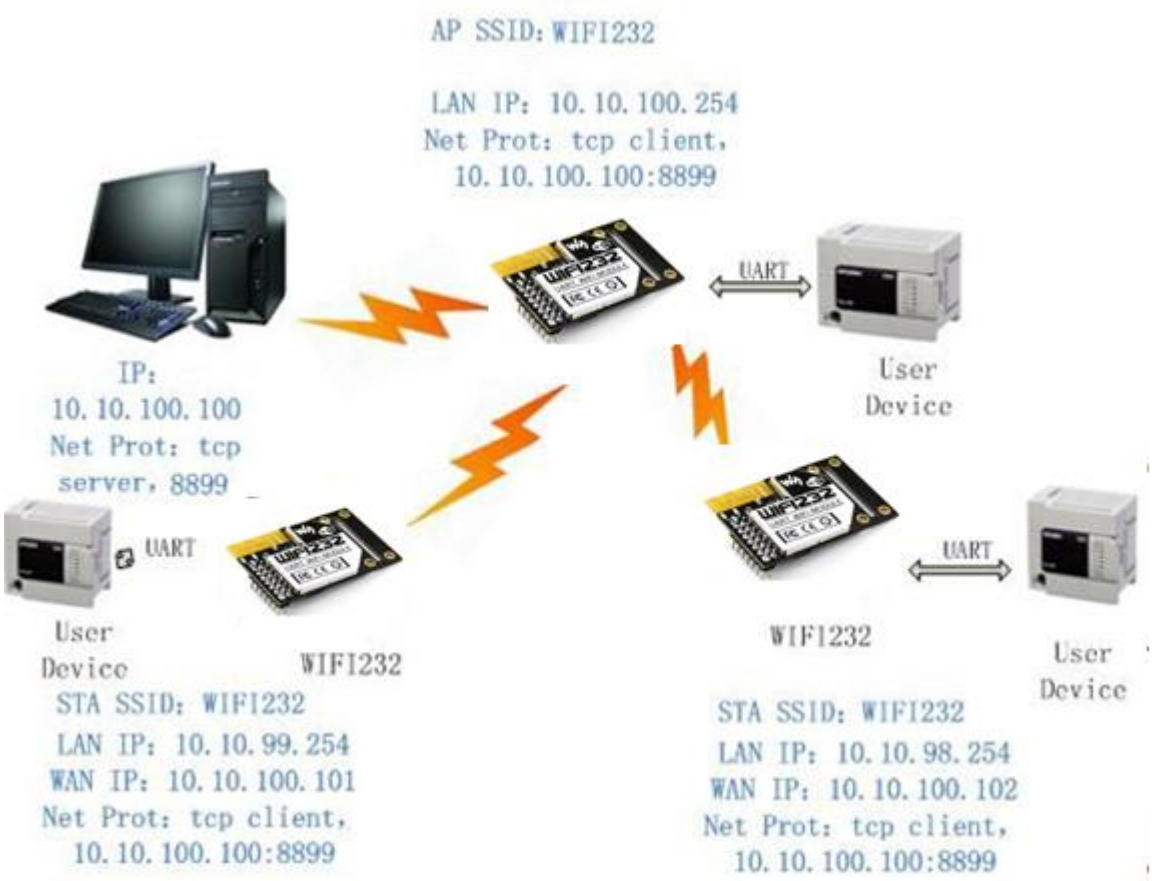


Figure 53 Wireless Data Acquisition Card Application

As above figure, one WIFI232 configured as AP mode and all others configured as STA mode. All WIFI232 which configured as STA and data server PC wireless connected to WIFI232 which configured as AP to make up a wires network

Data server PC open TCP/Server protocol and all WIFI232 modules open TCP/Client protocol All data acquisition cards' data and sampling information can be transmitted to data server PC for operation.

7 Appendix A: Questions and Answers

Q1: How to configure transparent serial port application (TCP protocol) with two WIFI modules?

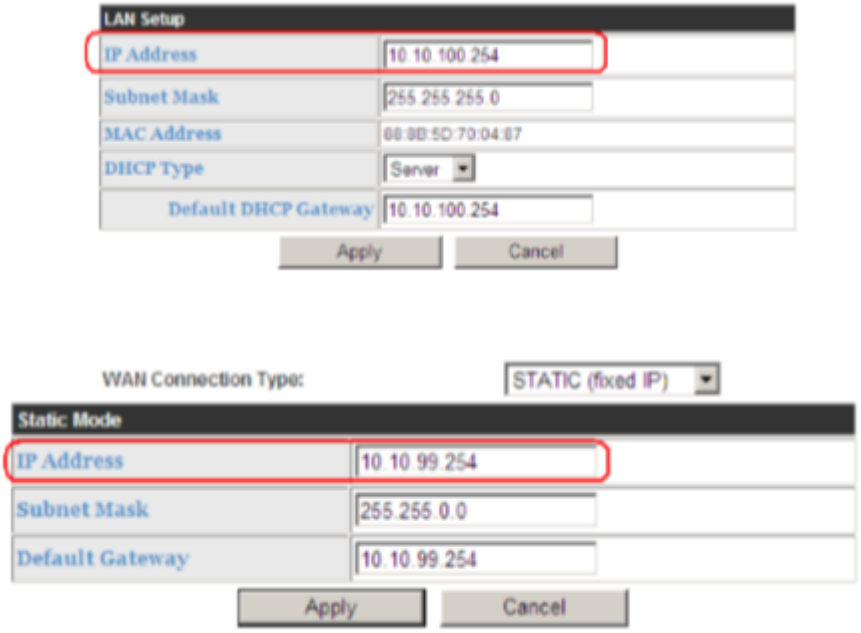
A1: Network structure as below figure:

- Module 1# Setting:
  - Works as AP model
  - LAN IP address: 10.10.100.254
  - Network Protocol: TCP/Server, Port ID: 8899; (Module default setting)
- Module 2# Setting:
  - Works as STA mode;
  - WAN connection type: DHCP or Static IP (For example 10.10.100.100)
  - Network Protocol: TCP/Client, Port ID: 8899; Application IP address: Module 1#'s LAN IP address (10.10.100.254)
  - **Note:** When module 2# works s STA mode, module's WIFI interface works as WAN port. Module's WAN IP address and LCAN IP address shall be setting different segment. SO, module 2#'s LAN IP address must change to other segment; (For this sample, we change to 10.10.99.254);

Figure 54 Q1

Q2: Where to Set WIFI Module LAN IP and WAN IP through WEB page?

A2: WIFI232 Wireless LAN IP address setting see "AP Interface Setting Page" as below Figure.



Q3: How to configure transparent serial port application (UDP protocol) with two WIFI modules?

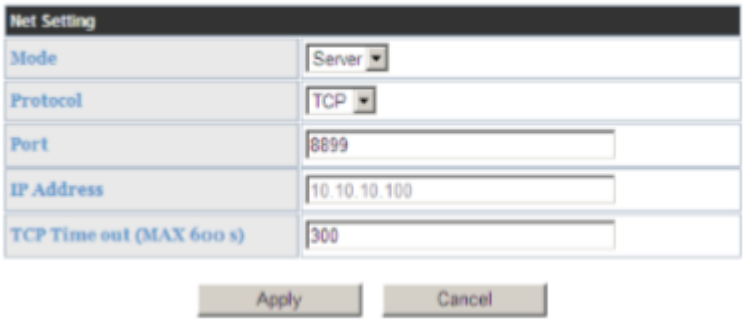
A3: Network structure as below figure:

- Module 1# Setting:
  - Works as AP mode;
  - LAN IP address: 10.10.100.254;
  - Network Protocol: UDP, Port ID: 8899; Application IP address:10.10.100.100;
- Module 2# Setting:
  - Works as STA mode;
  - WAN connection type: Static IP (10.10.100.100)
  - Network Protocol: UDP, Port ID: 8899; Application IP address: Module 1#"s LAN IP address (10.10.100.254);
  - LAN IP address: 10.10.99.254 (Different net segment with WAN port)

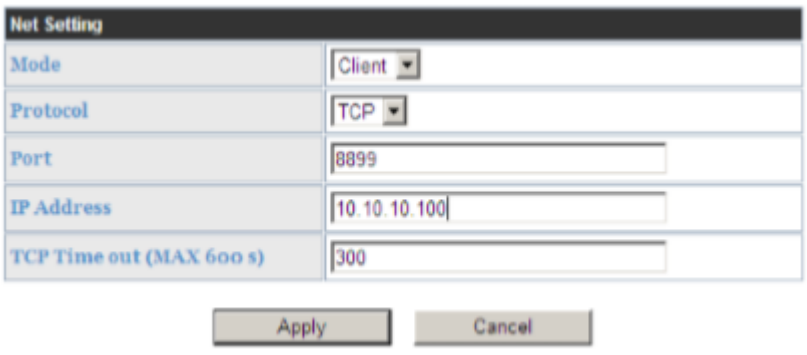
Q4: Where to set WIFI232 module network protocol (TCP/UDP)?

A4: WIFI232 network protocol setting as below Figure,

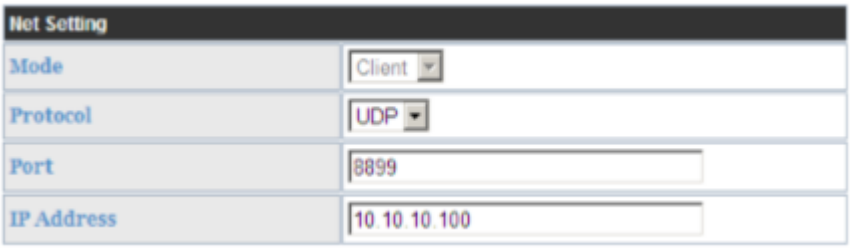
- Protocol: TCP Server
  - Only Port ID required: 8899 (Default)



- Protocol: TCP Client
  - Application IP address required: it's target TCP server's IP address;
  - Port ID required: 8899 (Default)



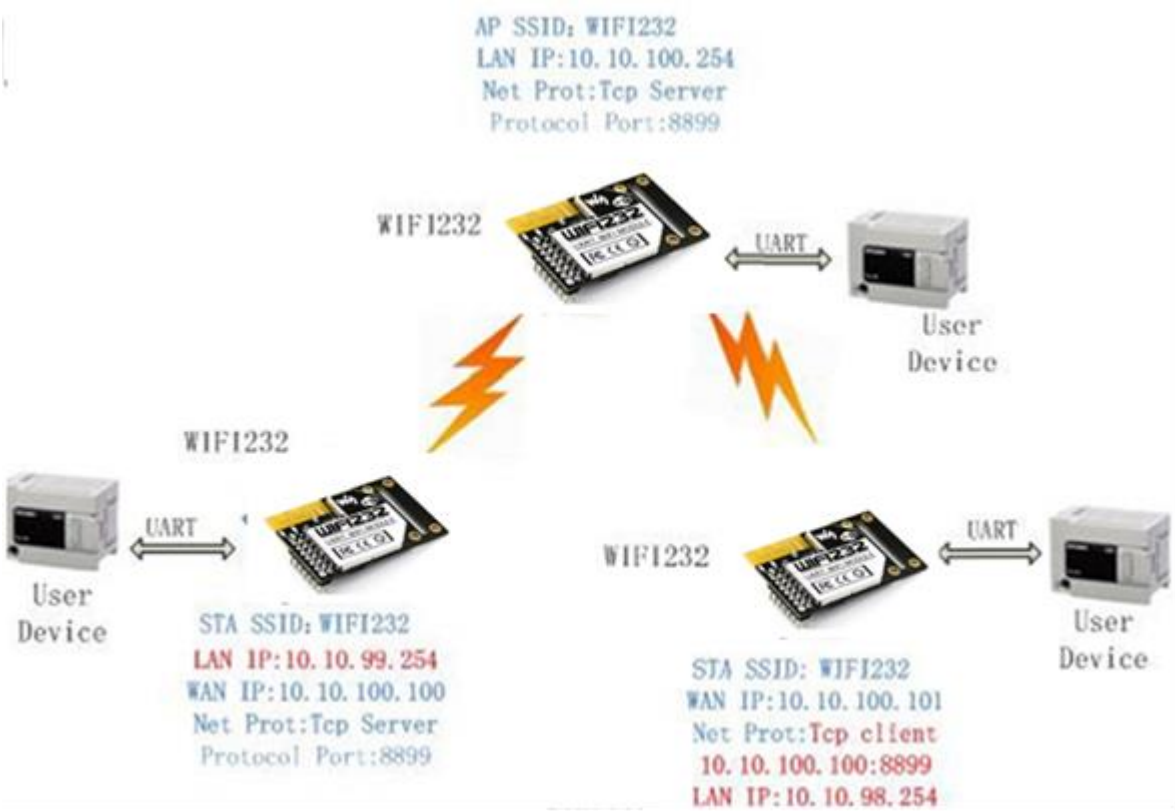
- Protocol: UDP
  - No Server/Client selection required;
  - Application IP address required: it's target device's IP address;
  - Port ID required: 8899 (Default)



Q5: How to configure transparent serial port application: Two WIFI modules all configured as STA and connection through AP?

A5: Network structure as below figure:

- Module 1# Setting: (We use WIFI232 as AP for this example)
  - Works as AP mode and all default setting;
- Module 2# Setting:
  - Works as STA mode;
  - WAN connection type: Static IP: 10.10.100.100;
  - Network Protocol: TCP/Server, Port ID: 8899;
  - LAN IP address: 10.10.99.254 (Different net segment with WAN port);
- Module 3# Setting: Works as STA mode;
  - WAN connection type: Static IP: 10.10.100.101;
  - Network Protocol: TCP/Client, Port ID: 8899; Application IP address: Module 2#"s WAN IP address (10.10.100.100);
  - LAN IP address: 10.10.98.254 (Different net segment with WAN port);



Q6: How to avoid IP address confliction when apply WIFI232 module?

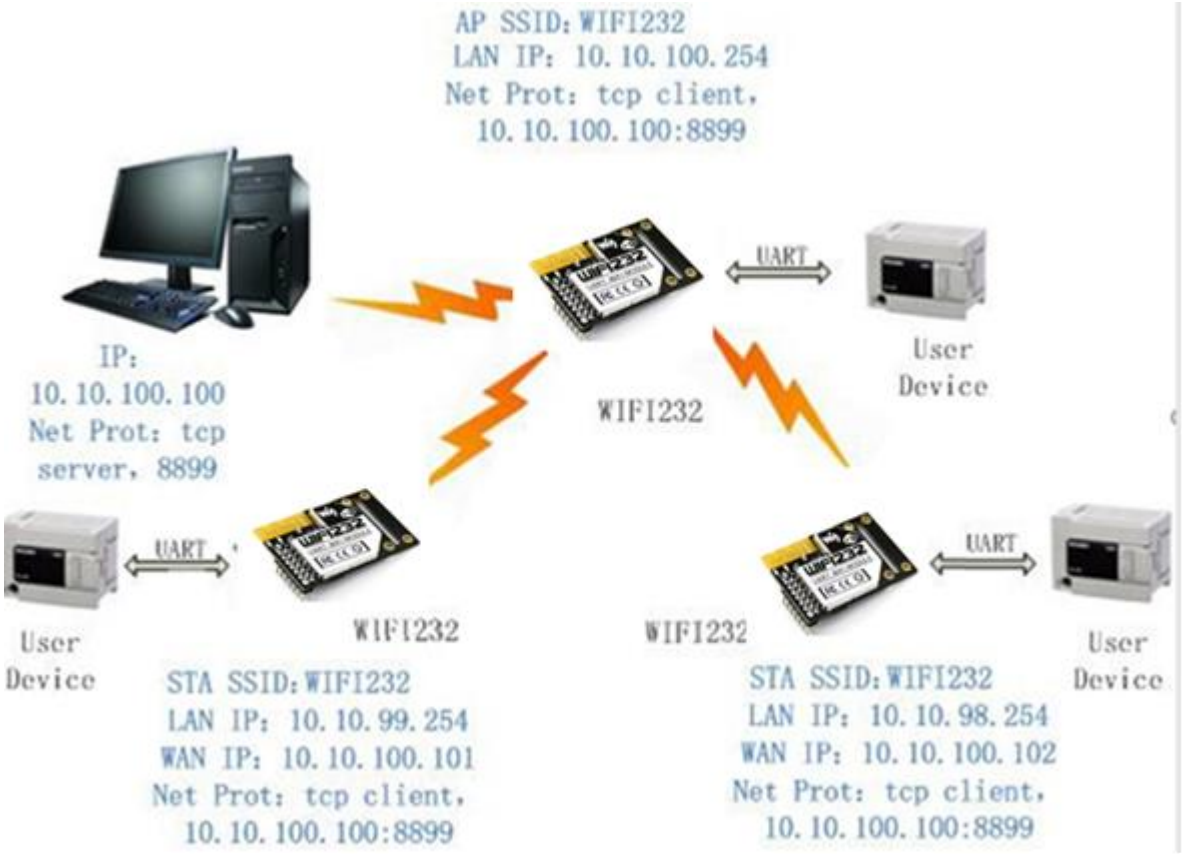
A6: The following address allocation method can avoid the IP address confliction for dynamic and static IP address mixed application.

- Module dynamic IP address range from 100 to 200 for last IP address segment.
  - Such as default IP: 10.10.100.254. When module works as AP, the IP address module can allocate to STA is from 10.10.100.100 to 10.10.100.200;
  - So, if user needs to set static IP for dedicated STA internal network, the available IP address range can start from 10.10.100.1 to 10.10.100.99

Q7: PC works as server, all WIFI modules works as data acquisition card and connect with PC, how to configure this application?

A7: Network structure as below figure: Three WIFI232 module setup 3 TCP links with PC server. Module 1# works as AP and all devices connect to module 1# through WiFi interface;

- PC Setting:
  - IP address: 10.10.100.100;
  - Network Protocol: TCP/Server, Port ID: 8899;
- Module 1# Setting:
  - Works as AP mode;
  - LAN IP address: 10.10.100.254;
  - Network Protocol: TCP/Client, Port ID: 8899; Application IP address:10.10.100.100;
- Module 2# Setting:
  - Works as STA mode;
  - WAN connection type: Static IP: 10.10.100.101;
  - Network Protocol: TCP/Client, Port ID: 8899; Application IP address:10.10.100.100;
  - LAN IP address: 10.10.99.254 (Different net segment with WAN port);
- Module 3# Setting:
  - Works as STA mode;
  - WAN connection type: Static IP: 10.10.100.102;
  - Network Protocol: TCP/Client, Port ID: 8899; Application IP address:10.10.100.100;
  - LAN IP address: 10.10.98.254 (Different net segment with WAN port);



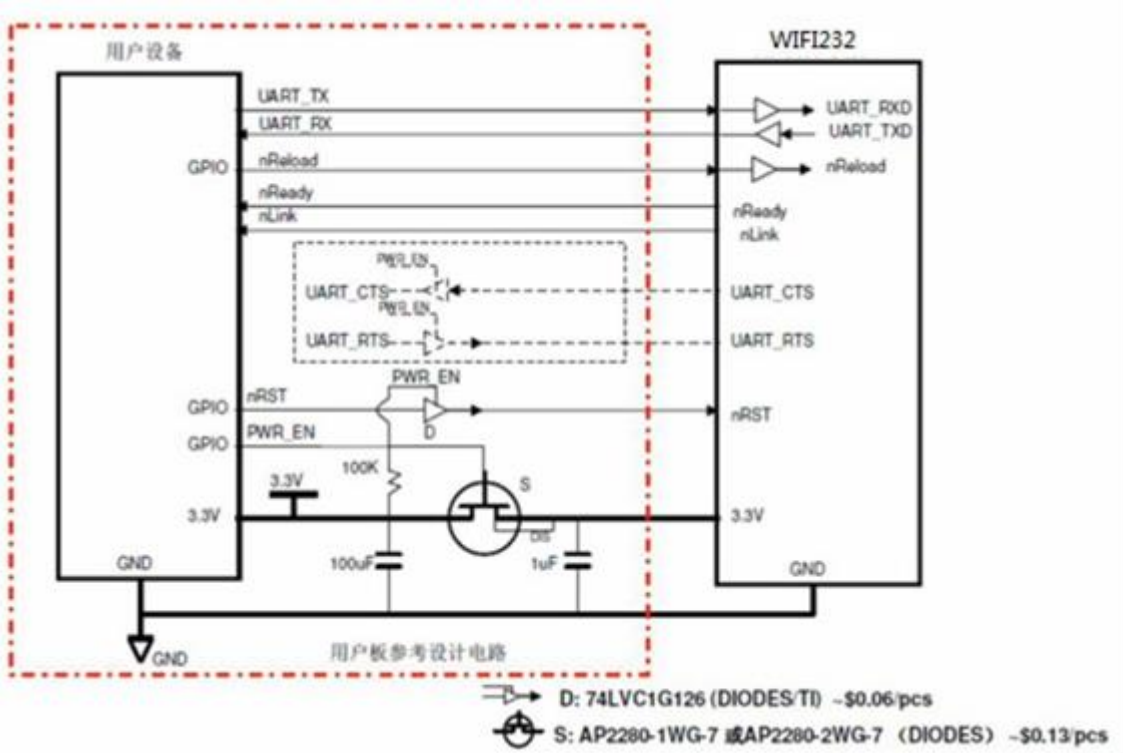
Q8: WIFI module support UDP multicast?

A8: At present, all the WIFI module does not support UDP multicast function, IP multicast address range is "224.0.0.0~ 239.255.255.255",When setting module, please don't set this IP section, if set, may cause the module can't normal start.

Q9: WIFI module operates in STA mode, the PC how to get the IP module?

A9: All wifi module supports UDP search, they will return to their respective IP, MAC, MID, detailed search process is as follows: 1. PC via UDP broadcast (broadcast address: xx.xx.xx.255, Port: 48899) sent a password, the default password is: "HF-A11ASSISTHREAD", the password can be used AT commands (AT + FASWD) set up, it's Up to 100 bytes. 2. After the module receives a password, if the password is correct, to the address (Unicast, Port: 48899) sends local IP address and MAC address and name of the module. (IP, MAC, MID as 10.10.100.254,888 B5D0000E2, guxin). So you can get to the IP address of the module.

8 Appendix b: external power shutdown mode reference design



9 Appendix c: Disclaimer

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