M03 - LVTTL UART to Wi-Fi

(IEEE 802.11 b/g)

AT Command and User Manual

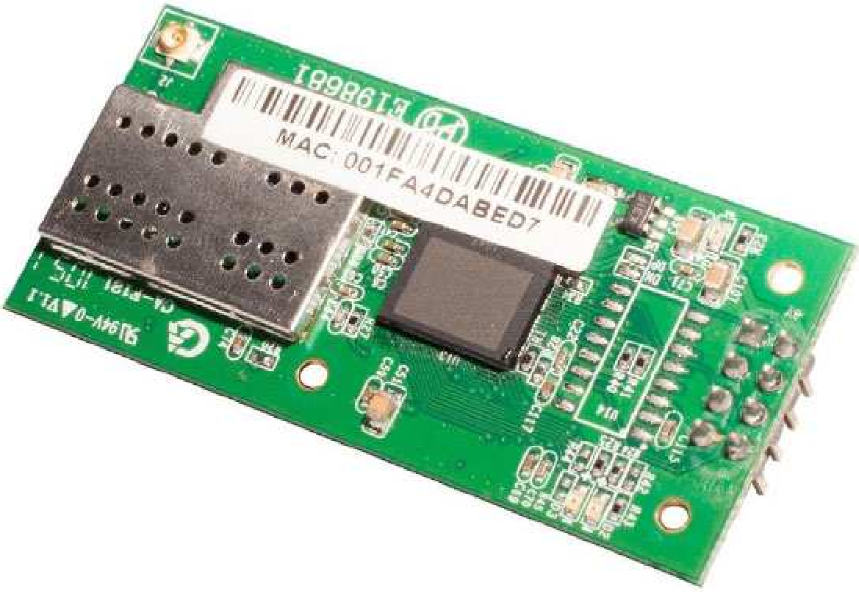

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Table of Contents

1 Introduction

M03 is the new third-generation embedded UART-WIFI modules studied by Venus Supply Co., Ltd. (www.ThaiEasyElec.com) UART-WIFI is an embedded module based on the UART serial, according with the WIFI wireless WLAN standards, It accords with IEEE802.11 protocol stack and TCP / IP protocol stack, and it enables the data conversion between the user serial and the wireless network module. Through the UART-WIFI module, the traditional serial devices can easily access to the wireless network.

M03 does a comprehensive hardware and software upgrades based on the products of the first two generations, now it's more functional and more convenient to use, its main features include:

Interface

- ✧ 2*4 pins of Interface (2.54 Pitch)
- ✧ The range of baud rate: 1200~115200bps
- ✧ RTS / CTS Hardware flow control
- ✧ single 3.3V power supply

Wireless

- ✧ support IEEE802.11b / g wireless standards
- ✧ support the range of frequency: 2.412~2.484 GHz
- ✧ support two types of wireless networks:

  Ad hoc and Infrastructure
- ✧ support multiple security authentication mechanisms:

  WEP64/WEP128/ TKIP/CCMP (AES)

  WEP/WPA-PSK/WPA2-PSK
- ✧ support quick networking
- ✧ support wireless roam

Others

- ✧ support multiple network protocols

  TCP/UDP/ICMP/DHCP/DNS/HTTP
- ✧ support two types of work modes:

auto and command

- Support the transparent transmission mode
- support AT+ instruction set
- support a variety of parameters configuration methods:

serial / WEB server / wireless configuration

Application

- intelligent bus network, such as wireless credit card machine
- small financial payment network, such as wireless POS machine
- industrial equipment networking, such as wireless sensor
- Things

2 Overview

2.1 Technical Specification

Table2-1 Technical Specifications

	Item	Parameters
wireless	Wireless standard	IEEE802.11b/g
	Frequency range	2.412~2.484 GHz
	Receiver sensitivity	802.11b: -86 dBm @ 11Mbps (typical) 802.11g: -71 dBm @ 54Mbps(typical)
	Transfer rate	802.11b: 1,2,5.5,11 Mbps 802.11g: 6,9,12,18,24,36,48,54 Mbps
	Modulation	DSSS, OFDM, DBPSK, DQPSK, CCK, QAM16/64
	Output power	802.11b: 18±2 dBm(typical) 802.11g: 15±1 dBm(typical)
	Antenna Interface	IPX
	Item	Parameters
Hardware	WLAN Chip Set	TLG10UA03 from www.hed.com.cn (China)
	Serial type	UART (LVTTL : Low Voltage TTL)
	Serial rate	1200~115200 bps
	Operating voltage	3.3±0.3 V
	Operating current	300mA (typical)
	Storage temperature	-40~+85 ˚C
	Operating temperature	0~75 ˚C
	Dimensions	55.2×25.4×11.5 ㎜
	Environmental certification	RoHS
	Item	Parameters

Software	Network type	Infra/ADHOC
		WEP/WPA-PSK/WPA2-PSK
	Security	WEP64/WEP128/TKIP/CCMP(AES)
	Work mode	auto/command
	Serial command	AT+Instruction set
	Network protocol	TCP/UDP/ARP/ICMP/DHCP/DNS/HTTP
	Most sockets to connect	15
	TCP connection	the most connection:8 the most Client:8 the most Server:3~4 the most client to connect to server built in this module :4
	UDP connection	the most connection5~6
	The maximum sending rate	11Kbytes /s(TCP)

2.2 Hardware introduction

2.2.1 Mechanical Dimension

The mechanical dimension of M03 is shown as follow, there into, figure 2-1 is the top view of module and side view of the module.

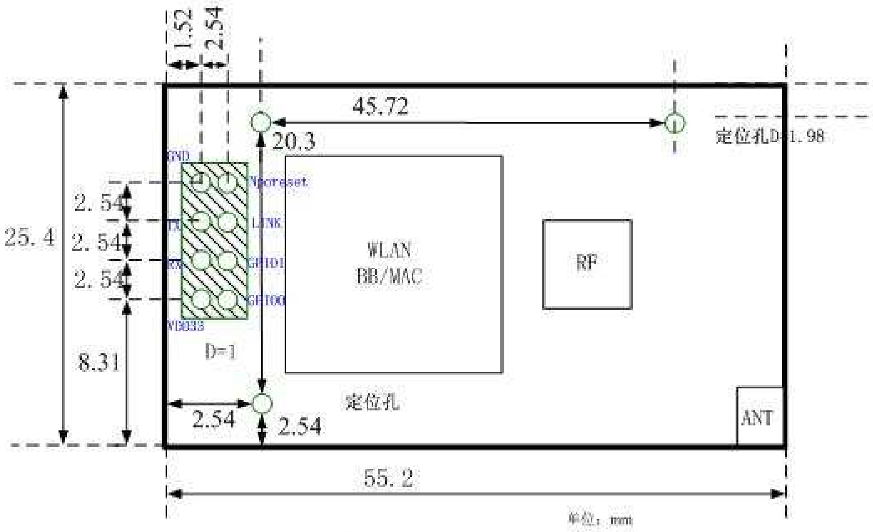


图2-1 模块俯视图

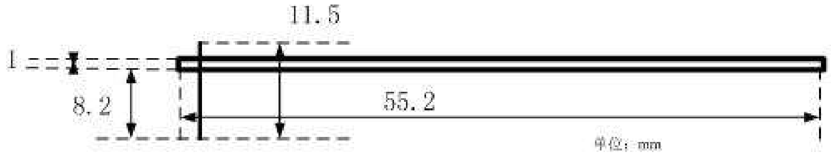


图2-2 模块侧视图

figure 2-1 is the top view of module

2.2.2 External Interface

The following figure is the external interface diagram of M03 product.

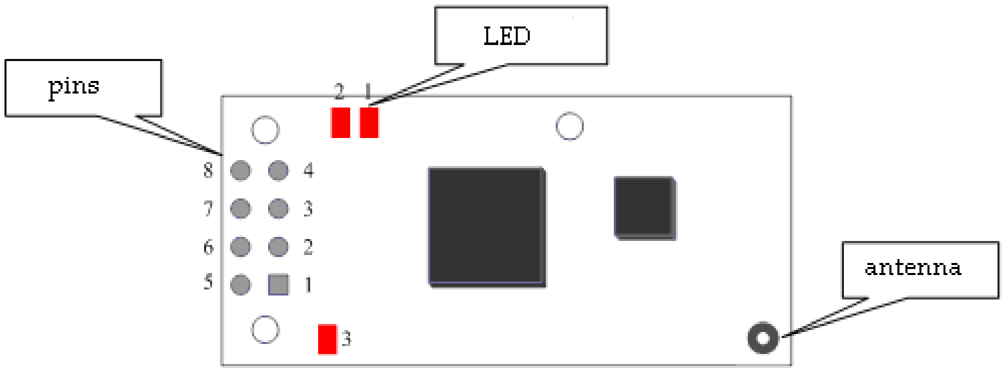


Figure 2-2 interface diagram (Top View)

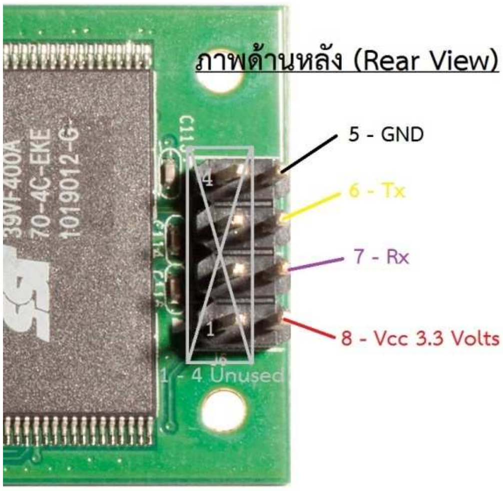


Figure 2-3 interface diagram (Rear View)

2.2.3 Pin Interfaces

The product supports 8-pin dual in-line as Figure 2-2 , they are defined as follows:

Table 2-2 Pin Interfaces

No	function	direction	description
1	nRTS/nREADY	O	Optional features pin, detailed definition see Section 2.3.6,and it's connected to LED1
2	nCTS/MODE/GPIO	I/O	Optional features pin, detailed definition see Section 2.3.6,and it's connected to LED1
3	Link	O	Optional features pin. It's the designation of wireless transmission and it's connected to LED3
4	nRESET	I	Optional features pin. It's a reset signal and effective when it's low.
5	VDD	I	The pin of 3.3V input
6	RXD	I	the pin receives data from the serial
7	TXD	O	the pin sends data to the serial
8	GND	I	ground

Notices:

1. The lateral pins (5 ~ 8) can be used for the pins interface of EWLM064 - TTL UART to WiFi (IEEE 802.11b - 11 Mb) in single row .
2. The medial pins (1 to 4) is optional feature pins, when they are not in use they can be connected to nothing.

2.2.4 Optional

2.2.4.1 USB to Serial (optional)

M03 is UART to Wifi Module (LVTTL : Low Voltage TTL). To connect with your PC / Notebook which is RS232 Level , please use TTL to RS232. In the present , most of PC / Notebook not have DB9 to provide RS232 interface but have only USB interface . USB to Serial is the module that can provide physical USB but give serial TTL data for connect the TTL UART device to PC / Notebook easily . PC / Notebook will find the interface as COM port and you can use serial communication program to connect as the same DB9 interface. For suggestion such as ETEE002 : Serial UART to USB mini B Converter V4.

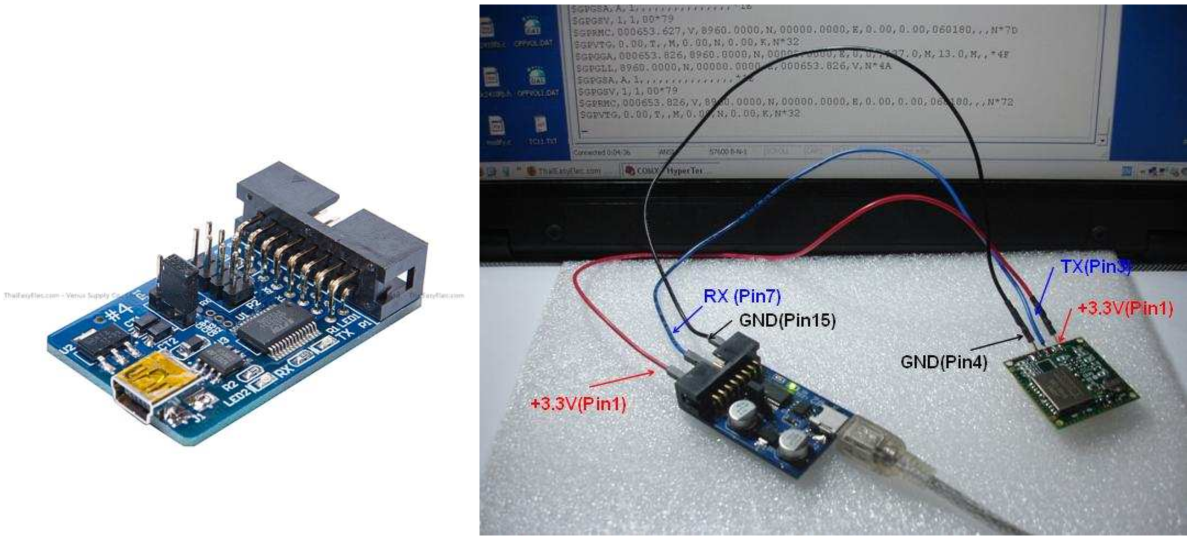


Figure 2-4 U.FL. to SMA Interface Cable

2.2.4.2 Antenna interface (optional)

This product provides one antenna interface : IPX (U.FL Connector) but not include cable . Please order as an option

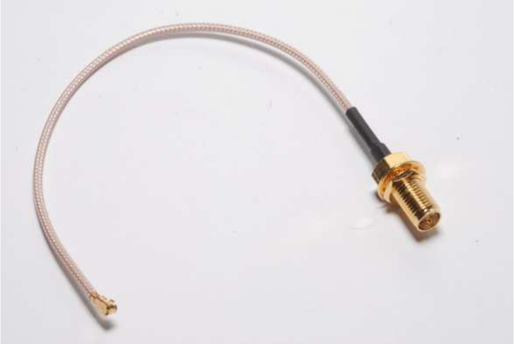


Figure 2-5-1 U.FL. to SMA Interface Cable

2.2.4.3 Antenna (optional)

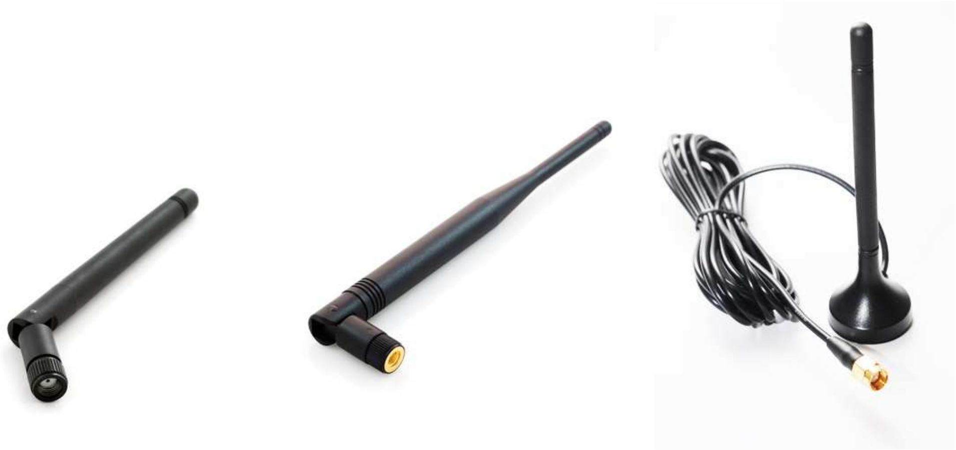


Figure 2-5-2 Antenna 2.4 Ghz in many type (dBi difference)

This product must be connected with the 2.4Ghz antenna according to IEEE 802.11g / 802.11b standards, the parameters are required as follows:

Table 2-3 antenna parameters

No	description
Frequency range	2.4~2.4825 GHz
Impedance	50 Ω
VSWR	≦1.5

2.2.4.4 Wireless adapter (optional)

Figure 2-5-3 Wireless adapter

Wireless adapter can be used to configure parameters of the product through the wireless connection, which is more useful when the products can’t connect to serial port. In addition, parameter configuration of a group of products can be achieved by using the wireless adapter. The method for use is shown in Section 3.2.

2.3 Main features

2.3.1 Wireless Network Connection

2.3.1.1 Network Topology

WIFI wireless network includes two types of topology basic network (Infrastructure), and ADHOC networks (ADHOC).to explain the wireless network topology, two basic concepts are needed to be understood first.

AP, that is the wireless access point, the founder of a wireless network and the center of the network nodes. The wireless router we use at home or in office may be an AP.

STA, short for station, each terminal connects to a wireless network (such as laptops, PDA and other networking devices) can be called with a STA devices.

✧ *Basic wireless network based on AP(Infrastructure)*

Infrastructure: it’s also called basic network. It’s built by AP and many STAs which join in. The characters of network of this type is that AP is the center, and all communication is transmitted through the AP .

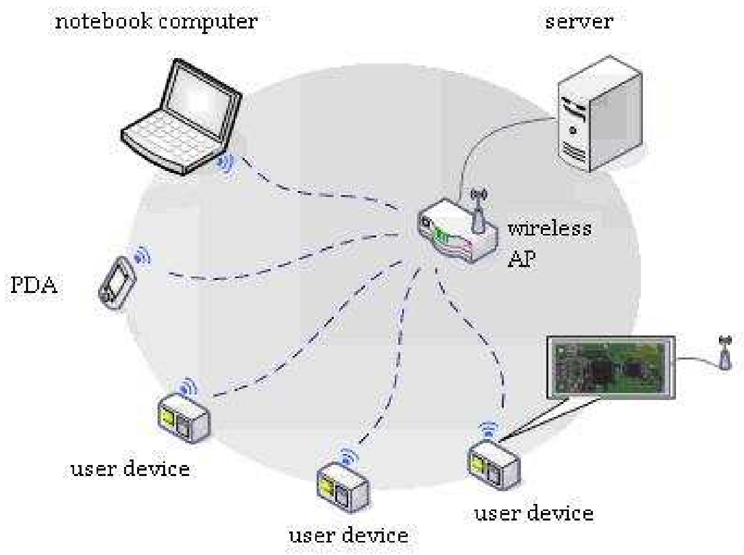


figure2-6 Infrastructure topology

✧ *wireless network based on ad hoc network (ADHOC)*

ADHOC :it's also called independent basic service set, and it's built by two or more STAs without AP, this type of network is a loose structure, all the STAs in the network can communicate directly.

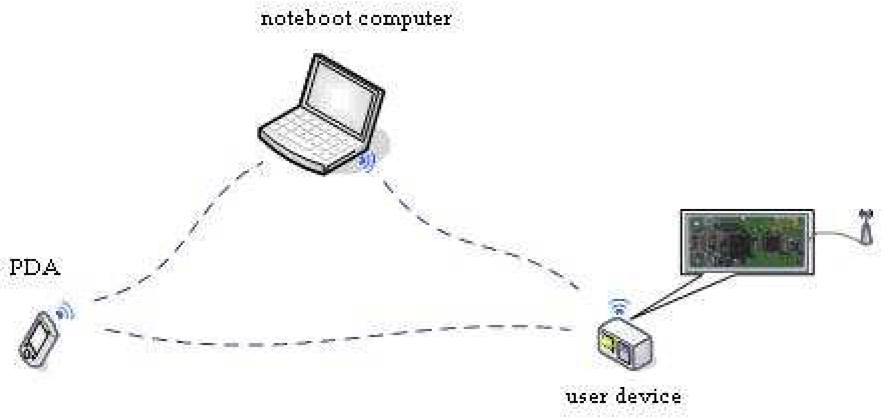


figure2-7 ad hoc network topology

M03 works as a STA, and supports the two types of wireless networks above.

2.3.1.2 Security

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

- ✧ WEP64
- ✧ WEP128
- ✧ WPA-PSK/TKIP
- ✧ WPA-PSK/CCMP
- ✧ WPA2-PSK/TKIP
- ✧ WPA2-PSK/CCMP

2.3.1.3 Quick networking

The module supports quick networking by specifying channel number. In the usual course of wireless networking, devices would first scan automatically on the current channel, in order to search for the network (or Ad hoc) built by the target AP. This module provides working channel configuration, when the channel of the target network is known, users can specify the working channel directly, the networking time will be reduced from 2 seconds to about 300 milliseconds, then quick networking is achieved.

2.3.1.4 Address binding

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

2.3.1.5 Wireless Roam

This module supports 802.11 wireless roam. Wireless Roam is that, in order to expand the coverage of a wireless network, multi-AP co-found the wireless network with a same SSID/ESSID, each AP is used to cover different area, STA joined in the network can choose a proximate AP(namely signal is the strongest) to access according to different location, and mobile STA will switch among the different APs .

When wireless roam is enabled, the module will automatically initiate a scan in every 100 seconds, and according to the current scan result, module selects a recent AP to access. During the wireless roaming, the network may be a brief interruption, therefore, it is recommended to close as no need of roam.

What should be noted is that, when BSSID address is blinded, wireless roaming is not effective anymore.

2.3.1.6 Region Setting

The module supports wireless region setting. Users can set the wireless channel list to determine the channels of scanning range.

2.3.2 Plug and Play Serial

The module supports serial transparent transmission and auto-work mode, it really achieves the serial plug and play, and it does the greatest degree to reduce the use complexity. In this mode, users only need to pre-set the required network parameters as follow:

- ✧ The paraments of wireless network, include:
  network name(SSID);
  security mode;
  Key(if it’s need);
- ✧ default TCP/UDP paraments, include:
  protocol type
  connection type
  server address
  port number

Since then, after its power is on, module can automatically connect to the default wireless network and server each time. As in the auto mode, the module's serial always work in the transparent transfer state, so users only need to think of the module as a virtual serial cable, and send or receive data as using a simple serial. In other words, the serial cable of users’ original serial devices is directly replaced with the module, user equipments can be easy for wireless data transmission without any changes.

In this mode, the module supports the trigger length and trigger time of auto forming a frame, Trigger length means that the module receives from the serial a specified length of data, then forms a wireless data frame, and immediately start the network sending process. Trigger time means, when the data received from the serial is less than the specified length, the module will force to form a frame with the current data and start to send after the specified time.

In this mode, the module serial supports hardware flow control, provides normal RTS /CTS signals, it's strongly recommended when doing large amounts of data, hardware flow control should be enabled, so as to fully ensure reliable data transmission. In the applications which doesn't need flow control, users can simply leave RTS / CTS pin vacant.

2.3.3 Command Mode of Serial

Module also provides the command mode based on serial control, which is different from auto-work mode, this mode provides the user with sufficient flexibility, and meet users' specific needs of different applications.

In this mode, the module works according to user command through the serial, user can control the module completely with the command, including modifying parameters, controlling networking, controlling TCP/IP connection and data transmission. This is a high-level use, and also the most flexible to use. Users can discretionarily control the connection and disconnection of the wireless network with command, also can create several different types of TCP / IP connections at the same time and keep them transferring. However, this model also requires the user has full understanding of control protocol of the module's AT Instruction set, and have a basic use knowledge of wireless network and TCP/IP network.

This module beds a set of AT+Instruction used for system control and parameter configuration command (see Article VI), all instructions are based on ASCII code, using Windows Super Terminal program can directly control module with command, it's convenient for debugging and using.

2.3.4 TCP/IP Protocol stack

This module contains a complete TCP / IP protocol stack, and it supports the TCP/UDP /ICMP/ARP/DHCP/DNS/HTTP protocol, in addition, it also supports programming interfaces of socket based on AT+Instruction set.

✧ supports 8 TCP client connections at most

✧ supports 3 TCP server connections at most, and the most number of clients which can join in one server is 4

✧ supports 5~6 UDP connections at most

- supports UDP broadcasting
- supports 8 TCP connections at most
- supports DHCP Client
- supports DNS Resolver
- supports HTTP, built-in WEB server
- supports programming interfaces of socket

2.3.5 Flexible Parameter Configuration

This module commonly works based on the default parameters, configured parameters are saved in the flash memory, parameters can be saved when power is down, the user can use a variety of methods to modify the configuration parameters, they include:

- *on the basis of wireless connection, using the configuration management program (recommended)*

  Use the dedicated wireless adapter and connect it with the module through wireless connection, and then run the configuration management application we provide, you can search and configure the parameters of the module, the method of operation and interface are the same with those when serial connection is used. Advantages of this approach are: the first is ***anytime***, that means module doesn't need to connect to any wireless network, as long as the module is power-on, parameters can be modified; the second is ***anywhere***, without any physical cable connection, even if the module has been integrated into the user equipment, parameters can also be modified; the third is ***group configuration***, it means a group of modules can be uniformly modified once, which is more useful to do a unified factory configuration to devices for users, it can greatly improve operation efficiency.

- *on the basis of serial connection, using the configuration management program*

  It needs an adapter plate to connect the module to the serial of the PC, and then run the configuration management application, this approach has the advantage of intuitive interface and easy operation

✧ *on the basis of serial connection, using Windows HyperTerminal program*

It needs an adapter plate to connect the module to the serial of the PC, and then run the Windows HyperTerminal program, and do the paraments configuration with AT+Instruction set, this approach is the most flexible, but it needs users are familiar with AT+Instruction set.

✧ *on the basis of network connection, using IE browser program*

This approach requires the module has connected to a wireless network. On the PC connected to the same wireless network, use IE browser to connect the WEB server of the module. This approach has the advantages of simple operation and intuitive interface.

2.3.6 Multi-functional GPIO

This module provides two multi-functional pins which can be multiplexed:

Table 2-8 GPIO Multi-functions

pin		function
0	nRTS	Output, RTS signal, in auto-work mode, it as the RTS signal of this side can directly connect with the CTS signal of the other side
	nREADY	Output. In command mode, it indicates the state of wireless network connection of the module, law level is connected, high is disconnected
1	nCTS	Input. CTS signal, in auto-work mode, it as the CTS signal of this side can be directly connected to the RTS signal of the other side
	MODE	Input. it means the startup mode selection of the module,In the start-up phase (power-on / reset within 300ms),low level means common work mode,high level means configuration mode(refered in Section 4.2.1)
	GPIO	Input/output, it can works as general input or output pin according to user configuration

2.3.7 Firmware upgrade online

The module supports firmware upgrade online, there are two methods to upgrade the firmware:

- ✧ on the basis of serial connection, using the configuration management program
- ✧ on the basis of network connection, using the IE browser program

3 Quick Start Wizard

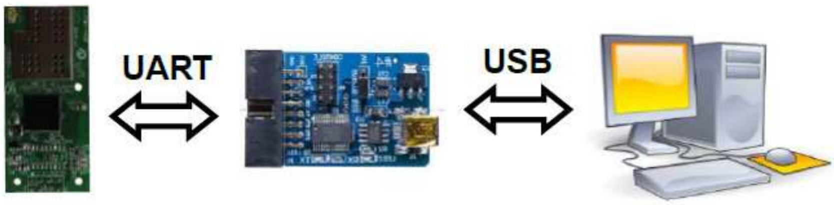
3.1 Preparation

- Hardware
  - M03 module
  - serial adapter board
  - serial cable
- Software
  - UART-WIFI configuration management program
  - Serial debugging software, such as serial debugging assistant, serial master (ComMaster.exe , Realterm) and so on.
  - TCP/UDP debugging software, such as TCP/UDP test tool (TCPUDPDbg.exe) and so on.

3.2 Setting parameters

1 Run the UART-WIFI configuration management program.

2 Connect M03 module with Serial adapter board, and then turn the power on after the serial cable has been connected, as shown below:



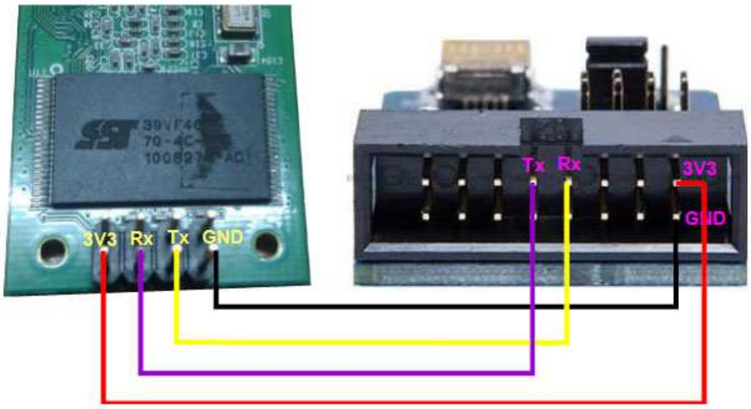
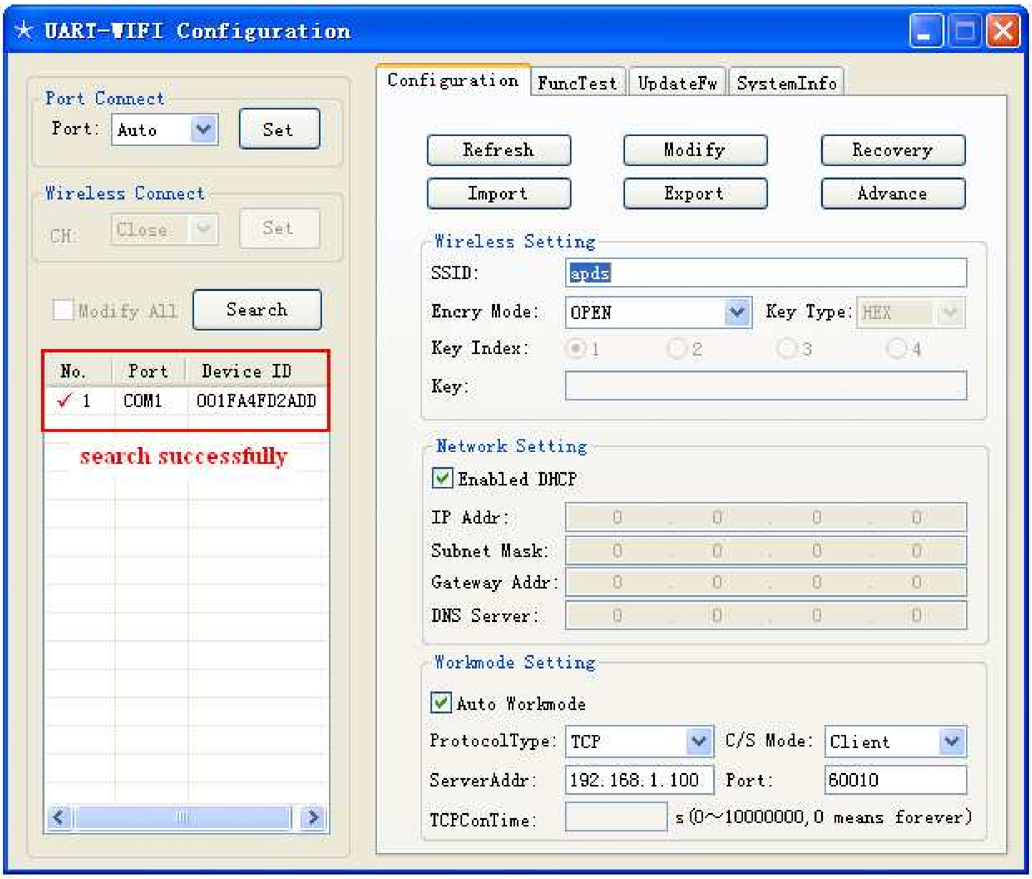


Figure 3-1 connection between with serial adapter board and UART-WIFI module

3 click "search modules", as shown below:



Port: Auto

CH: Close

☐ Modify All

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

search successfully

Wireless Setting

SSID: apds

Encry Mode: OPEN Key Type: HEX

Key Index: ● 1 ○ 2 ○ 3 ○ 4

Key:

Network Setting

☑ Enabled DHCP

IP Addr: 0 . 0 . 0 . 0

Subnet Mask: 0 . 0 . 0 . 0

Gateway Addr: 0 . 0 . 0 . 0

DNS Server: 0 . 0 . 0 . 0

Workmode Setting

☑ Auto Workmode

ProtocolType: TCP C/S Mode: Client

ServerAddr: 192.168.1.100 Port: 60010

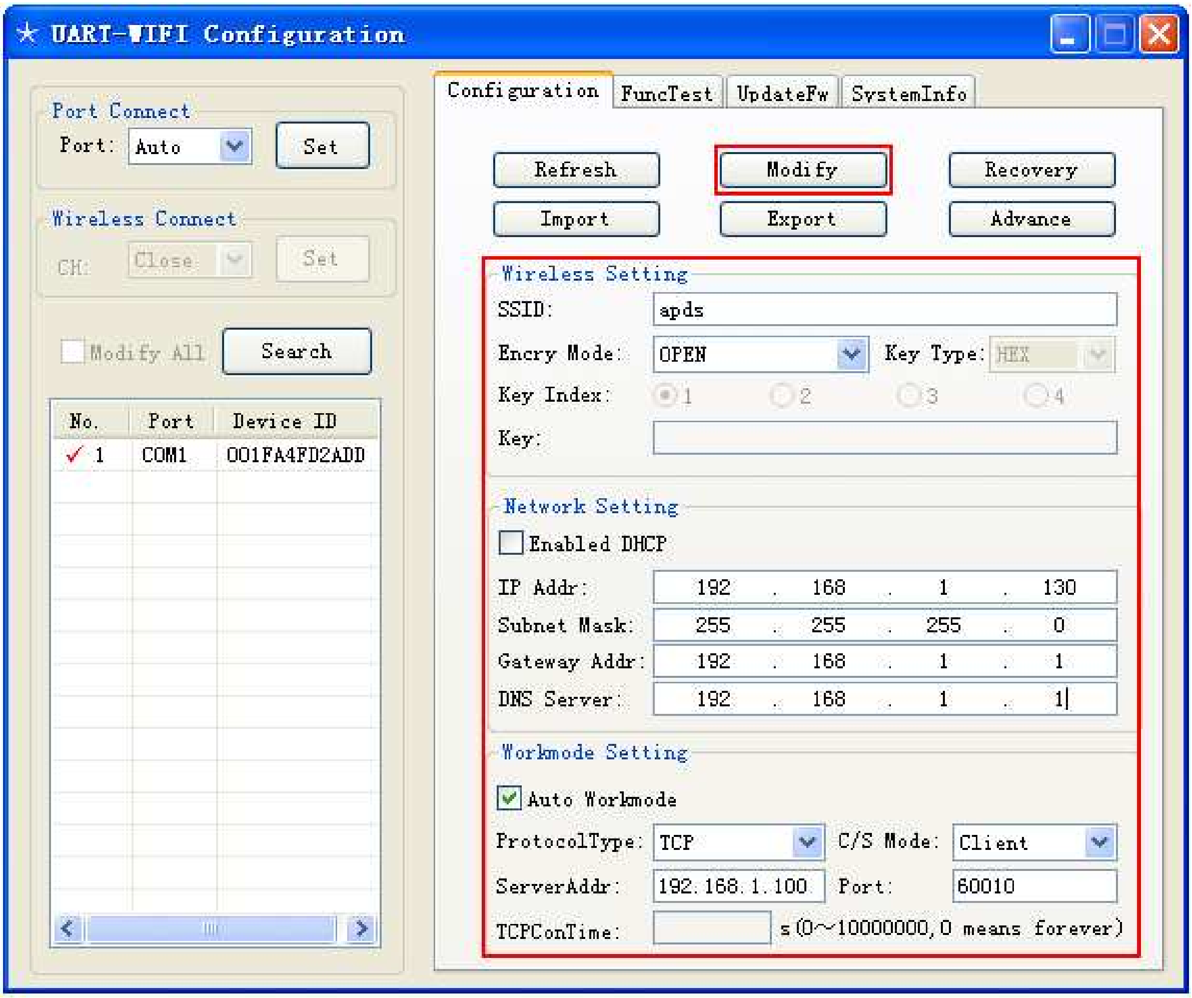
TCPConTime: s (0~10000000, 0 means forever)

Figure 3-2 Search modules successfully

4 According to the wireless router (AP) that you connect to, you can modify the parameters of wireless settings, including network name, encryption, keys and the IP address of network settings.

5 Modify the working mode settings, select the "enable auto-work mode" option and set the parameters according to what you want.

6 After modifying parameters as shown below, click "submit " and select "manually reset later" in the pop-up dialog box.



Port: Auto

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

SSID: apds
Encry Mode: OPEN
Key Type: HEX
Key Index: ● 1 ○ 2 ○ 3 ○ 4
Key:

□ Enabled DHCP
IP Addr: 192 . 168 . 1 . 130
Subnet Mask: 255 . 255 . 255 . 0
Gateway Addr: 192 . 168 . 1 . 1
DNS Server: 192 . 168 . 1 . 1

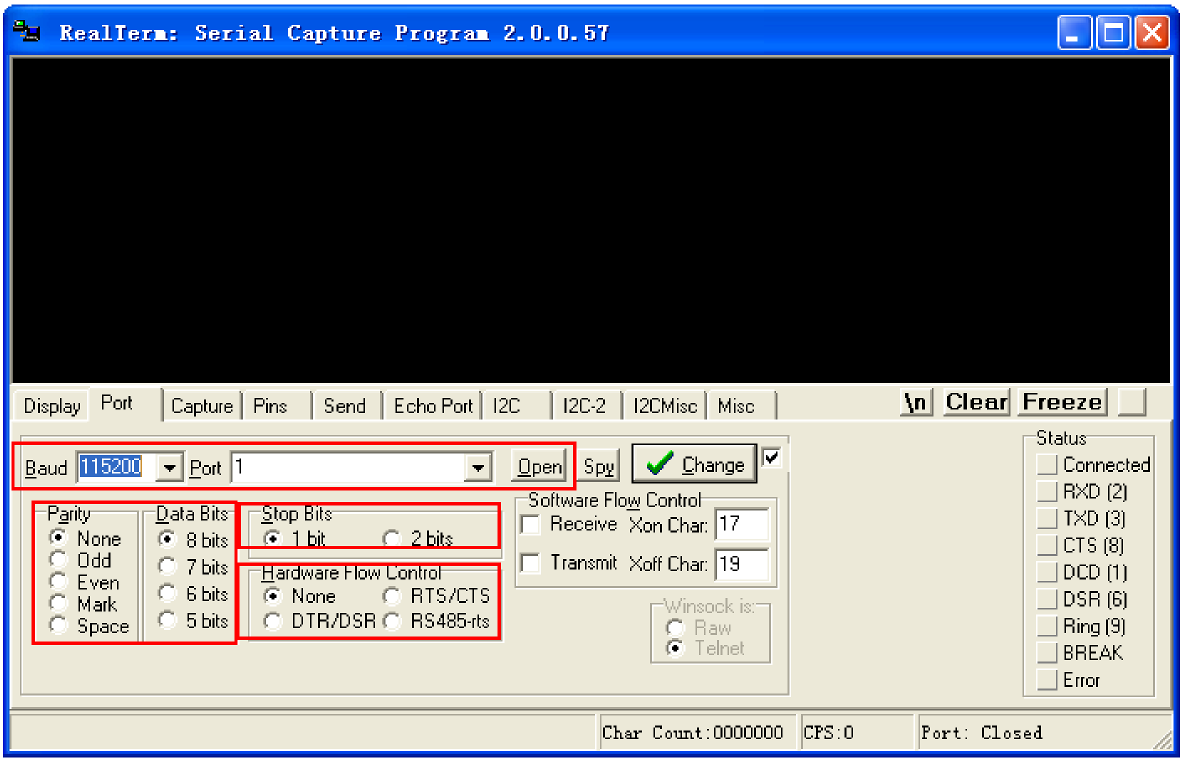
☑ Auto Workmode
ProtocolType: TCP
C/S Mode: Client
ServerAddr: 192.168.1.100
Port: 60010
TCPConTime: s(0~10000000,0 means forever)

Figure3-3 Modify parameters of UART-WIFI module

3.3 Testing

1 Run TCP / UDP debugging software, create a TCP Server whose detecting port is 60000.

2 Run serial debugging software, such as RealTerm.exe in this case. Modify parameters.



Baud 115200 Port 1

Parity: ● None ○ Odd ○ Even ○ Mark ○ Space

Data Bits: ● 8 bits ○ 7 bits ○ 6 bits ○ 5 bits

Stop Bits: ● 1 bit ○ 2 bits

Hardware Flow Control: ● None ○ RTS/CTS ○ DTR/DSR ○ RS485-rts

Software Flow Control: □ Receive Xon Char: 17 □ Transmit Xoff Char: 19

Winsock is: ○ Raw ● Telnet

Char Count:0000000 CPS:0 Port: Closed

Figure3-5 modify the parameters of ComMaster

3 Repower the serial adapter plate(or press the reset button), and the M03 module will reset and automatically connect to the network and TCP server. Then you can begin your transmission test between ComMaster and the TCP/UDP test tools.

4 Product Design Guide

4.1 Hardware Connection

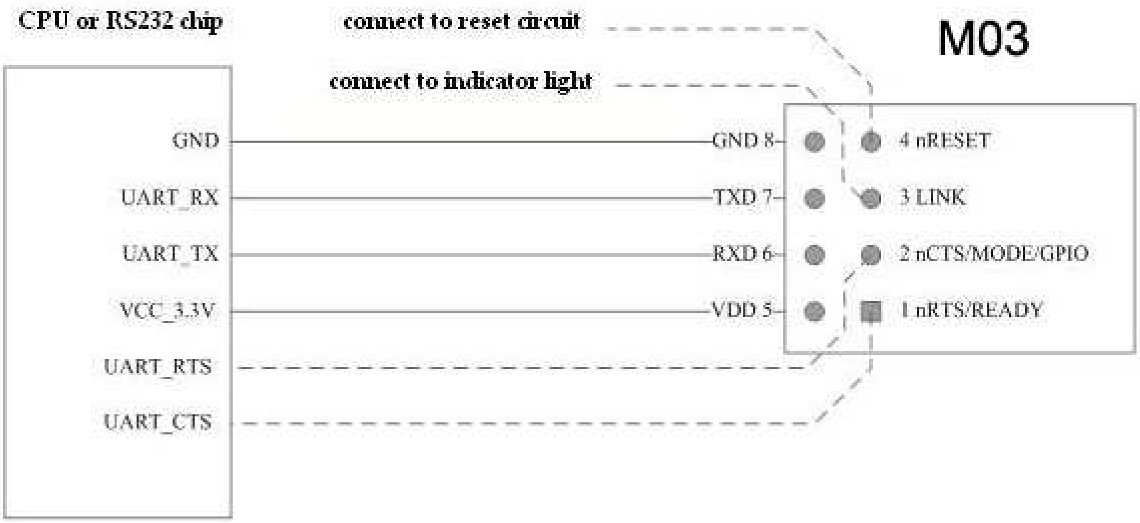


figure4-1 Hardware Connection

M03 module provides 8-pin dual in-line, the lateral row pins (5 ~ 8) must be connected, as shown above .Inside row pins (1 ~ 4) are optional feature pins, connection as shown above. If they are not used, you can leave the corresponding pins vacant. .

4.2 Work mode

4.2.1 Start-up mode selection

Multi-functional pins nCTS/MODE/GPIO (pin 2) is used to select start-up mode at the power-on and reset phase, timing is shown below.

- ✧ Normal startup mode

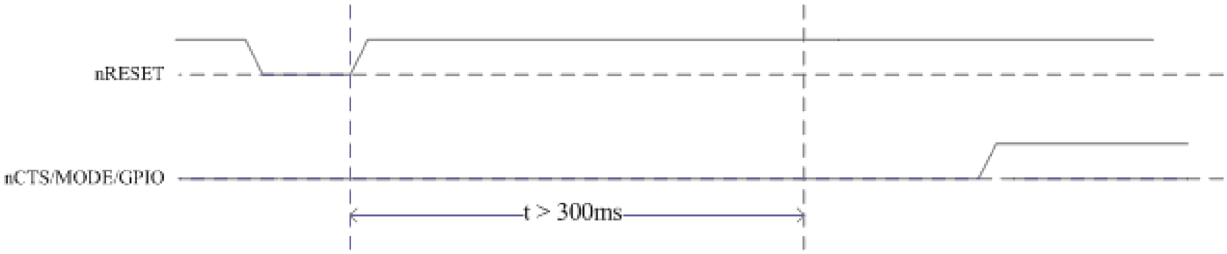


figure4-2 Normal startup mode

What is noted is that nCTS/MODE/GPIO pin of the module do a internal pull-down, when it's disconnected, module accesses to the normal startup mode automatically.

In the normal startup mode, the system runs according to the default work mode (auto or command) in the parameters.

- ✧ launching configuration mode

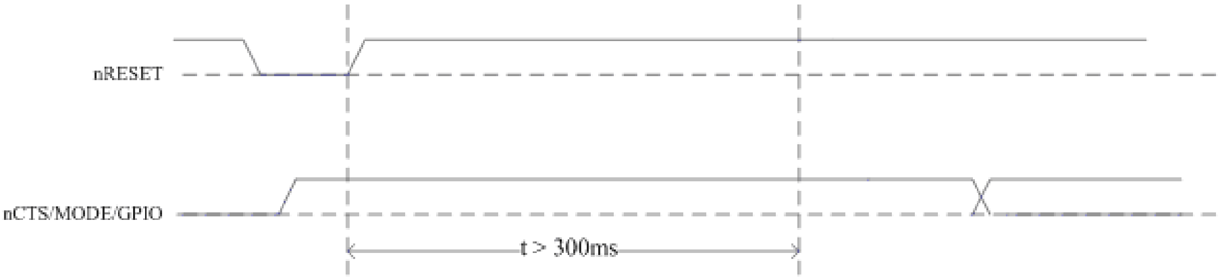


figure4-3 launching configuration mode

In launching configuration mode, the system ignores the default work mode parameters, and force to operate in the AT+Instruction mode, this mode is commonly used to modify the parameters with the configuration management program and to do the function tests.

4.2.2 Auto-work mode

The module supports auto-work mode, and it really achieves a plug and play serial, and it reduces user complexity furthest. In this mode, user should only configure the necessary parameters. After power is on each time, module can automatically connect to the default wireless network and server. As in the automatic mode, the module's serial always work in the transparent transmission mode, so users only need to think of it as a virtual serial cable, and send and receive data as using a simple serial. In other words, the serial cable of users’ original serial devices is directly replaced with the module, user equipments can be easy for wireless data transmission without any changes.

4.2.2.1 Automatic retry mechanism

In auto-work mode, the connection of the system runs completely and automatically, and its working process is shown below:

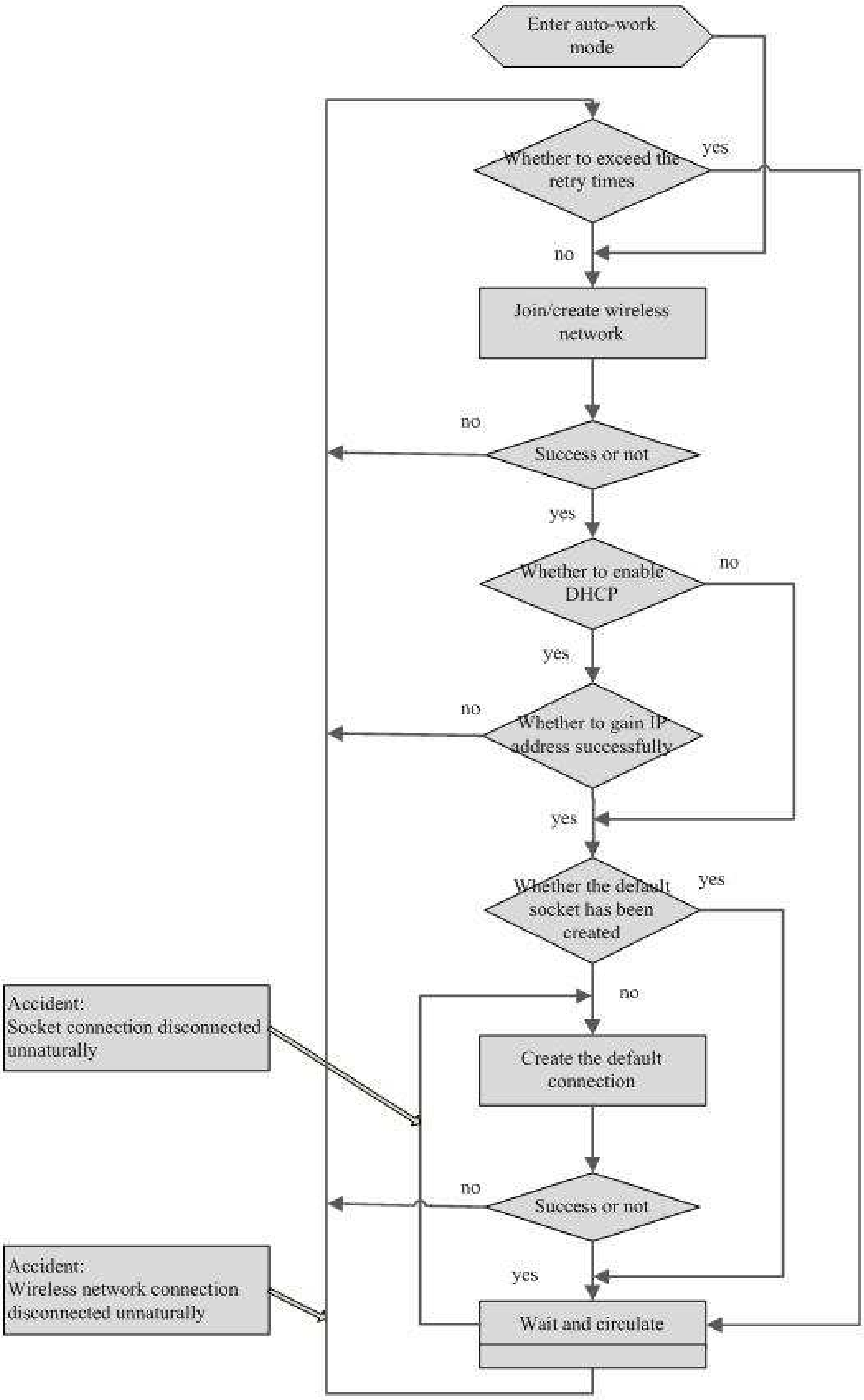

Enter auto-work mode
Whether to exceed the retry times
yes
no
Join/create wireless network
no
Success or not
yes
Whether to enable DHCP
no
yes
no
Whether to gain IP address successfully
yes
Whether the default socket has been created
yes
no
Accident:
Socket connection disconnected unnaturally
Create the default connection
no
Success or not
yes
Accident:
Wireless network connection disconnected unnaturally
Wait and circulate

figure4-4 Automatic retry mechanism

Note:

1 The default Automatic retry time of the system is set to forever, that is, the system will retry to connect acquire and acquire when the networking is failed or network is disconnected. Users can also set a limited number of retries value, in this case, once the retry number is over the limit, the system will not try to reconnect any more, except resetting the system;

2 Socket connection (here especially means TCP connection) is a virtual connection, in the case of non-normal disconnection of the wireless network, the original socket connection will not be deleted, and restored when the wireless network connection is resumed;

4.2.2.2 Auto framing system

In transparent transmission mode, all data in the serial transfers in the form of byte stream, and in the network, the data transfer at a fixed frame format, therefore, the data between the serial and network need a conversion process between a stream and a frame.

For the data transmission in the direction from the network to the serial, data conversion from a frame into a stream is very easy. but in the contrary direction, that is data is converted from the stream to frame format, it needs certain rules to restrain. The module uses two parameters to specify the conversion rules:

- ✧ Auto framing length: When the data length the module received reach the length of auto framing, the module will trigger the framing operation, and send the data frame to the network.
- ✧ Auto framing period: In certain cases, such as the data sent is little, and cause the data in buffer can fill up a data block, then the data in buffer is not normally sent. At this time timeout mechanism is needed to ensure the small amount of data can be sent, the timeout is auto framing period.

Two parameters above together form the two trigger terms of auto framing. The longer the length of auto framing, the higher the transmission performance of the system, the shorter the auto framing period, the higher real-time transmission of the system, so in practice the two parameters can be adjusted according to the needs to obtain the best effect of transmission.

4.2.2.3 Hardware Flow Control Mechanism

Module supports hardware flow control mechanism in transparent transmission mode.

- ✧ RTS: it indicates the enable signal of module receiver, and it’s effective when it’s low, if the following conditions are met simultaneously, RTS signal is effective.
  - ◆ Wireless network is connected
  - ◆ The length of data in UART receiver buffer is no longer than 3/4 of full
- ✧ CTS: it indicates the enable signal of host receiver, and it’s effective when it’s low, once the module detects the ineffective CTS signal, it will immediately stop sending data to the serial until CTS becomes effective.

4.2.2.4 Exit transparent transmission

In auto-work mode with default configuration, the module's serial is in transparent transmission state. At this time, all data through the serial receiving are forwarded to the network, and similarly, data received from the network, the module also sent to serial. This is a simple data transfer state, at this time, if user wants to do the transmission in command through the serial, firstly needs to exit the transparent transmission status. Meanwhile, the module also exit auto-work mode.

The conditions of Module exiting transparent transmission status is shown as following figure.

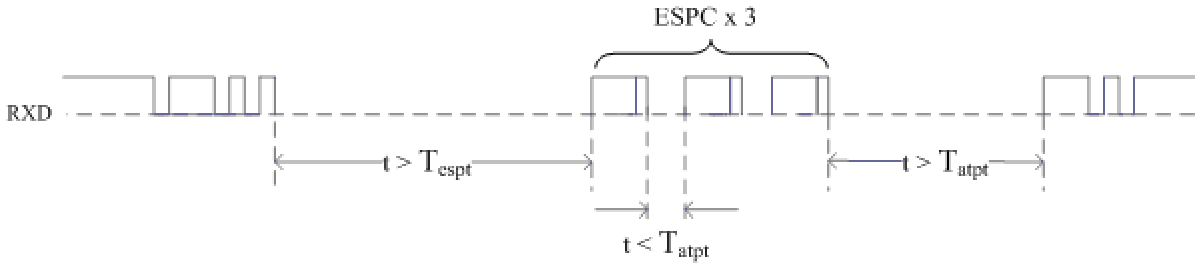


figure4-5 Sketch map of exiting transparent transmission status

There into,

ESPC: escape character

T_{espt}: Escape time

T_{atpt}: Auto framing period

After having detected the existing condition as shown above, the module puts out “+OK”, and confirms the serial exiting transparent transmission and switching to the AT+Instruction state

4.2.3 Command work mode

The module also provides a command mode based on serial control, to use for different applications of users' specific requirements.

In this mode, the module works according to user commands issued through the serial, user can completely control the module with command, including parameters configuration, networking control, TCP/IP connection control and data transmission. This is an advanced usage, and also the most flexible for users use. Users can discretionarily control the connection and disconnection of the wireless network by order, also can create several different types of TCP/IP connection at the same time and keep them transmitting.

To use this mode, please refer to Chapter 6 AT+Instruction control protocol.

4.3 Parameter Details

4.3.1 Wireless parameters

4.3.1.1 SSID

Table 4-1 SSID

Parameter name	Parameter	Correlative Command
SSID	SSID	AT+SSID
Description		
network identity of WIFI network, the length is 1 to 32 ASCII characters		

4.3.1.2 Encryption mode

Table 4-2 Encryption mode

Parameter name	Parameter	Correlative Command
Encryption mode	Encryption	AT+ENCRY
Description		
encryption types of WIFI network, options include: ✧ OPEN ✧ WEP64 ✧ WEP128 ✧ WPA-PSK(TKIP) ✧ WPA-PSK(CCMP)		

✧ WPA2-PSK(TKIP) ✧ WPA2-PSK(TKIP) ✧ WAPI(not supported)

4.3.1.3 Key Format

Table 4-3 Key Format

Parameter name	Parameter	Correlative Command
Key Format	Key Format	AT+KEY
Description		
Key format of WIFI network, options include: ✧ HEX format ✧ ASCII format For WEP encryption, the difference between HEX and ASCII formats is the display format of key, such as WEP64 encryption, its key can be 5 ASCII characters (such as 12345) or 10 hexadecimal numbers (such as 3132333435). For WPA/WPA2-PSK encryption, HEX and ASCII formats indicate different meanings, HEX format: PMK ASCII format: PSK		

4.3.1.4 Key Index

Table 4-4 Key Index

Parameter name	Parameter	Correlative Command
Key Index		AT+KEY
Description		
key index number of WIFI network, this parameter is only effective in WEP encryption mode, optional range is 1 to 4,it’s no sense in other encryption mode		

4.3.1.5 Key

Table 4-5 Key

Parameter name	Parameter	Correlative Command
Key	Encryption Key	AT+KEY
Description		

Key string of WIFI network, the keys of different encryption modes and key formats have different length provisions: ✧ WEP64(HEX):10 characters ✧ WEP64(ASCII):5 characters ✧ WEP128(HEX):26 characters ✧ WEP128(ASCII):13 characters ✧ WPA/WPA2-PSK(HEX):64 characters ✧ WPA/WPA2-PSK(ASCII):8~63 characters
Tips
In WPA/WPA2-PSK (TKIP/CCMP) encryption mode, as the key format is ASCII, the module must first do the conversion to the key of ASCII format when it's power-on, this process increases about 10 seconds to the starting time. And When using WPA/WPA2 encryption, directly using PMK of hexadecimal format can eliminate this delay. However, some APs does not provide PMK (which can be directly input) of hexadecimal format in WPA/WPA2 mode, in this case, you can use the WPA key conversion tool (WPA Key Converter.exe) to convert PSK to PMK and set to the module.

4.3.2 Network Parameters

4.3.2.1 DHCP

Table 4-6 DHCP

Parameter name	Parameter	Correlative Command
DHCP	DHCP Enable	AT+NIP
Description		
Used to indicate the network address type of the client, if this parameter is enabled, the module will dynamically obtain the network address of the client according to the DHCP protocol.		

4.3.2.2 IP address

Table 4-7 IP address

Parameter name	Parameter	Correlative Command
IP address	Fixed IP Address	AT+NIP
Description		

Used to specify static IP address of the local network address of the client, it’s only effective in the case of exiting DHCP.

4.3.2.3 Subnet Mask

Table 4-8 Subnet Mask

Parameter name	Parameter	Correlative Command
Subnet Mask	Subnet Mask	AT+NIP
Description		
Used to specify the subnet mask of the local network address, it’s only effective in the case of exiting DHCP.		

4.3.2.4 Gateway address

Table4-9 Gateway address

Parameter name	Parameter	Correlative Command
Gateway address	Gateway Address	AT+NIP
Description		
Used to specify the gateway address of the local network address, it’s only effective in the case of exiting DHCP.		

4.3.2.5 DNS Server

Table 4-10 DNS Server

Parameter name	Parameter	Correlative Command
DNS Server	DNS Address	AT+NIP
Description		
Used to specify the DNS server address of the local network address, it’s only effective in the case of exiting DHCP.		

4.3.3 Parameters of work mode

4.3.3.1 Auto-work mode

Table 4-11 Auto-work mode

Parameter name	Parameter	Correlative Command
Auto-work mode	Auto Mode Enable	AT+ATM
Description		
Used to specify whether auto-work mode of the module is enabled or not.		

4.3.3.2 Protocol Type

Table 4-12 Protocol Type

Parameter name	Parameter	Correlative Command
Protocol Type	Protocol	AT+ATRM
Description		
Used to specify the protocol type of the default connection module creates in the auto-work mode, options include: ✧ TCP ✧ UDP		

4.3.3.3 CS mode

Table 4-13 CS mode

Parameter name	Parameter	Correlative Command
CS mode	CS Mode	AT+ATRM
Description		
Used to specify the CS mode of the default connection module creates in the auto-work mode, options include: ✧ Client ✧ Server		

4.3.3.4 Server Address

Table 4-14 Server Address

Parameter name	Parameter	Correlative Command
Server Address	Server Address	AT+ATRM
Description		
In the auto-work mode, when CS mode of the default connection module creates is Client, it’s used to specify the server module connects to, its input format may be IP address or domain name.		

4.3.3.5 TCP connection timeout

Table 4-15 TCP connection timeout

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>TCP connection timeout</td><td>Tcp Link TimeOut</td><td>AT+ATRM</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">In the auto-work mode, when CS mode of the default connection module creates is TCP server, it’s used to specify the maximum connection time of the client which joined in the server in the condition of no data transfer, if the no transfer connection is more than this time, the client will be kicked out automatically.</td></tr>
</table>

4.3.3.6 Port number

Table 4-16 Port number

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>Port Number</td><td>Port Number</td><td>AT+ATRM</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">Used to specify the port number of the default connection module creates in the auto-work mode.</td></tr>
</table>

4.3.4 Advanced wireless parameters

4.3.4.1 Network mode

Table 4-17 Network mode

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>Network mode</td><td>Network Mode</td><td>AT+WPRT</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">Used to specify the network mode of the WIFI network, options include:
✧ Infrastructure
✧ Ad hoc
The default setting is Infrastructure. In most cases, if what we want to join to is wireless network AP creates, using the default setting is just contented. Only when user needs to join ADHOC, the parameter may be modified to ADHOC.</td></tr>
</table>

4.3.4.2 Creating ADHOC when network does not exist

Table 4-18 Create ADHOC when network does not exist

Parameter name	Parameter	Correlative Command
Create ADHOC When network does not exist	Create ADHOC When network does not exist	AT+WATC
Description		
Used to specify whether to automatically create network or not if the network does not exist when WIFI network type is ADHOC. The default setting of system is disabled. This parameter is only effective if the network type is set to ADHOC, if users need to create an ADHOC network, set this parameter to Enable.		

4.3.4.3 BG mode

Table 4-19 BG mode

Parameter name	Parameter	Correlative Command
BG mode	Wireless Standard	AT+WBGR
Description		
Used to specify the BG mode of the WIFI network, options include: ✧ B/G fixed mode ✧ B mode The default setting of system is B/G fixed mode, ordinarily user doesn’t need to modify this parameter.		

4.3.4.4 The maximum rate

Table 4-20 The maximum rate

Parameter name	Parameter	Correlative Command
The maximum rate	Data Rate	AT+WBGR
Description		
The maximum wireless sending rate, options include: 1M,2M,5.5M,11M,6M,9M,12M,18M,24M,36M,48M,54M When BG mode is chose to be B mode, options include only the first 4 items. The default setting of system is 36M, ordinarily user doesn’t need to modify this parameter when the use environment is harsh, and wireless signal is worse,		

<table>
<tr><td>user can modify this parameter to reduce the sending rate in order to improve the reliability of wireless transmission.</td></tr>
</table>

4.3.4.5 BSSID

Table 4-21 BSSID

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>BSSID</td><td>AP BSSID</td><td>AT+BSSID</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">Used to specify the BSSID address of WIFI network, options include:
✧ Auto
✧ Fixed,it needs to input BSSID address
The default setting of system is Auto, ordinarily user doesn’t need to modify this parameter. When join to WIFI network, module can detect BSSID address of the network according with SSID and join in. When several networks (APs create) with the same SSID is existed, in order to enhance network security, user can fix the target AP by modifying this parameter to fix BSSID address. Once the parameter is fixed, the module will never connect to the network without suited BSSID.</td></tr>
</table>

4.3.4.6 Channel

Table 4-22 Channel

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>Channel</td><td>Channel Number</td><td>AT+CHL</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">Used to specify the channel of WIFI network, options include:
✧ Auto
✧ Channel 1~14
The default setting of system is Auto, ordinarily user doesn’t need to modify this parameter. When join to WIFI network, the module will automatically scan all channels to detect the target network. The time module needs to scan each channel is 150ms,and the completion of all channel scan takes about 2s.In order to reduce the scanning time and improve networking speed, user can specify channel number through modifying this parameter. What should be noted, Once user set it to fixed channels, the module scans only the specified</td></tr>
</table>

channels, if the target AP has changed the channel number, module will never connect to the network successfully.

4.3.4.7 Auto Retry

Table 4-23 Auto Retry

Parameter name	Parameter	Correlative Command
Auto Retry	Auto Retry Count	AT+CHL

Description

This parameter is only effective in auto-work mode, it 's used to specify the auto retry number when networking is failed or network disconnects unnaturally, options include:

- ✧ Never
- ✧ Ever
- ✧ 1~254

The default setting of system is Ever

4.3.4.8 Wireless roam

Table 4-24 wireless roam

Parameter name	Parameter	Correlative Command
Wireless roam	Wireless Roam	AT+WARM

Description

Used to specify whether to enable the function of wireless roam or not.

The default setting of system is disabled. What should be noted, when the parameter of BSSID is set to fixed, wireless roam will become no effect.

4.3.4.9 Channel List

Table 4-25 Channel List

Parameter name	Parameter	Correlative Command
Channel List	Channel List	AT+CHLL

Description

Used to specify the wireless region settings, the ranges of the 2.4G frequency bands different countries and regions open is different, such as the United States is 1 ~ 11 channels, Europe is 1 to 13 channels ,and Japan is 1 to 14 channels.

The system default setting is 1~14 channels. ordinarily user doesn't need to modify this parameter. Another use of this parameter is reducing the time of scanning and networking by modifying the channel range. For example, we have known the AP may be connected to is in 1,6,11 channels, the channel list can be set only 1,6,11, so that the module will only scan these three channels in the process of networking, thus the purpose of shortening the networking time is reached.

Another should be noted is that parameter of channel has higher priority than the parameter of channel list, that is, when the parameter of channel is set to the specified channel, even if this channel is not included by the channel list, networking will still succeed .

4.3.5 Port parameters

4.3.5.1 Baud Rate

Table 4-26 Baud Rate

Parameter name	Parameter	Correlative Command
Baud Rate	Baud Rate	AT+UART
Description		
Baud rate setting of serial, options include: ✧ 1200~115200bps The default setting of system is 115200bps。		

4.3.5.2 Data Bits

Table 4-27 Data Bits

Parameter name	Parameter	Correlative Command
Data Bits	Data Bits	AT+UART
Description		
Length setting of serial data bits, options include: ✧ 8 bits ✧ 7 bits The default setting of system is 8 bits		

4.3.5.3 Stop Bits

Table 4-28 Stop Bits

Parameter name	Parameter	Correlative Command
Stop Bits	Stop Bits	AT+UART
Description		
Length setting of serial stop bits, options include: ✧ 1 bit ✧ 2 bits The default setting of system is 1 bit.		

4.3.5.4 Parity Bit

Table 4-29 Parity Bit

Parameter name	Parameter	Correlative Command
Parity Bit	Parity	AT+UART
Description		
Parity Bit setting of serial, options include: ✧ no parity ✧ odd parity ✧ even parity The default setting of system is no parity.		

4.3.6 Parameters of transparent mode

4.3.6.1 Auto framing length

Table 4-30 Auto framing length

Parameter name	Parameter	Correlative Command
Auto framing length	Data Trigger Length	AT+ATLT
Description		
When serial is in transparent transmission mode, and the data received reaches the length this parameter specifies, module will force to frame a network frame and trigger the sending process, the optional range is 64 ~ 1024 bytes. The default setting of system is 512 bytes.		

4.3.6.2 Auto framing period

Table 4-31 Auto framing period

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>Auto framing period</td><td>Data Trigger Timeout</td><td>AT+ATPT</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">When serial is in transparent transmission mode, the data received is less than the length of framing, if waiting time is more than this parameter specifies , module will force to frame a network frame and trigger the sending process. The timeout period of auto framing has a optional range of 100 ~ 10000ms, the minimum accuracy is 100ms. In addition, this setting must be less than the setting of escape time.
The default setting of system is 500ms.</td></tr>
</table>

4.3.6.3 Escape Character

Table 4-32 Escape Character

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>Escape Character</td><td>Escape Character</td><td>AT+ESPC</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">This parameter is specified the escape character used to exit the transparent transmission mode for serial, such as "+" , when system is in the state of detecting escape character, and the data receives is three and only three consecutive escape characters, it will exit the transparent transmission mode.
The default setting of system is 0x2B, that is characters "+" in ASCII.</td></tr>
</table>

4.3.6.4 Escape time

Table 4-33 Escape time

<table>
<tr><th>Parameter name</th><th>Parameter</th><th>Correlative Command</th></tr>
<tr><td>Escape time</td><td>Escape Trigger Period</td><td>AT+ESPT</td></tr>
<tr><th colspan="3">Description</th></tr>
<tr><td colspan="3">When serial is in transparent transmission mode, the time received no data is more than this parameter specifies, it will automatically detect the escape characters. Optional range is 100 ~ 10000ms, the minimum accuracy is 100ms.</td></tr>
</table>

In addition, the setting must be greater than the setting of auto framing period.

The default setting of system is 2000ms.

4.3.7 System parameters

4.3.7.1 System password

Table 4-34 System password

Parameter name	Parameter	Correlative Command
System password	Login Password	AT+PASS
Description		
The login password for accessing the module through WEB server or wireless configuration. The default setting of system is “000000”.		

4.3.7.2 WEB server

Table 4-35 WEB server

Parameter name	Parameter	Correlative Command
WEB Server	Web Server	AT+WEBS
Description		
Used to specify whether to enable the WEB server or not and the server port. The default setting of system is enabled,the default port is 80.		

4.3.7.3 Command Mode

Table 4-36 Command Mode

Parameter name	Parameter	Correlative Command
Command Mode	Command Mode	AT+CMDM
Description		
Used to specify the control protocol of the module in command mode, options include: ✧ AT+Instruction ✧ Compatible Protocol The default setting of system is AT+Instruction mode, ordinarily user doesn’t need to modify this parameter. The command mode of compatible protocol is used to be compatible with the control protocol of TLG09UA01/02		

products. If user wants to use this mode, please call for the Technical Support for more help.

4.3.7.4 GPIO1 mode

Table 4-37 GPIO1 mode

Parameter name	Parameter	Correlative Command
GPIO1 mode	GPIO Mode	AT+IOM
Description		
Used to specify the work mode of GPIO1,options include: ✧ System function ✧ Input ✧ Output The default setting of system is system function.		

4.4 Default setting

Table 4-38 default setting

parameter	value	description
Wireless setting		
SSID	"default"	The SSID of wireless network is “default”
Encryption mode	OPEN	The encryption mode of wireless network is open
Key format	-	
Key Index	-	
Key	-	
Network setting		
DHCP	Enable	Enable DHCP protocol to dynamically obtain IP address
IP address	-	
Subnet Mask	-	
Gateway address	-	
DNS server	-	
Work mode setting		

Auto-work mode	Enable	Enable the auto-work mode
Protocol type	TCP	Default connection: When it's set to TCP server,the default timeout is 120second
CS mode	Server	
Server address	-	
TCP connection timeout	120	
Advanced wireless setting		
Network mode	Infra	Network mode is Infrastructure
Create ADHOC when network does not exist	-	-
BG mode	B/G	Wireless mode is BG fixed
Maximum rate	36M	The Maximum sending rate is 36M
BSSID	Auto	Forbid to fix the BSSID address of wireless network
Channel	Auto	Detect the operating channel of wireless network automatically
Auto retry	255	Retry for ever automatically
Wireless roam	Disable	Forbid to do the wireless roam
Channel list	0x3fff	1~14 channels
Serial setting		
Baud rate	115200	The data format of serial is set to: Baud rate is 115200bps; 8 bits of data bits 1 bit of stop bits No parity of parity bit
Data bits	8 bits	
Stop bits	1 bit	
Parity bit	None	
The setting of transparent mode		
Auto framing length	512	The length is 512 bytes
Auto framing period	500ms	The period is 500ms
Escape character	0x2B	The character is 0x2B,that is "+" in ASCII

Escape time	2000ms	The period is 2000ms
System setting		
System password	"000000"	Login password of system is "000000"
WEB server	Enable	Enable WEB server,port is 80
Command mode	AT+	The system command is AT+Instruction set
GPIO1 mode	System	The setting of GPIO1is system function

4.5 Typical application examples

4.5.1 The networking of active serial device

4.5.1.1 Application scene

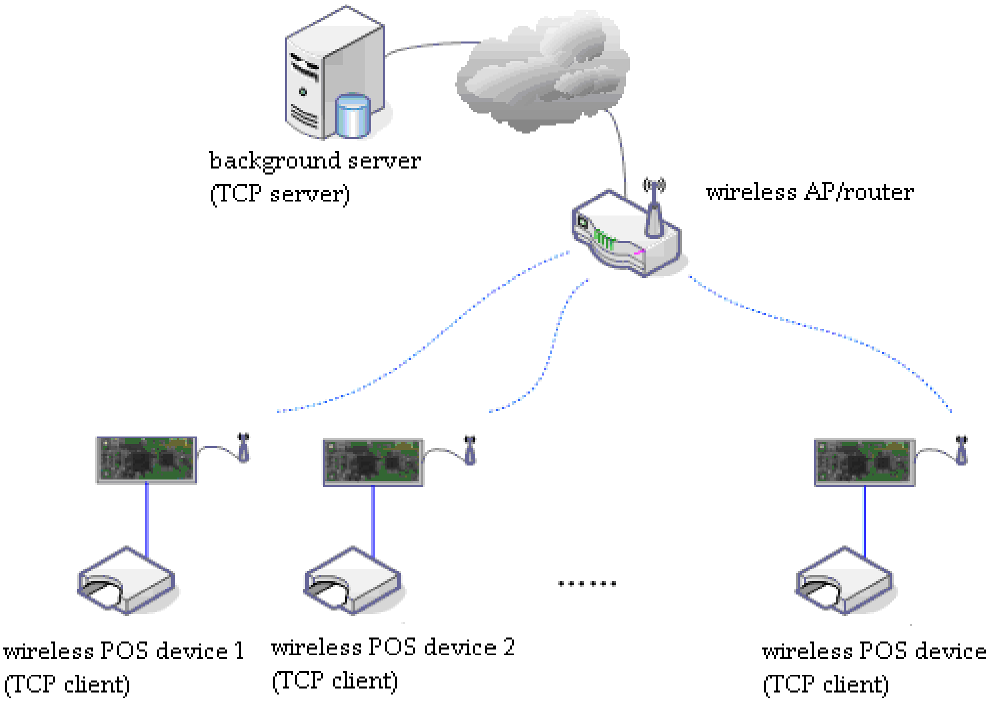


Figure 4-6 The networking of active serial device

The networking of active serial device means the device sponsors the networking and data exchange with background server (upload or download). Typical active-type equipment is such as wireless POS machine, after each credit card transaction and then begins to connect background server, and upload the transaction data. The topology of the networking of active serial device is as shown above. There into, the background server works as a TCP Server, the device connects to the network through wireless AP or router, and works as a TCP Client.

4.5.1.2 Reference Setting

Wireless POS machine X

- ✧ Wireless setting
  - ➢ SSID, encryption mode, key and so on(refer to the setting of wireless AP or router)
- ✧ Network setting
  - ➢ Enable DHCP
- ✧ Work mode setting
  - ➢ Enable auto-work mode
  - ➢ Protocol type: TCP
  - ➢ C/S mode: client
  - ➢ Server address: IP address of background server, such as 192.168.0.100
  - ➢ Port number: port number of background server, such as 6000

4.5.2 The networking of passive serial device

4.5.2.1 Application scene

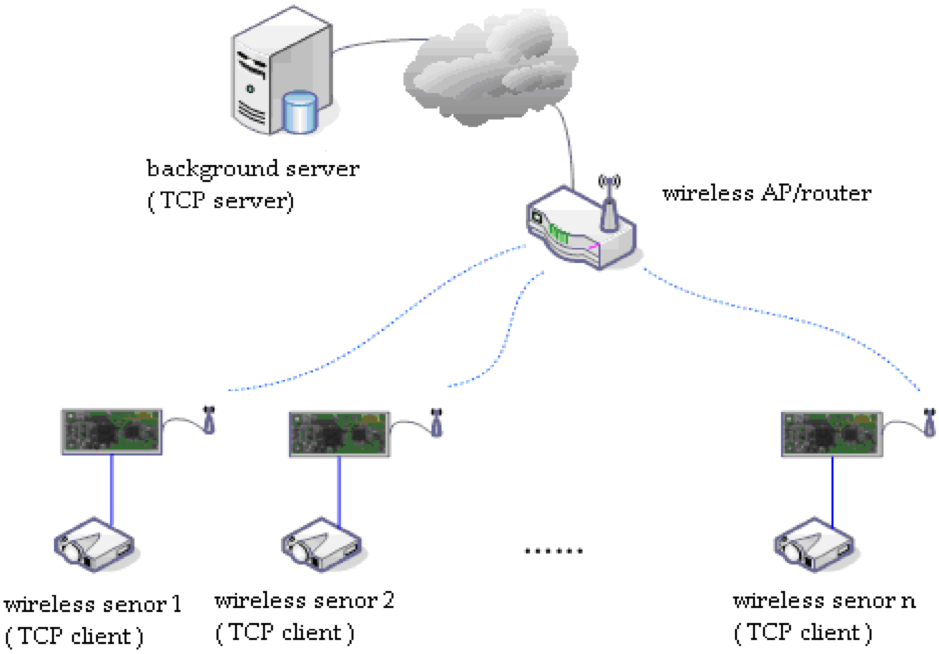


Figure4-7 The networking of passive serial device

The networking of passive serial device means, all devices in the system are passive to wait for a connecting, only the background server sponsors the networking and does request or data download. Typical applications are such as some wireless sensor network, each sensor terminals always are doing the real-time data collection, and the data collected does not immediately upload, but temporarily stores in the devices. The background servers periodically connect devices actively, and request to upload or download data. At this time, background server works as a TCP Client, while the device works as a TCP Server.

4.5.2.2 Reference setting

Wireless sensor X

✧ Wireless setting

➢ SSID, encryption mode, key and so on(refer to the setting of wireless AP or router)

✧ Network setting

➢ IP address: 192.168.0.X

  - Subnet mask: 255.255.255.0
  - Gateway address: 192.168.0.1
  - DNS address: 192.168.0.1
- Work mode setting
  - Enable auto-work mode
  - Protocol type: TCP
  - C/S mode: server
  - Port number:6000
  - Connection timeout:120s

4.5.3 The networking with broadcast method of serial device

4.5.3.1 Application scene

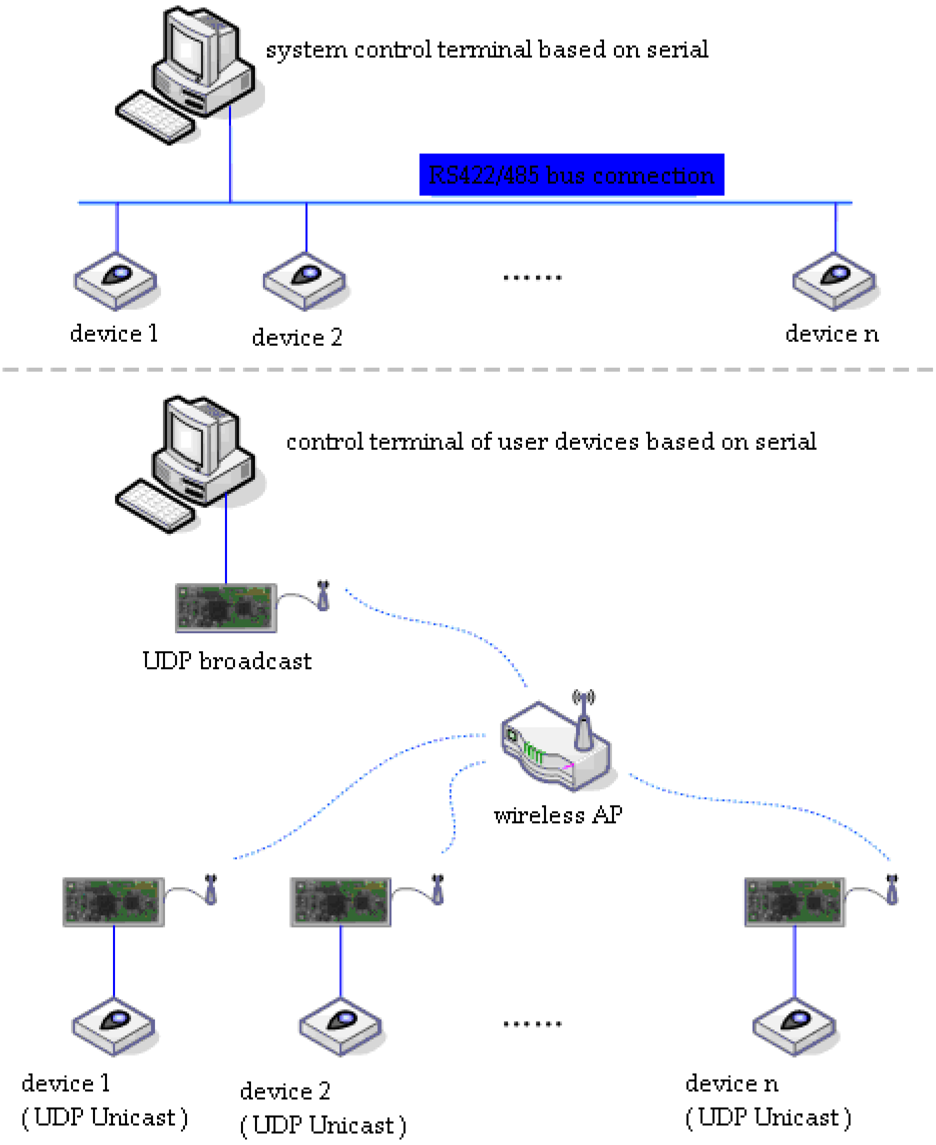


figure4-8 The networking with broadcast method of serial device

The networking with broadcast type of serial device is a networking mode based on UDP protocol. In the network, the host works in UDP broadcast mode, all devices works in UDP unicast mode. This method creates a passive network essentially. The most typical application is upgrading the wireless network for the traditional network based on the connection of RS422/485 bus. If user would use this connection mode, all the devices and their system control terminals in the original system needn't to get any changes of software, user directly replaces the original hardware connection of RS422/485 with this module, and it can be truly "plug and play".

4.5.3.2 Reference setting

Control terminal of device

- ✧ Wireless setting
  - ➢ SSID, encryption mode, key and so on(refer to the setting of wireless AP or router)
- ✧ Network setting
  - ➢ IP address: 192.168.0.Y
  - ➢ Subnet mask: 255.255.255.0
  - ➢ Gateway address: 192.168.0.1
  - ➢ DNS address: 192.168.0.1
- ✧ Work mode setting
  - ➢ Enable auto-work mode
  - ➢ Protocol type: UDP
  - ➢ C/S mode: broadcast
  - ➢ Port number: 6000
  - ➢ Connection timeout: 0

Device X

- ✧ Wireless setting
  - ➢ SSID, encryption mode, key and so on(refer to the setting of wireless AP or router)
- ✧ Network setting
  - ➢ IP address: 192.168.0.X
  - ➢ Subnet Mask: 255.255.255.0
  - ➢ Gateway address: 192.168.0.1
  - ➢ DNS address:192.168.0.1
- ✧ Work mode setting
  - ➢ Enable auto-work mode
  - ➢ Protocol type: UDP
  - ➢ C/S mode: unicast
  - ➢ Port number: 6000
  - ➢ Connection timeout: 0

4.5.4 Wireless virtual serial

4.5.4.1 Application scene

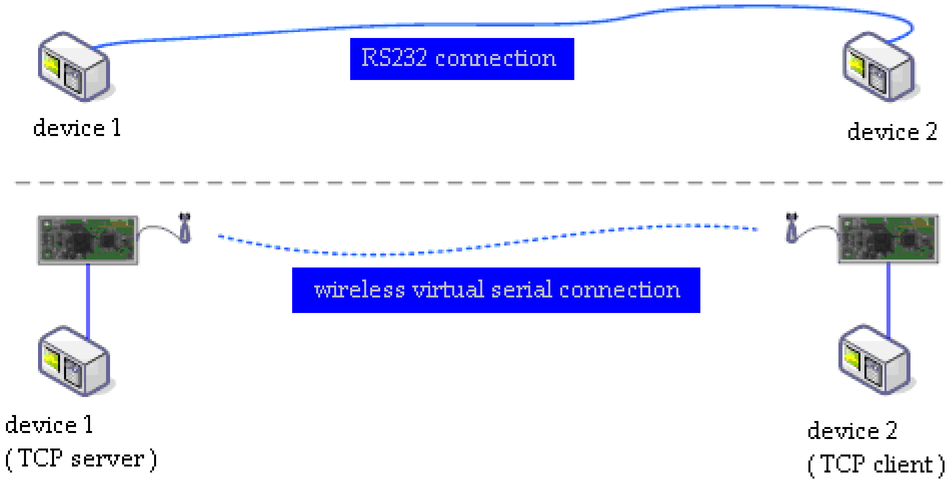


figure4-9 Wireless virtual serial

4.5.4.2 Reference setting

Device 1

✧ Wireless setting

- ➢ Network mode: ADHOC, and enable “Create ADHOC when network does not exist”
- ➢ SSID: my_ADHOC
- ➢ Encryption mode: open
- ➢ Others is default

✧ Network setting

- ➢ IP address: 192.168.0.1
- ➢ Subnet Mask: 255.255.255.0
- ➢ Gateway address: 192.168.0.1
- ➢ DNS address:192.168.0.1

✧ Work mode setting

- ➢ Enable auto-work mode
- ➢ Protocol type: TCP
- ➢ C/S mode: server
- ➢ Port number:6000

- Connection timeout:0

Device 2

- Wireless setting
  - Network mode: ADHOC
  - SSID: my_ADHOC
  - Encryption mode: open
  - Others is default
- Network setting
  - IP address: 192.168.0.2
  - Subnet Mask: 255.255.255.0
  - Gateway address: 192.168.0.1
  - DNS address:192.168.0.1
- Setting of work mode
  - Enable auto-work mode
  - Protocol type: TCP
  - C/S mode: client
  - Port number:6000
  - Server address:192.168.0.1

4.5.5 Multi-network connection mode

4.5.5.1 Application scene

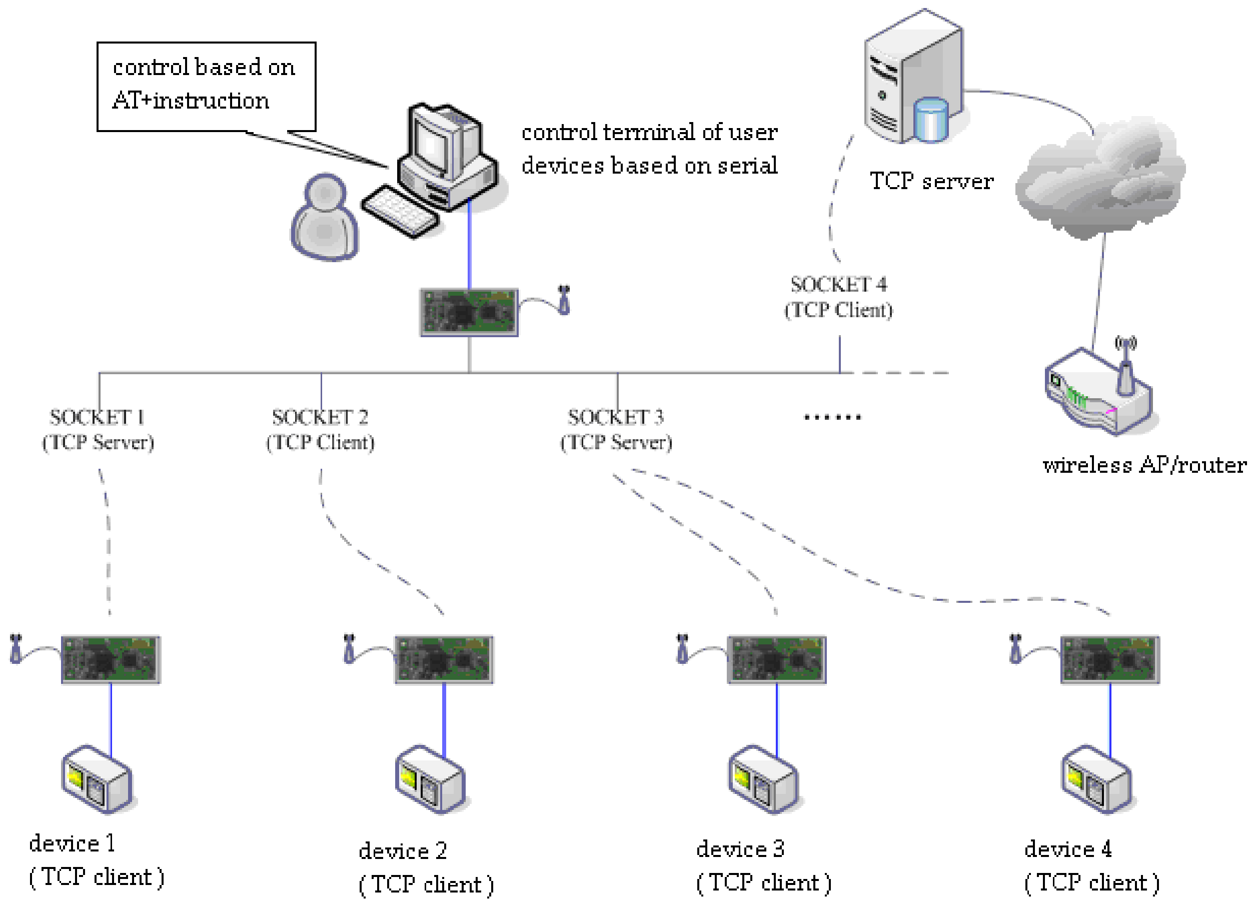


figure4-10 Multi-network connection mode

As shown above, it's the network topology diagram of multi-network connection based on this modules, this system does not be used for a particular application, it is not practical, but only be used to descript the function of this module as an analog system.

In the system above the module of device control terminal works in command mode, user inputs to the AT+Instruction to control it create four TCP connections, including 2 Clients and 2 Servers. There is a number of clients access to each server. Control terminal can communicate with all devices and server in the above figure through different socket connection.

4.5.5.2 Reference setting

Device control terminal

- ✧ Wireless setting
  - ➢ SSID, encryption mode, key and so on(refer to the setting of wireless AP or router)
- ✧ Network setting

- IP address: 192.168.0.X
- Subnet Mask: 255.255.255.0
- Gateway address: 192.168.0.1
- DNS address:192.168.0.1

- Work mode setting
  - Disable auto-work mode

5 Configuration management manual

5.1 Configuration through configuration management software

5.1.1 Introduction

We offer a configuration hypervisor that can manage M03 module expediently for configuration querying, config, function test etc. Its main function includes,

- module management
  - management through serial
  - management through wireless connection
- parameter configuration
  - modify/query module parameters
  - import/export parameters
  - modify parameters for a group of modules
  - resume to default setting
- function test
  - wireless network command test
  - socket command test
  - AT+ instruction test
- firmware upgrade
- system information query

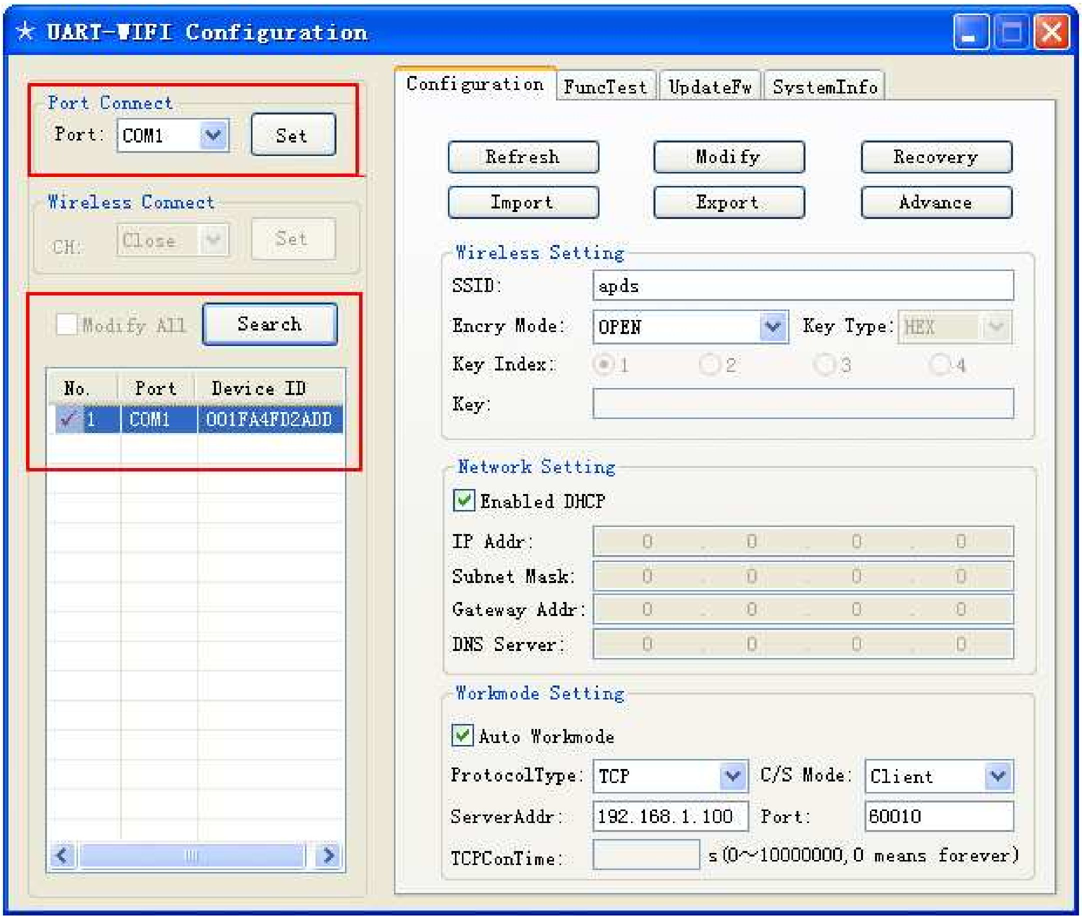
5.1.2 Module management

5.1.2.1 Management through serial connection

1 Connect the M03 module to the serial adapter, then turn it power-on.

2 Open the UART-WIFI configuration hypervisor, select the port number of connection from port list, you can select ‘auto’ unless you make sure.

3 Click ‘search module’, if the connection port is selected to ‘auto’ and the computer has more than one serial, it maybe expend a long time for searching, The following sketch map will show after search completed.



Port: COM1

CH: Close

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

SSID: apds

Encry Mode: OPEN　Key Type: HEX

Key Index: ● 1　○ 2　○ 3　○ 4

Key:

☑ Enabled DHCP

IP Addr: 0 . 0 . 0 . 0

Subnet Mask: 0 . 0 . 0 . 0

Gateway Addr: 0 . 0 . 0 . 0

DNS Server: 0 . 0 . 0 . 0

☑ Auto Workmode

ProtocolType: TCP　C/S Mode: Client

ServerAddr: 192.168.1.100　Port: 60010

TCPConTime: s (0~10000000, 0 means forever)

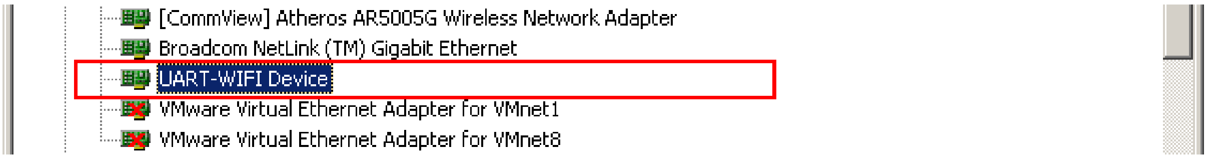
figure5-1 serial connection sketch map

5.1.2.2 Management through wireless connection

Note: Using this function needs to choose correct wireless adapter and install wireless driver correctly.

1 Plug the wireless adapter in computer, it’s shown as the figure 2-5.

2 Install wireless driver, the successful result is shown as the following sketch map.



[CommView] Atheros AR5005G Wireless Network Adapter
Broadcom NetLink (TM) Gigabit Ethernet
UART-WIFI Device
VMware Virtual Ethernet Adapter for VMnet1
VMware Virtual Ethernet Adapter for VMnet8

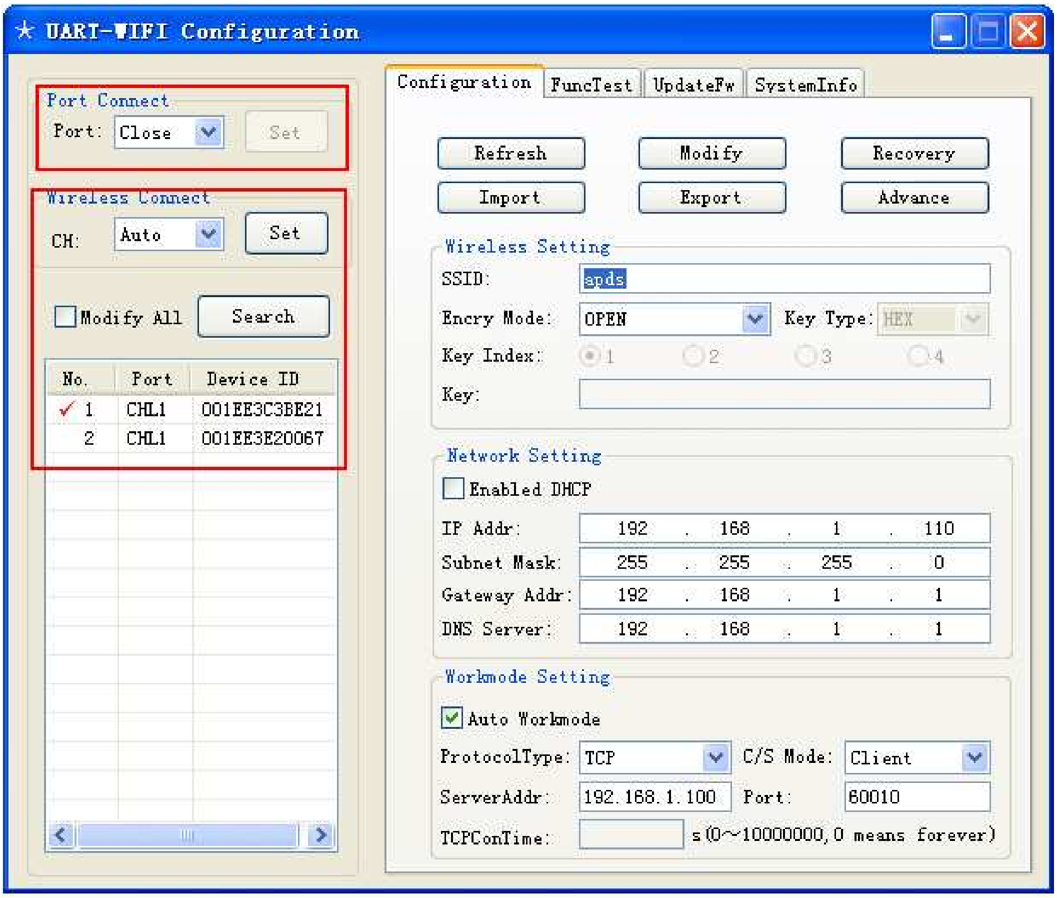
Figure5-2 Install wireless driver

3 Open the UART-WIFI configuration hypervisor, if the driver is installed successfully, setting frame of wireless connection will be in activation status.

4 Click 'setting' button, input system password (only the module of which the system password match with the setting can be scanned).

5 Select scan channel from channel list. It will scan all channels from 1 to 14 ,if 'auto' is selected.

6 Click 'search module', if channel is selected to 'auto', it will expend a long time to search, the completed result is shown as the following sketch map.



Port Connect
Port: Close

Wireless Connect
CH: Auto
□ Modify All

No.	Port	Device ID
✓ 1	CHL1	001EE3C3BE21
2	CHL1	001EE3E20067

Wireless Setting
SSID: apds
Encry Mode: OPEN Key Type: HEX
Key Index: ● 1 ○ 2 ○ 3 ○ 4
Key:

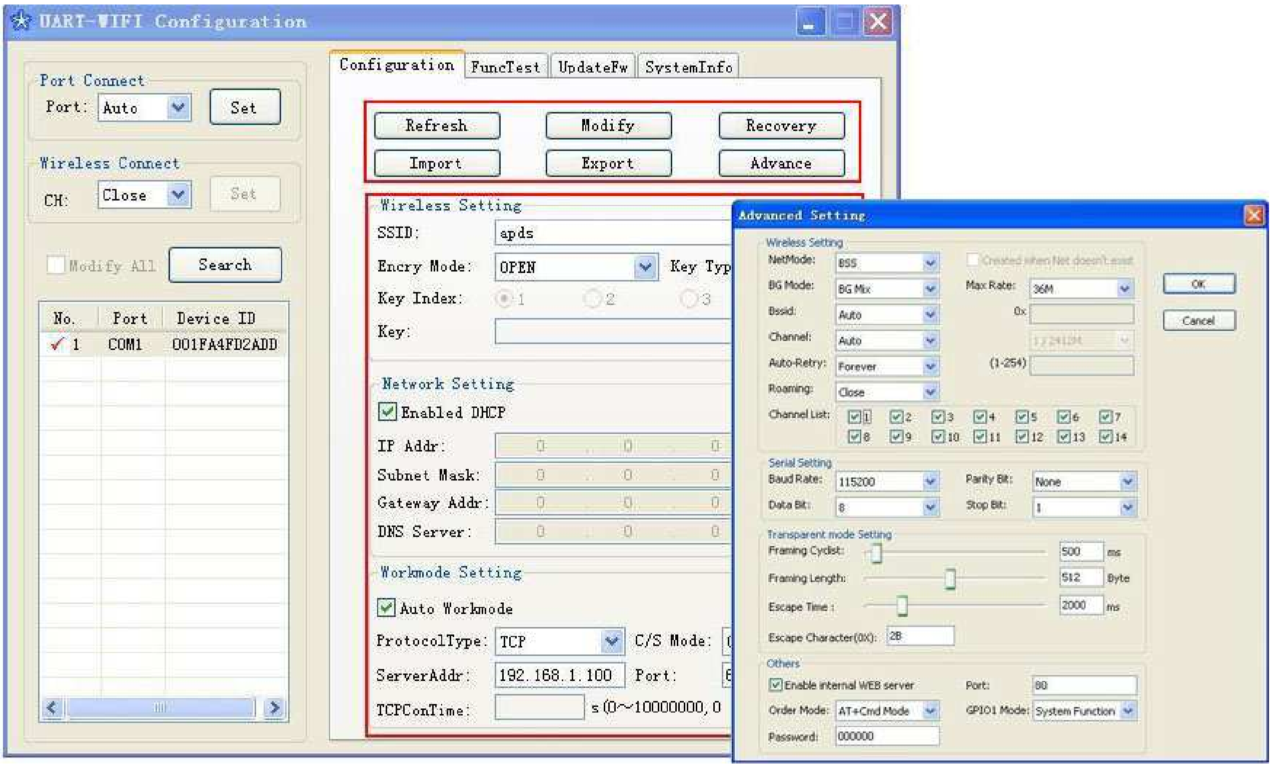
Network Setting
□ Enabled DHCP
IP Addr: 192 . 168 . 1 . 110
Subnet Mask: 255 . 255 . 255 . 0
Gateway Addr: 192 . 168 . 1 . 1
DNS Server: 192 . 168 . 1 . 1

Workmode Setting
☑ Auto Workmode
ProtocolType: TCP C/S Mode: Client
ServerAddr: 192.168.1.100 Port: 60010
TCPConTime: s(0~10000000,0 means forever)

Figure5-3 sketch map of wireless connection

5.1.3 Configuring parameter

This section offers the function of fast querying/modifying configuration parameter of module for user.



Port: Auto

CH: Close

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

Wireless Setting
SSID: apds
Encry Mode: OPEN
Key Typ
Key Index: ● 1 ○ 2 ○ 3
Key:

Network Setting
☑ Enabled DHCP
IP Addr: 0 . 0 . 0
Subnet Mask: 0 . 0 . 0
Gateway Addr: 0 . 0 . 0
DNS Server: 0 . 0 . 0

Workmode Setting
☑ Auto Workmode
ProtocolType: TCP
C/S Mode:
ServerAddr: 192.168.1.100
Port:
TCPConTime: s (0~10000000, 0

Advanced Setting

Wireless Setting
NetMode: BSS
□ Created when Net doesn't exist
BG Mode: BG Mix
Max Rate: 36M
Bssid: Auto
0x
Channel: Auto
Auto-Retry: Forever
(1-254)
Roaming: Close
Channel List: ☑1 ☑2 ☑3 ☑4 ☑5 ☑6 ☑7 ☑8 ☑9 ☑10 ☑11 ☑12 ☑13 ☑14

Serial Setting
Baud Rate: 115200
Parity Bit: None
Data Bit: 8
Stop Bit: 1

Transparent mode Setting
Framing Cyclist: 500 ms
Framing Length: 512 Byte
Escape Time : 2000 ms
Escape Character(0X): 2B

Others
☑ Enable internal WEB server
Port: 80
Order Mode: AT+Cmd Mode
GPIO1 Mode: System Function
Password: 000000

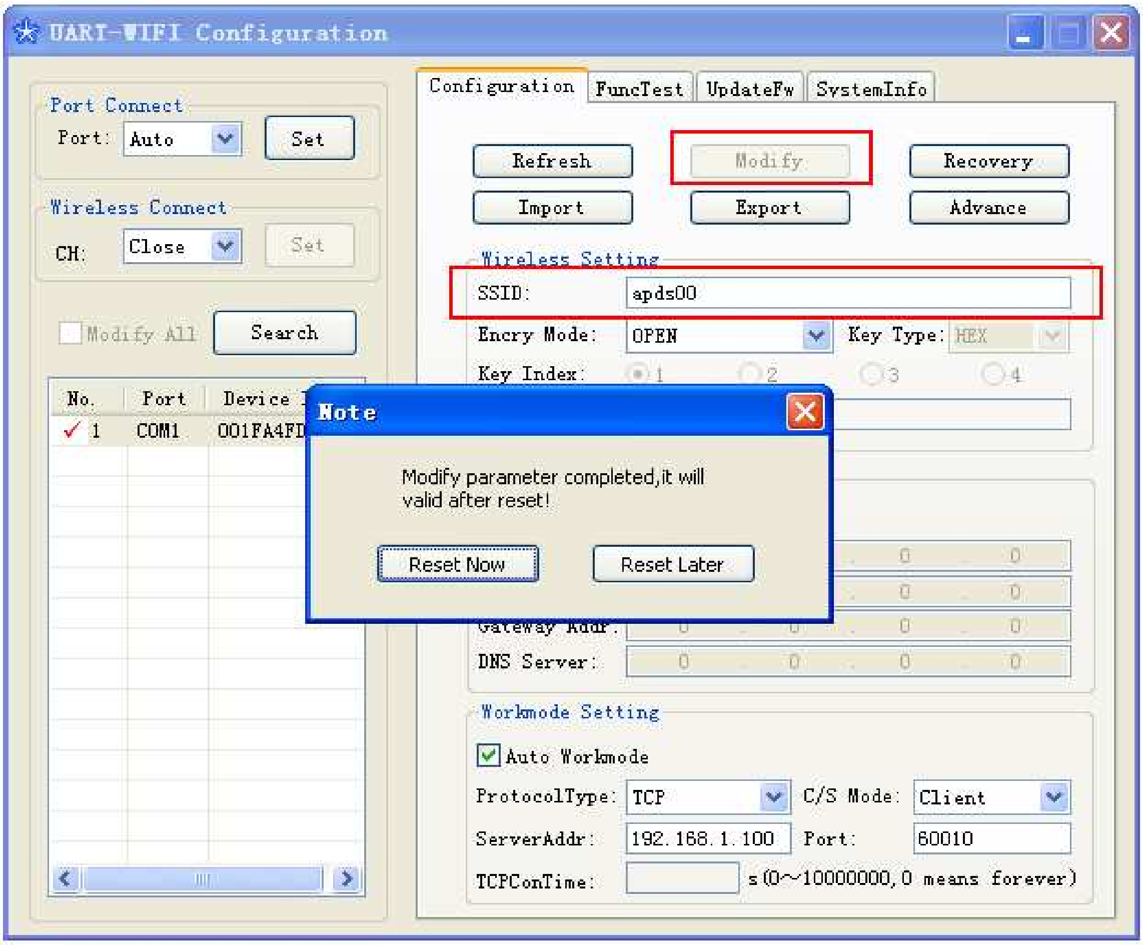
figure5-4 configure parameters

5.1.3.1 Refresh parameter

User can refresh the configuration parameter from wireless module and show in the display interface through clicking the 'refresh parameter' button.

5.1.3.2 Submit modification

User can click 'submit modification' button after modifying configuration parameter (including parameter in advanced setting) in the display interface to save the parameters into wireless module. New parameters will become effective until wireless module has been reset, user can select to reset at once or manually reset later in pop-up dialog box after modifying, it's shown as the following sketch map.



Port: Auto

CH: Close

□ Modify All

No.	Port	Device I
✓ 1	COM1	001FA4FD

SSID: apds00

Encry Mode: OPEN Key Type: HEX

Key Index: ● 1 ○ 2 ○ 3 ○ 4

Gateway Addr: 0 . 0 . 0 . 0

DNS Server: 0 . 0 . 0 . 0

☑ Auto Workmode

ProtocolType: TCP C/S Mode: Client

ServerAddr: 192.168.1.100 Port: 60010

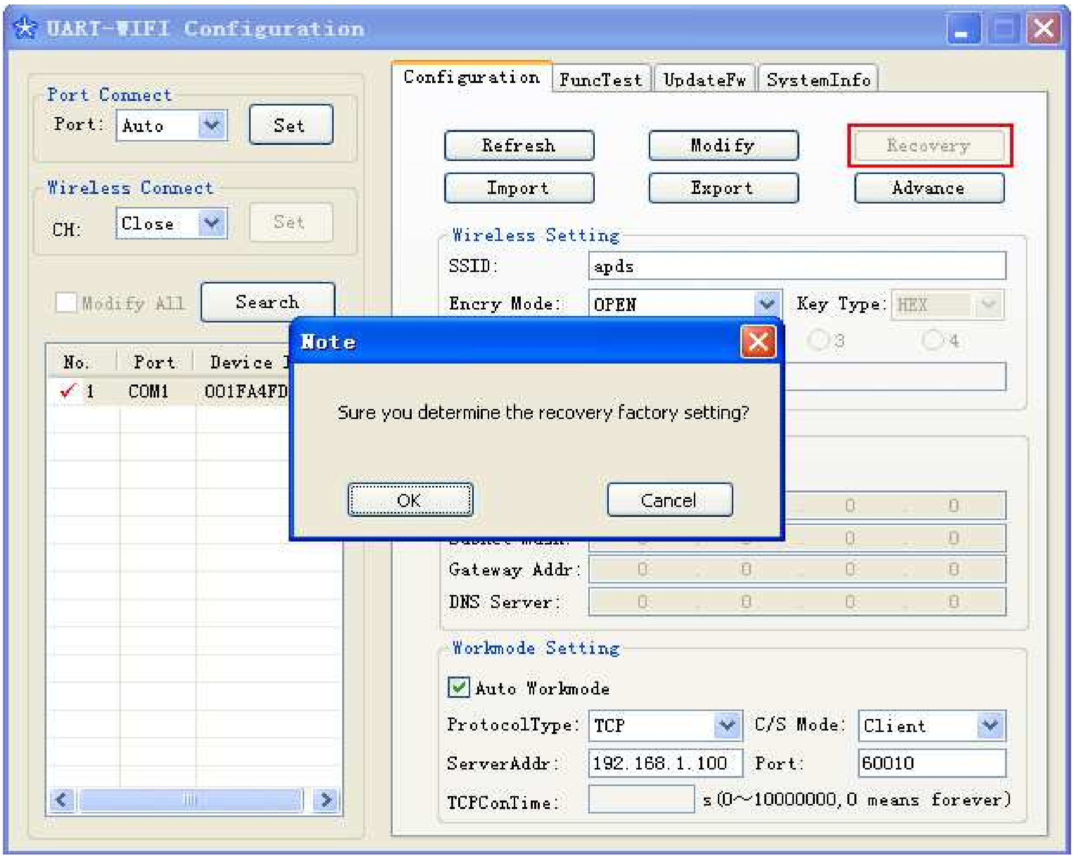
TCPConTime: s(0~10000000,0 means forever)

Modify parameter completed,it will valid after reset!

figure5-5 sketch map of submitting modification

5.1.3.3 Restore to factory setting

User clicks ‘’ button to restore the configuration parameters of the wireless module into factory status. After restoring, the factory setting becomes effect until the module has been reset.



Port: Auto

CH: Close

No.	Port	Device I
✓ 1	COM1	001FA4FD

Note

Sure you determine the recovery factory setting?

SSID: apds

Encry Mode: OPEN

Key Type: HEX

Gateway Addr: 0 . 0 . 0 . 0

DNS Server: 0 . 0 . 0 . 0

☑ Auto Workmode

ProtocolType: TCP

C/S Mode: Client

ServerAddr: 192.168.1.100

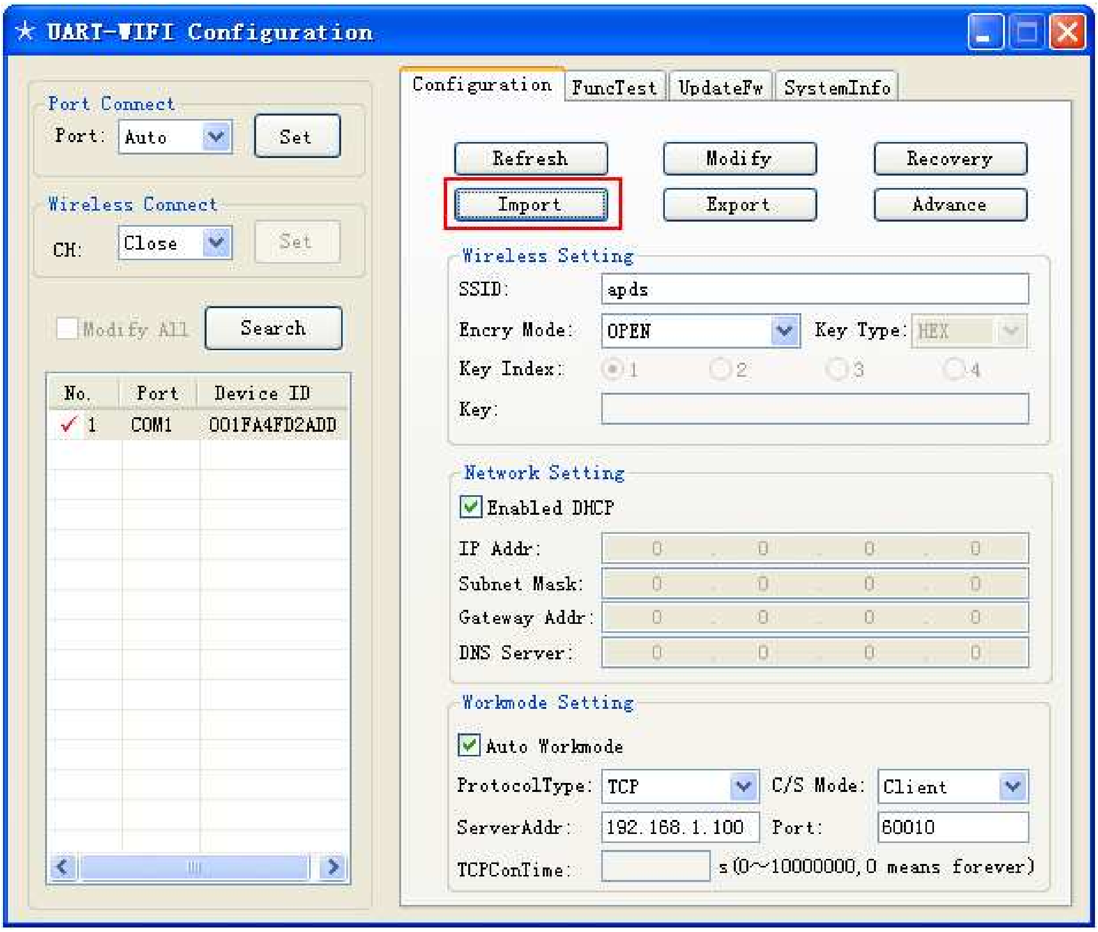
Port: 60010

TCPConTime: s(0~10000000,0 means forever)

figure5-6 sketch map of restoring to factory setting

5.1.3.4 Import/export parameters

User can save all configuration parameters in display interface to the specified configuration file through clicking the ‘export parameters’ button, and apply all parameter which are saved in configuration file through clicking ‘import parameter’ button. What should be noted is that, using import parameter function only imports parameters to the display interface, the imported parameters can be wrote in wireless module actually until clicking the ‘submit modification’.



Port: Auto

CH: Close

☐ Modify All

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

SSID: apds

Encry Mode: OPEN   Key Type: HEX

Key Index: ● 1 ○ 2 ○ 3 ○ 4

Key:

☑ Enabled DHCP

IP Addr: 0 . 0 . 0 . 0

Subnet Mask: 0 . 0 . 0 . 0

Gateway Addr: 0 . 0 . 0 . 0

DNS Server: 0 . 0 . 0 . 0

☑ Auto Workmode

ProtocolType: TCP   C/S Mode: Client

ServerAddr: 192.168.1.100   Port: 60010

TCPConTime: s (0~10000000, 0 means forever)

figure5-7 sketch map of Importing parameters

5.1.3.5 Group modification

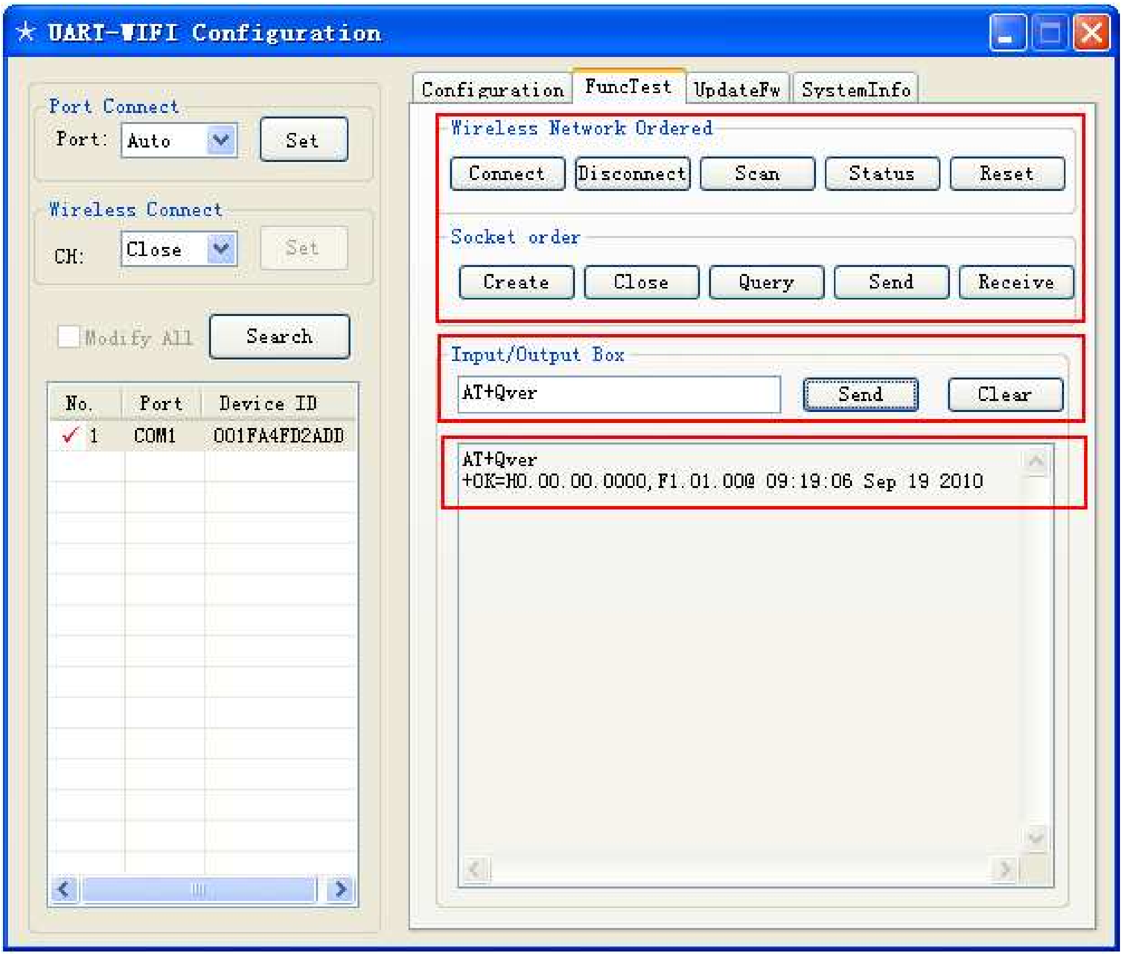
Group modification will be activated when configuration hypervisor has searched for more than one wireless module. If user selects the function the modified parameters will be applied to all of the wireless modules automatically through clicking ‘modify all’. This function can predigest operation steps and enhance work efficiency when a lot of modules need to be restored to the default configuration.

5.1.4 Function test

This section offers the function of fast testing AT+ instruction for user the user can jump over this section when using auto-work mode. Additionally this function cannot work while the module is configured through wireless connection.

User can send command through shortcut button of usual instruction or inputting AT+

instruction directly, it is shown as the following sketch map,



No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

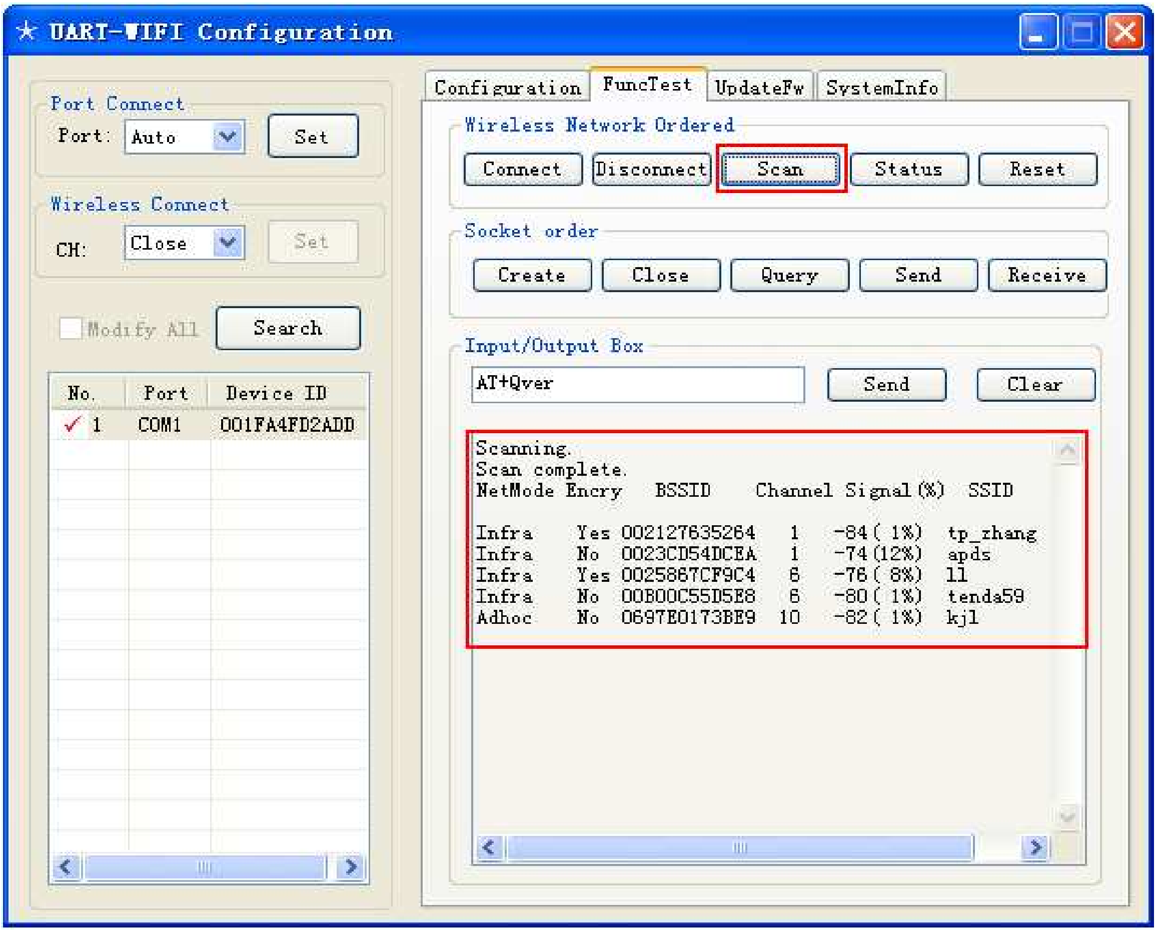
AT+Qver

```
AT+Qver
+OK=H0.00.00.0000,F1.01.00@ 09:19:06 Sep 19 2010
```

figure5-8 function test page

5.1.4.1 Network scanning

User can click ‘scan’ button to scan network as the following sketch map. Scan result will show in the following display frame such as network type, encryption, network MAC, channel, signal strength, etc.



Port: Auto

CH: Close

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

AT+Qver

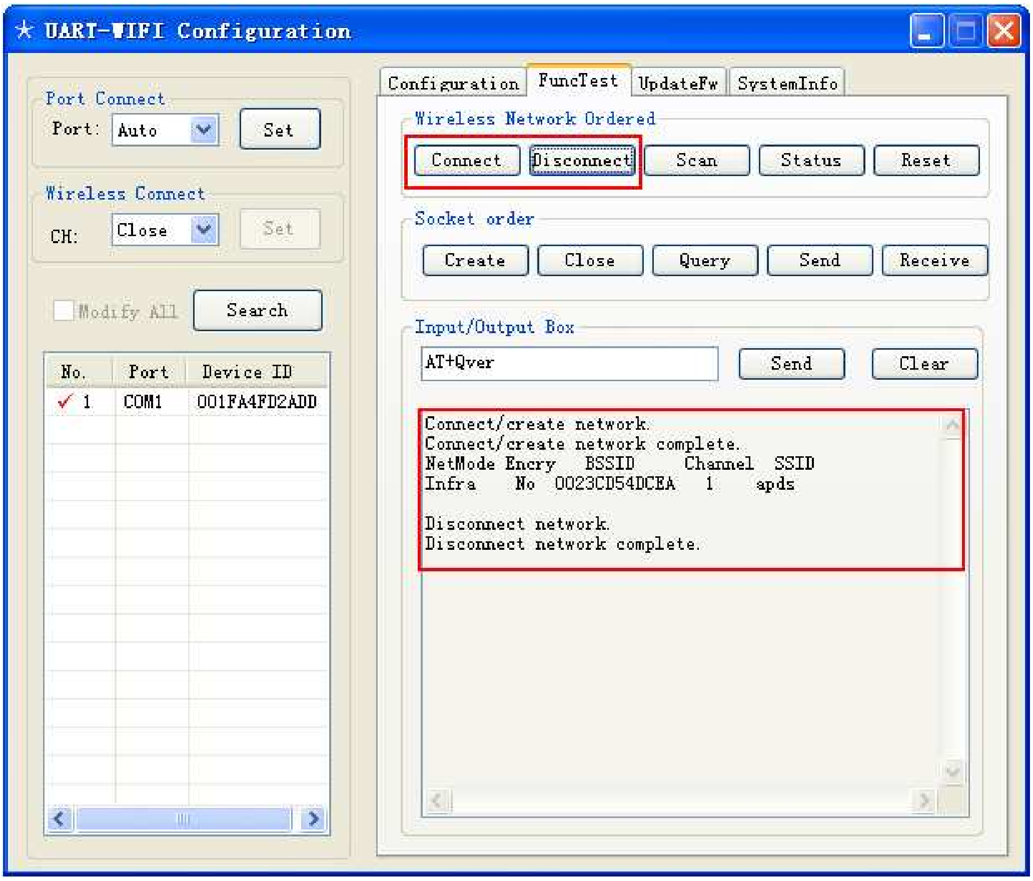
```
Scanning.
Scan complete.
NetMode Encry   BSSID    Channel Signal(%)  SSID

Infra    Yes 002127635264   1   -84( 1%)  tp_zhang
Infra    No  0023CD54DCEA   1   -74(12%)  apds
Infra    Yes 0025867CF9C4   6   -76( 8%)  11
Infra    No  00B00C55D5E8   6   -80( 1%)  tenda59
Adhoc    No  0697E0173BE9  10   -82( 1%)  kjl
```

figure5-9 network scanning

5.1.4.2 Join/Disconnect network

User can click the '' button to join or disconnect the wireless network as the following sketch map, the result will show in the following display frame.



Port: Auto

CH: Close

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

AT+Qver

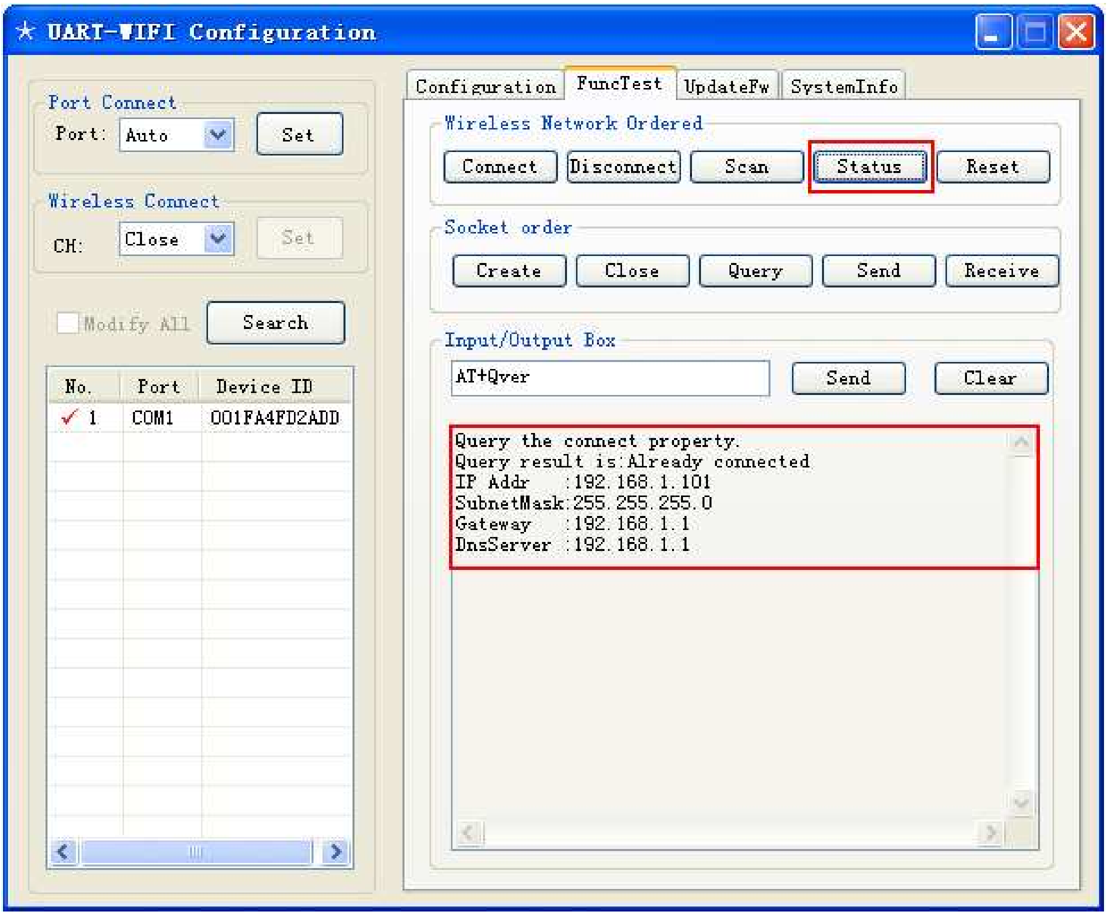
```
Connect/create network.
Connect/create network complete.
NetMode Encry   BSSID       Channel  SSID
Infra    No   0023CD54DCEA    1     apds

Disconnect network.
Disconnect network complete.
```

figure5-10 join/disconnect network

5.1.4.3 Query network status

User can click the ‘state’ button to query network connection status as following sketch map, the result will show in the following display frame.



No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

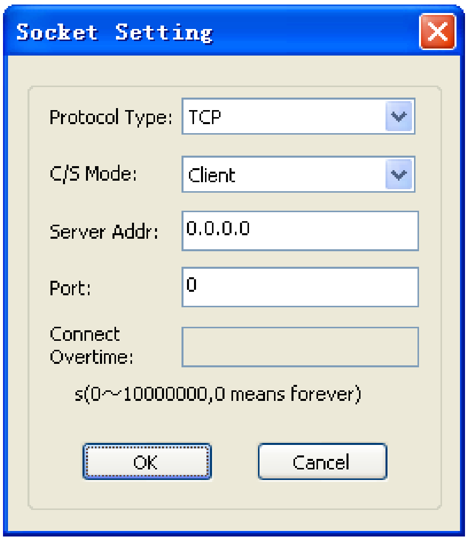
AT+Qver

```
Query the connect property.
Query result is:Already connected
IP Addr    :192.168.1.101
SubnetMask:255.255.255.0
Gateway    :192.168.1.1
DnsServer  :192.168.1.1
```

figure5-11 query network status

5.1.4.4 Create socket

User can click ‘create’ button to create socket as the following sketch map. Click the ‘Yes’ button after configured each parameter. It will return a socket number after creating successfully.



Protocol Type: TCP

C/S Mode: Client

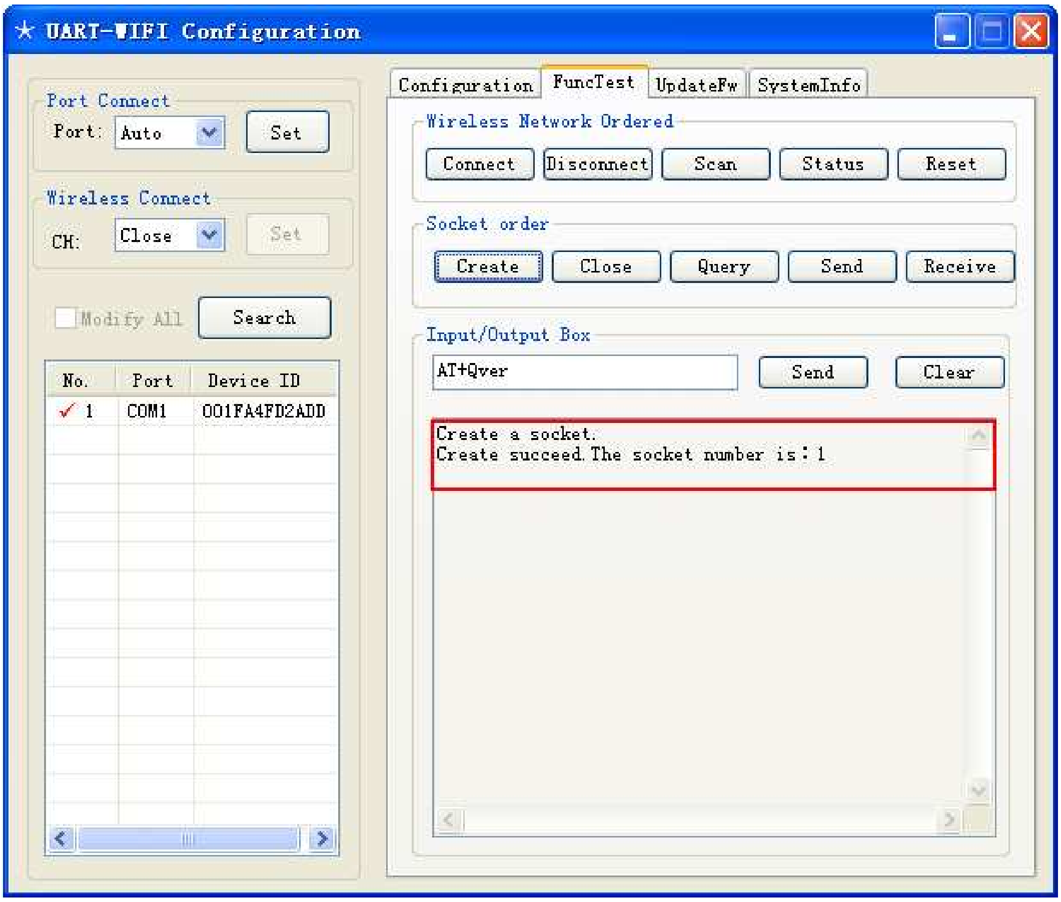
Server Addr: 0.0.0.0

Port: 0

Connect Overtime:

s(0~10000000,0 means forever)

figure5-12 interface of creating socket



No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

Input/Output Box: AT+Qver

```
Create a socket.
Create succeed.The socket number is:1
```

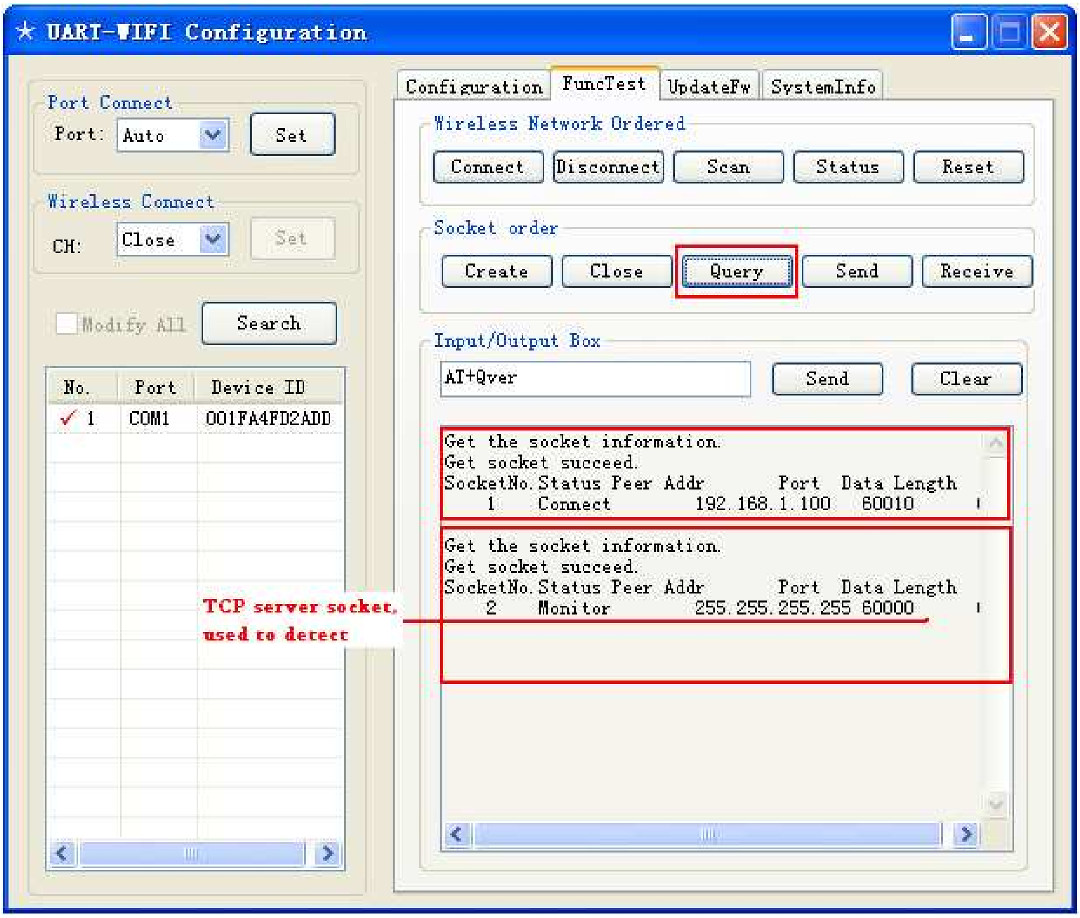
figure5-13 interface of the result of creating socket

5.1.4.5 close socket

User can delete the socket connection through clicking ‘close’ button and inputting the socket number which is expected to close.

5.1.4.6 query socket status

User can query socket status through clicking ‘query’ button and inputting the socket number which is wanted, the state of socket will return in the display frame after clicking ‘yes’ button.



Port: Auto

CH: Close

No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

AT+Qver

```
Get the socket information.
Get socket succeed.
SocketNo.Status Peer Addr       Port  Data Length
    1    Connect       192.168.1.100   60010

Get the socket information.
Get socket succeed.
SocketNo.Status Peer Addr       Port  Data Length
    2    Monitor       255.255.255.255 60000
```

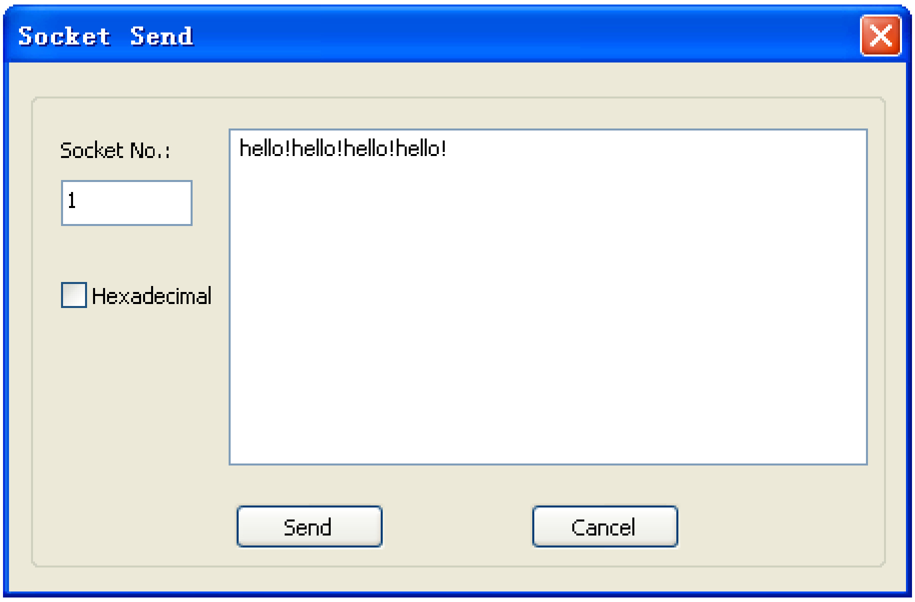
figure5-14 socket status querying

Description,

1、As shown above, the querying results return from two sockets are different. Because the second socket type is TCP server, which is in monitor state after creating successfully, its result does not only contain itself state, but also includes the connection information of Clients which are connecting to the server(these sockets are created by system automatically), as socket3 and socket4 shown in sketch map.

5.1.4.7 Socket sending

User can send data through socket by clicking ‘send’ button and inputting socket number(the socket of TCP server can’t be used to send or receive data directly, what is input should be the socket number of the connection between clients and the server)and data that need to send, the sending accomplishment information will return in the display frame after clicking 'yes' button.



1

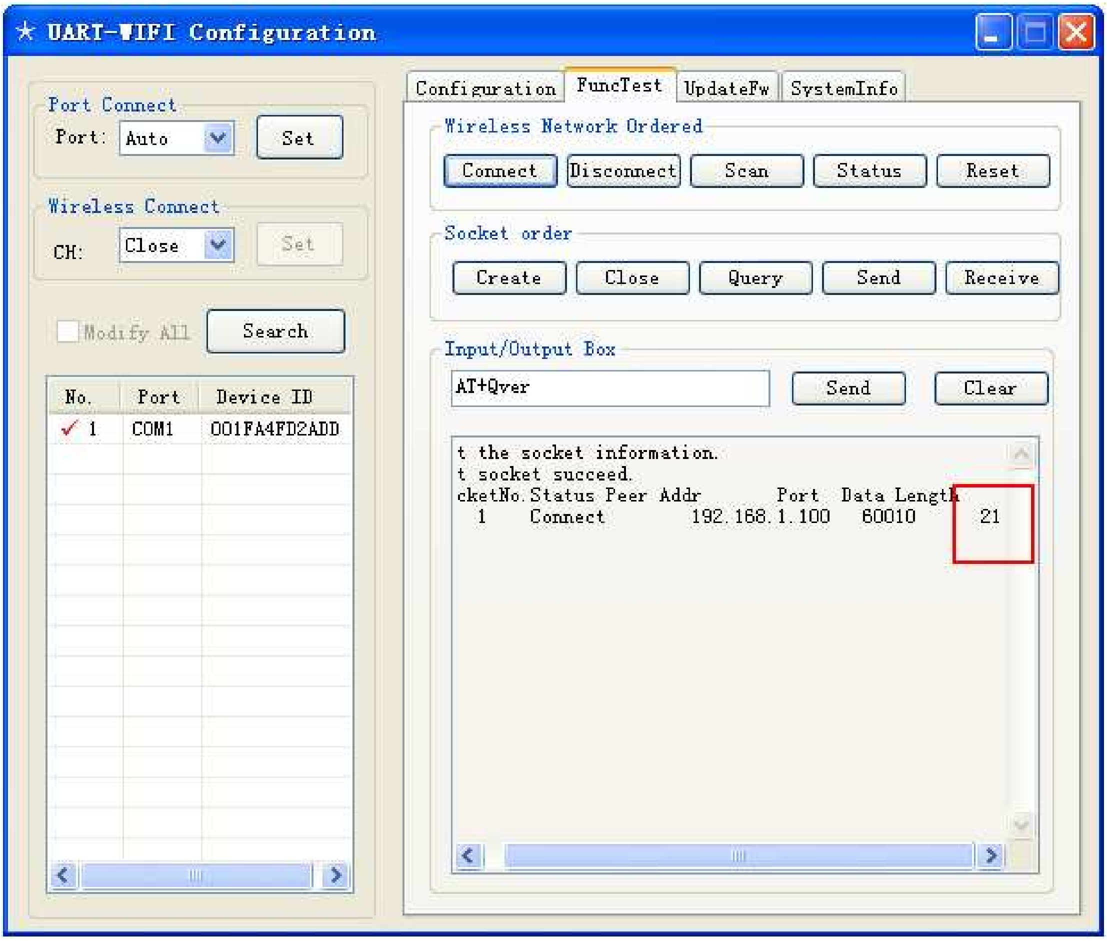
hello!hello!hello!hello!

figure5-15 send data through socket

5.1.4.8 Socket receiving

User can receive data through socket by clicking 'receive' button and inputting socket number (the socket of TCP server can't be used to send or receive data directly, what is input should be the socket number of the connection between clients and the server) and data size that expected to receive in pop-up dialog box, the data will show in the receive frame after clicking 'receive' button shown as figure5-18.

Before receiving data, please use 'query' command to confirm whether the socket receiver buffer has saved data in it at first.

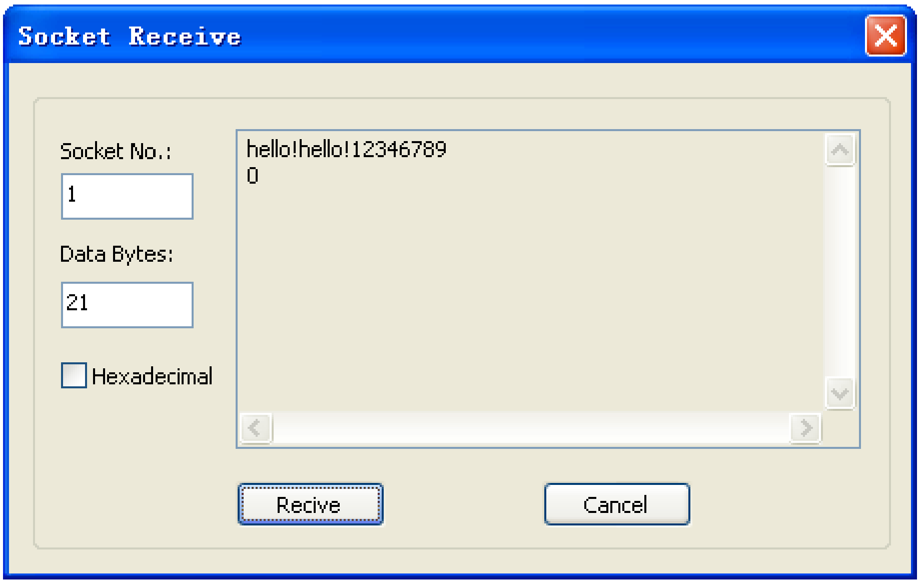


No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

AT+Qver

```
t the socket information.
t socket succeed.
cketNo.Status Peer Addr       Port  Data Length
  1    Connect        192.168.1.100   60010       21
```

figure5-16 query the receiver buffer



Socket No.: 1

Data Bytes: 21

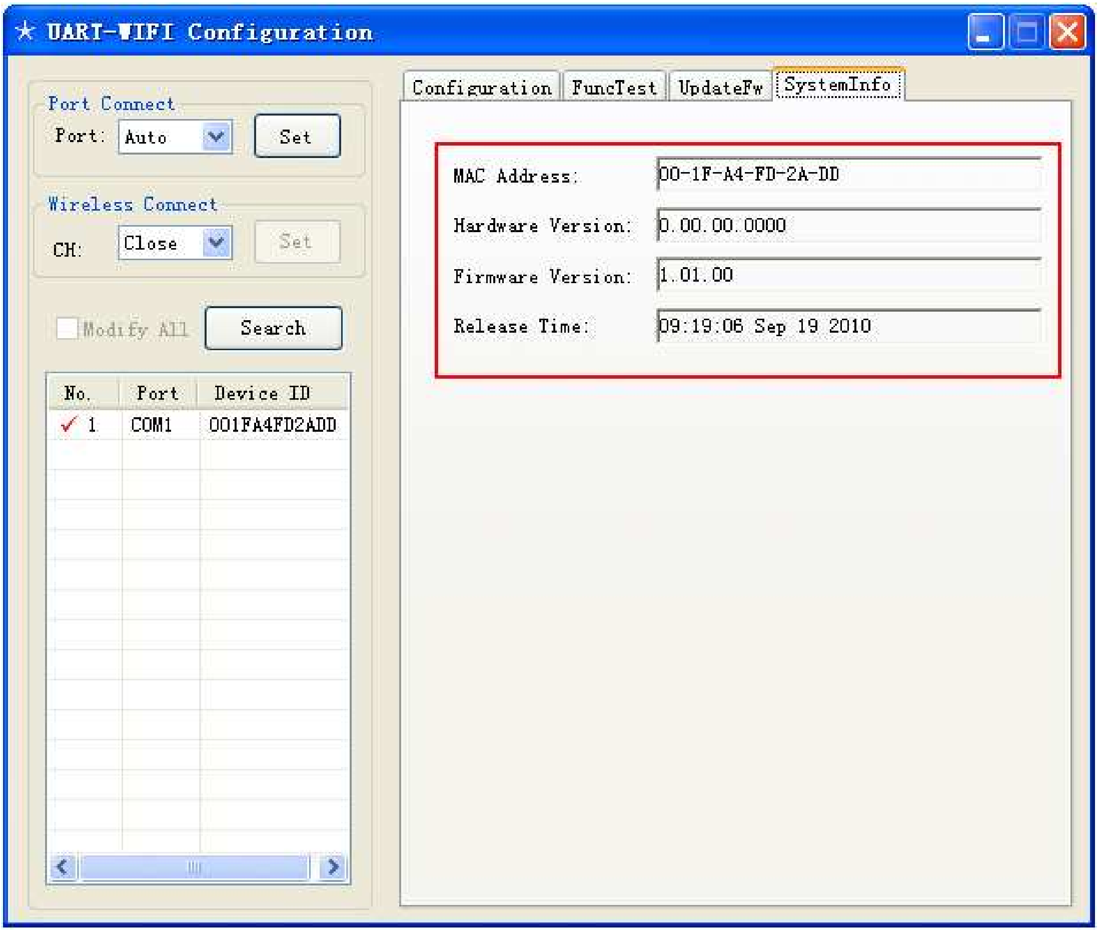
□ Hexadecimal

```
hello!hello!12346789
0
```

figure5-17 socket receiving

5.1.5 System information

User can query MAC address, hardware version information and firmware version information of the module in this section, the following sketch map is the show.



Port Connect
Port: Auto
Wireless Connect
CH: Close
□ Modify All

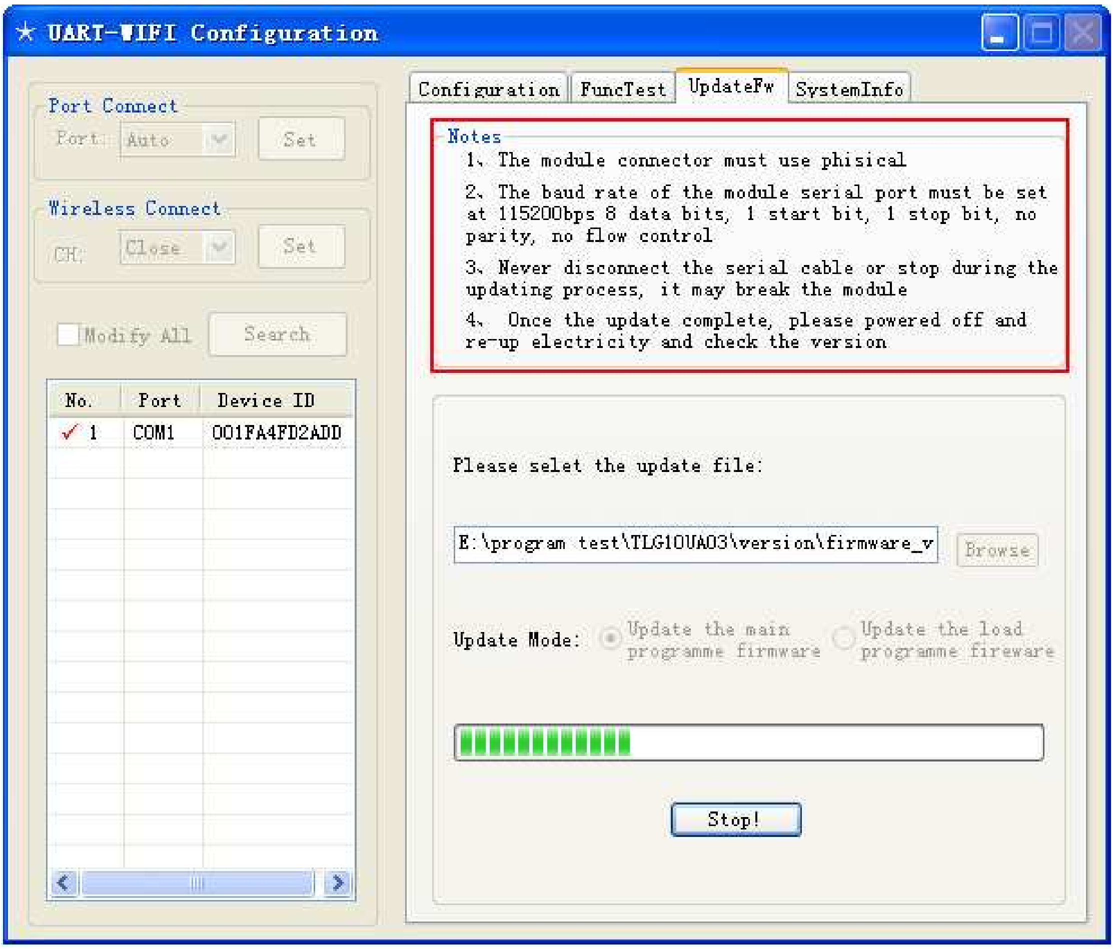
No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

MAC Address: 00-1F-A4-FD-2A-DD
Hardware Version: 0.00.00.0000
Firmware Version: 1.01.00
Release Time: 09:19:06 Sep 19 2010

figure5-18 system information

5.1.6 Firmware upgrade

This function will be activate when the module has connected to the wireless network. User can acquire the function of module firmware upgrade in this section, as the following sketch map shows (what should be noted is that, please read the notice carefully before upgrading, otherwise, failure will make the module destroyed)



No.	Port	Device ID
✓ 1	COM1	001FA4FD2ADD

Notes

1、The module connector must use phisical

2、The baud rate of the module serial port must be set at 115200bps 8 data bits, 1 start bit, 1 stop bit, no parity, no flow control

3、Never disconnect the serial cable or stop during the updating process, it may break the module

4、 Once the update complete, please powered off and re-up electricity and check the version

Please selet the update file:

E:\program test\TLG10UA03\version\firmware_v

Update Mode: ● Update the main programme firmware ○ Update the load programme fireware

figure5-19 firmware upgrade

5.2 Configuration through WEB server

WEB server has been embedded in this product, it can support the function of parameters configuration with IE browser, the method is as follow,

Notices,

1 Make sure the module has connected to the network successfully before using web page configuration;

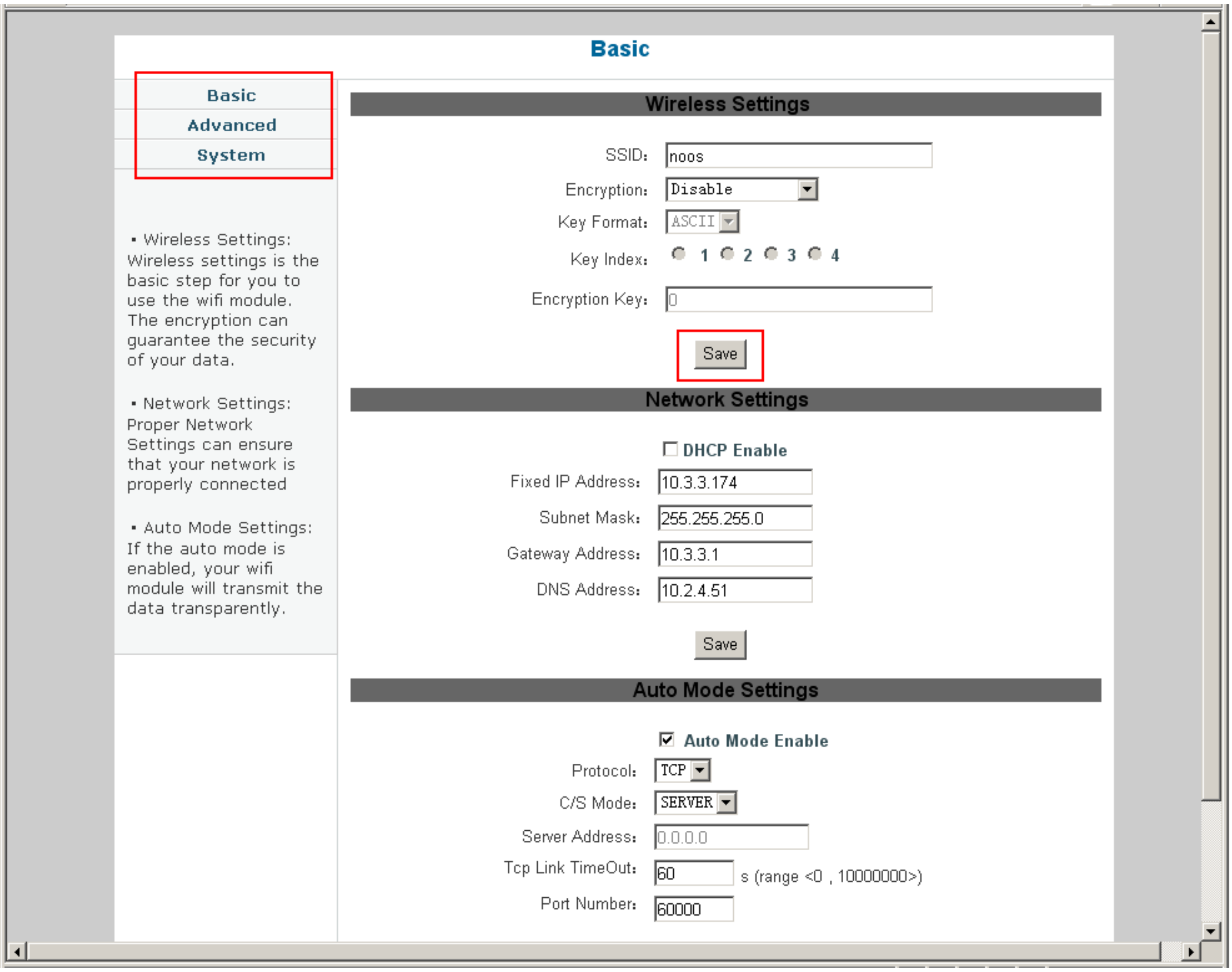
2 The default port number of the WEB server is 80,so it only needs to input address in address column of browser, if user has modified the web server port, user must input port number, otherwise the net cannot be opened, for example when the port number is set to 8080, the access address of the web server is http://192.168.1.20:8080

3 Please use Windows IE browser to access the server as well as you can.

5.2.1 Query/set configuration parameter

1 Open IE browser, connect after inputting IP address(and the port number sometimes) of wireless module in address column, the login interface will appear, input user name ‘admin’ and login password of module(default password is 000000).

2 The configuration web page is shown as the following sketch map, if user want to modify configuration parameters of wireless module, you need to click ‘save‘ button to submit the modification.



▪ Wireless Settings: Wireless settings is the basic step for you to use the wifi module. The encryption can guarantee the security of your data.

▪ Network Settings: Proper Network Settings can ensure that your network is properly connected

▪ Auto Mode Settings: If the auto mode is enabled, your wifi module will transmit the data transparently.

Wireless Settings

SSID: noos
Encryption: Disable
Key Format: ASCII
Key Index: ○ 1 ○ 2 ○ 3 ○ 4
Encryption Key: 0

Network Settings

□ DHCP Enable
Fixed IP Address: 10.3.3.174
Subnet Mask: 255.255.255.0
Gateway Address: 10.3.3.1
DNS Address: 10.2.4.51

Auto Mode Settings

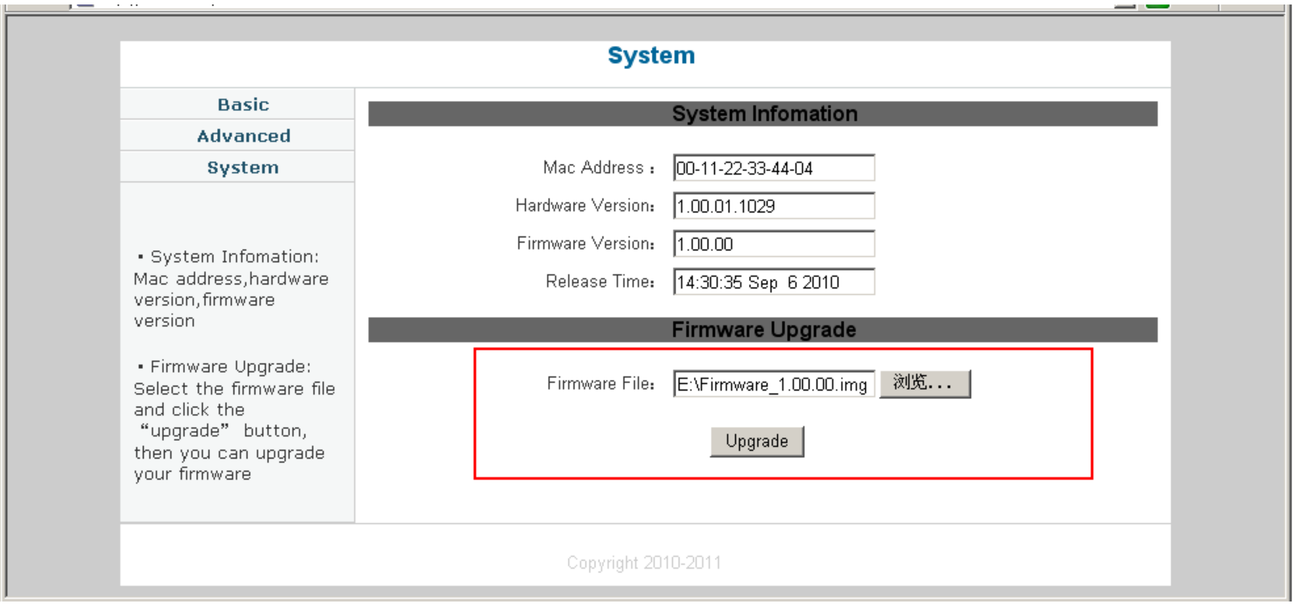
☑ Auto Mode Enable
Protocol: TCP
C/S Mode: SERVER
Server Address: 0.0.0.0
Tcp Link TimeOut: 60 s (range <0 , 10000000>)
Port Number: 60000

figure5-20 web page of parameter modification

3 After completing the submission, the wireless module will restart automatically, the web page will be also refreshed in ten seconds.

5.2.2 Firmware upgrade on line

The product supports firmware upgrade online through web page, it's shown as following sketch map,



System

▪ System Infomation: Mac address,hardware version,firmware version

▪ Firmware Upgrade: Select the firmware file and click the “upgrade” button, then you can upgrade your firmware

System Infomation

Mac Address : 00-11-22-33-44-04

Hardware Version: 1.00.01.1029

Firmware Version: 1.00.00

Release Time: 14:30:35 Sep 6 2010

Firmware Upgrade

Firmware File: E:\Firmware_1.00.00.img

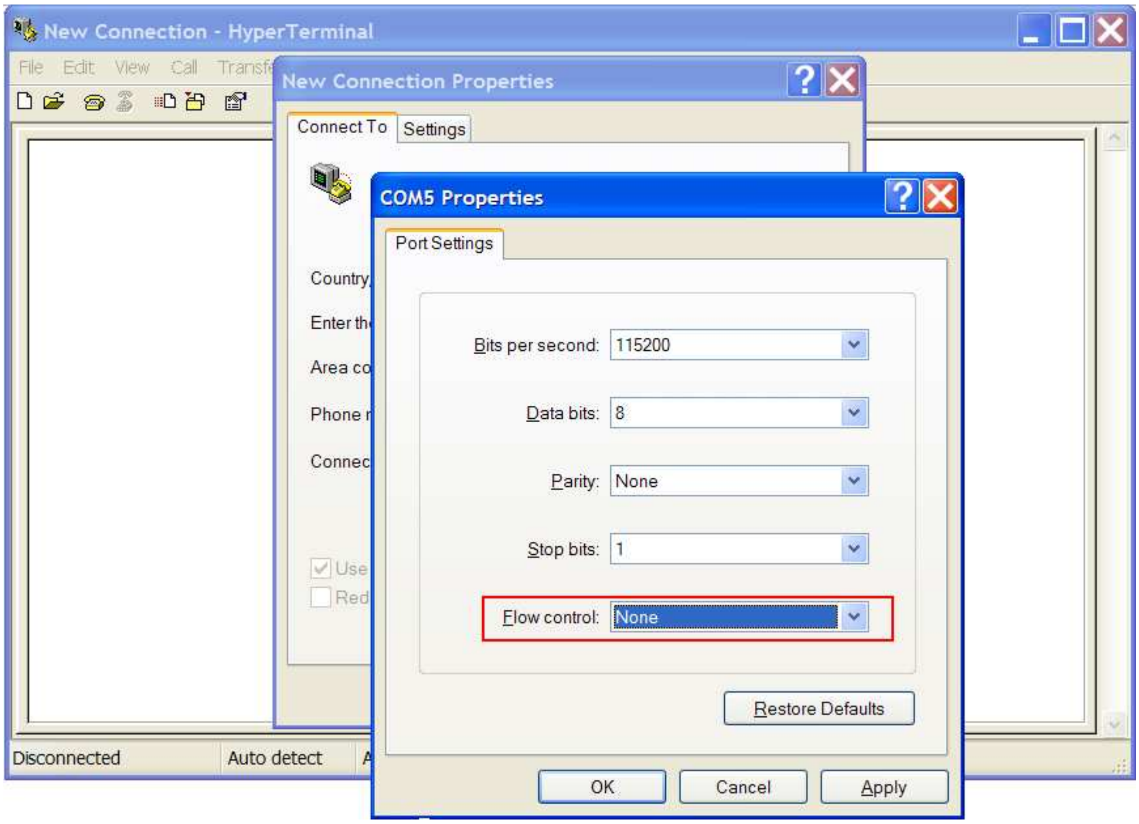
Copyright 2010-2011

figure5-21 online upgrade of firmware

5.3 Configuration through Hyper terminal program

User can ignore the section if only using the wireless module in auto-work mode. For the user who hopes to test the function of AT+Instruction, Windows Hyper Terminal which is embedded in Windows operation system can be used to input AT+ instruction directly for parameter configuration of wireless module and function test. What should be described is that, the serial debugging software (serial genius, serial master, etc) that referred in preamble all can be used for AT+Instruction test, this section just takes hyper terminal program as an example.

1. Open hyper terminal program (Windows >> start >> program >> accessories >> Communication >> Hyper terminal), input connection name and icon, select serial number and parameters (the same as the wireless module), what should be described is that the option of flow control must be set to none in command mode, the setting is shown as following sketch map.



Bits per second: 115200

Data bits: 8

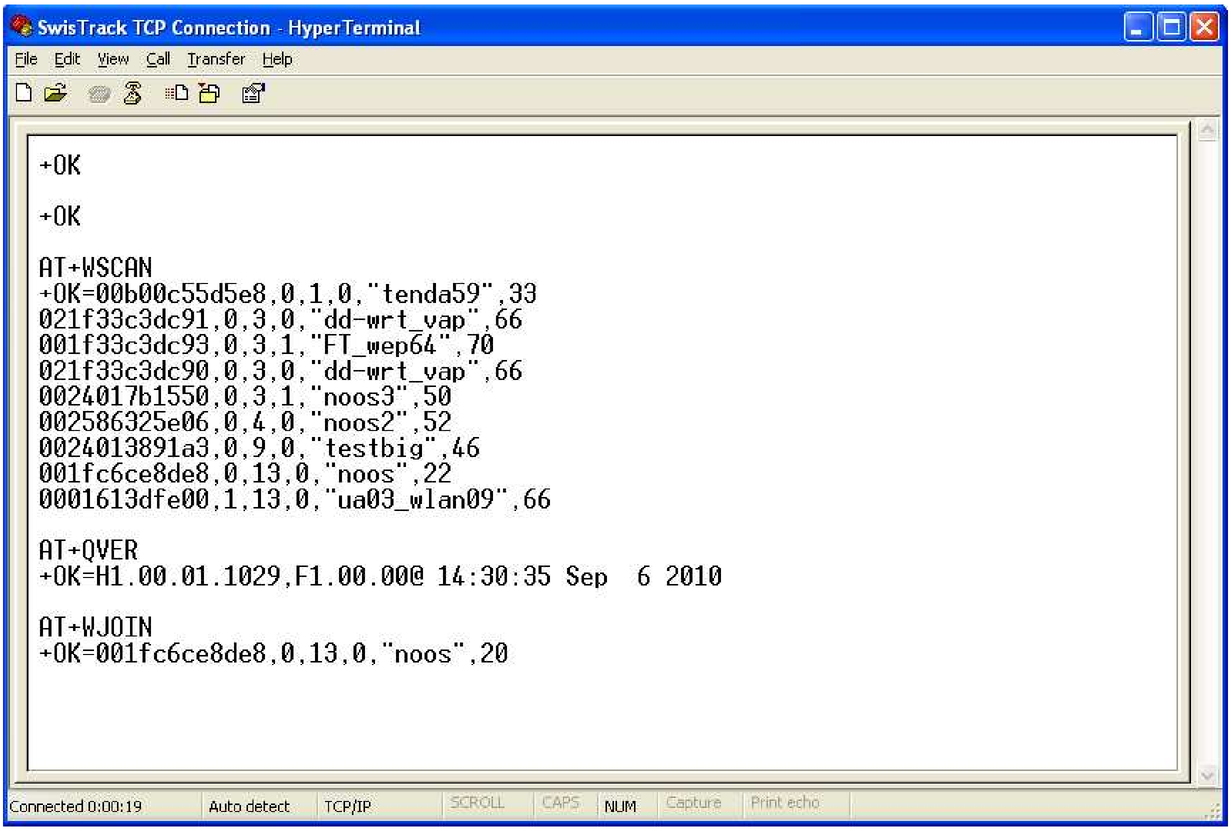
Parity: None

Stop bits: 1

Flow control: None

figure5-22 the configuration of super terminal

2. If the wireless module has started configuration mode (see the 4.2.1 section) or the work mode is set to command mode, please jump to step 5 directly, otherwise, it needs to make the module exiting the transparent transmission mode according to following approaches at first (refer to section 4.2.2.4).
3. Open a notepad to edit escape character string (the default escape character is'+') and save.
4. Wait for the time specified by the parameter of escape time (its default setting is 2 second), select 'send text file' in the 'transmit' menu, send escape character string file, the module return '+OK' information if success.
5. Input 'AT+E' instruction to open input return display (before it, the character that user input cannot be display in the super terminal interface).
6. Thus, user can use super terminal program to test the most of AT+ instruction set, for example, the command of network scan can be instead of inputting 'AT+WSCAN', it's shown as the following sketch map.


SwisTrack TCP Connection - HyperTerminal
File Edit View Call Transfer Help
Connected 0:00:19
Auto detect
TCP/IP
SCROLL
CAPS
NUM
Capture
Print echo

```
+OK

+OK

AT+WSCAN
+OK=00b00c55d5e8,0,1,0,"tenda59",33
021f33c3dc91,0,3,0,"dd-wrt_vap",66
001f33c3dc93,0,3,1,"FT_wep64",70
021f33c3dc90,0,3,0,"dd-wrt_vap",66
0024017b1550,0,3,1,"noos3",50
002586325e06,0,4,0,"noos2",52
0024013891a3,0,9,0,"testbig",46
001fc6ce8de8,0,13,0,"noos",22
0001613dfe00,1,13,0,"ua03_wlan09",66

AT+QVER
+OK=H1.00.01.1029,F1.00.00@ 14:30:35 Sep  6 2010

AT+WJOIN
+OK=001fc6ce8de8,0,13,0,"noos",20
```

figure5-23 instruction test

6 AT+Instruction Control Protocol

User can ignore this chapter if only using auto-work mode.

6.1 Syntax Introduction

This module uses AT+Instruction protocol as user control protocol. AT+Instruction protocol is based on the instruction of ASCII command style, The description of syntax format and management process is as follow.

6.1.1 Syntax Format

■ Format Description

< > means the parts must be included

[ ] means the optional part

■ Command Message

AT+<CMD>[op][para1],[para2], [para3] ,[para4]…<CR>

'AT+' means the leader of Command message

'CMD' means command string

'[op]' means the symbol of Command operator, when the command requires parameters, it can specify the operation type of parameters, it includes,

'=' means the leader symbol of parameters or returns

'=!' means to synchronize the modified parameter to flash in the command of parameters setting type

'=?' means to query the current setting in the command of parameters setting type

<CR> means enter, it's 0x0d in ASCII

■ Response message

+<RSP>[op][para1],[para2], [para3] ,[para4]…<CR><LF><CR><LF>

'+' means the leader of response message

RSP means response string

'OK' means success

'ERR' means fail

<CR> means enter, it's 0x0d in ASCII

<LF> means newline, it's 0x0a in ASCII

- Data Type

  >> String is enveloped with double quotation marks, but its content does not include the quotation mark, such as "this is a string".

  >> Dec means number in decimals, such as 10.

  >> Hex means number in hexadecimal, such as a.

  >> IP means IP address string, such as 192.168.0.1.

  >> MAC means MAC address, it's formed with 12 hexadecimal numbers, such as 001EE3A80102.

6.1.1.1 Process Flow

AT+Instruction protocol uses the form of command+response, most of instructions need a response message after the receiver has processed the instruction ,if the receiver receive a new command acquire in the process of processing the previous command, it will throw the command away stealthily without any response message, the process is shown as following figure.

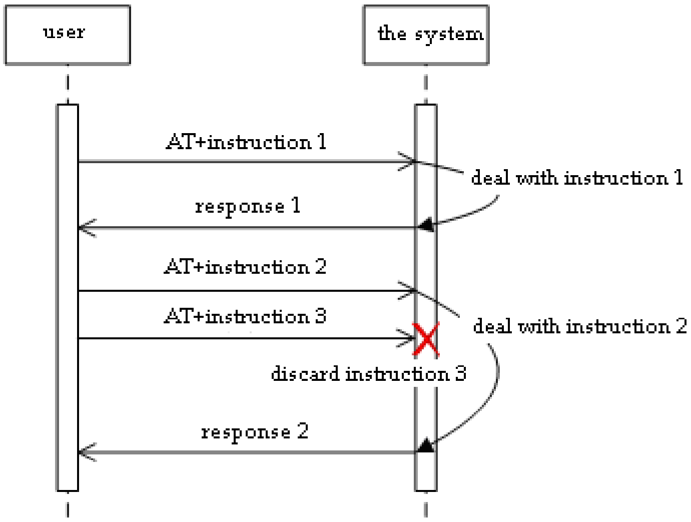


Figure6-1 Process flow of AT Instruction

Some special commands, such as AT+SKSND and AT+SKRCV, need to transmit binary data behind command or response, at this moment, data receiver becomes into diaphanous transmission status provisionally, and begins to receive binary numbers flow, until it has received the data, of which length is prescribed in the <SIZE> field of command or message, or waits for timeout, then it exits transparent transmission mode, the flow is shown as follow,

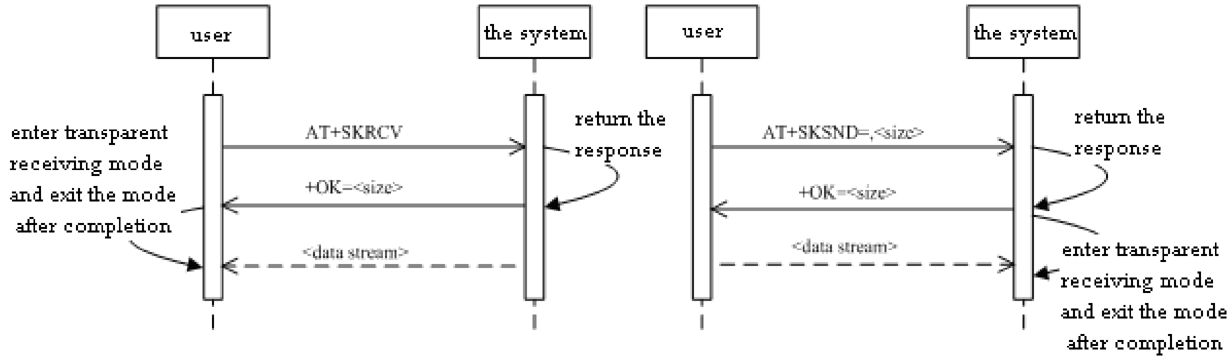


figure6-2 AT+Instruction special process flow

6.1.1.2 Format Examples

Example 1: responding success message

```
AT+
+OK
```

Example 2: responding failed message

```
AT+WJOIN
+ERR=-10
```

Example 3: Using input parameter

```
AT+UART=9600,1,1,0
+OK
```

Example 4: Using the symbol <!>

```
AT+ATPT=!500
+OK
```

Example 5:Using the symbol <?>

```
AT+ATPT=?
+OK=500
```

6.1.1.3 Error Code

Table 6-1 Error Code

Value	meanings
-1	Ineffective Command Format
-2	Non supported
-3	Ineffective Operation Symbol
-4	Ineffective Parameter
-5	Not Permitted
-6	Memory Lack
-7	FLASH Error
-10	Join Failed
-11	No Available socket
-12	Ineffective Socket
-13	Socket Connect Failed
-100	Undefined

6.2 Instruction Set

6.2.1 Instruction List

Table 6-2 AT+Instruction list

name	use
(null)	Null
ATLT	Set or query data length of automatic framing
ATM	Set or query work mode of module
ATPT	Set or query period of automatic framing
ATRM	Set or query connection message of socket module creates automatically in auto-work mode
BSSID	Set or query BSSID address of target AP
CHL	Set or query target wireless channel number

CHLL	Set or query wireless channel list
CMDM	Set or query default command mode of system
E	Switch serial character to show back
ENCRY	Set or query security mode of wireless network
ENTM	Set module into transparent transmission mode
ENTS	Enter sleeping mode
ESPC	Set or query escape character
ESPT	Set or query escape time
IOC	GPIO Control
IOM	Set or query GPIO mode
KEY	Set or query key of wireless network
LKSTT	Query network connection state
NIP	Set or query local IP address
PASS	Set or query system password
PMTF	Update parameters in memory to Flash
QMAC	Query physical address
QVER	Query version
RSTF	Return to manufacturer setting
SKCLS	Close socket connection
SKCT	Create socket connection
SKRCV	Receive data through socket connection
SKSDF	Set default sending socket connection
SKSND	send data through socket connection
SKSTT	query socket connection state
SSID	Set or query SSID
UART	Set or Query serial data format
WARC	Set or query automatic retry times in auto-work mode
WARM	Set or query wireless roam
WATC	Set or query whether to create ADHOC network automatically

WBGR	Set or query wireless BG mode and maximum send rate
WEBS	Set or query web service
WJOIN	Join in or create network
WLEAV	Disconnect network
WPRT	Set or query wireless mode
WSCAN	Scan for network
Z	Reset

6.2.2 Network Control Type

6.2.2.1 AT+WJOIN

Function:

Join/Create a wireless network. If the type of current network is ADHOC, and the module cannot search for the same SSID network, then it automatically creates a new network, or it has been connected, then return the message of network connection.

Format:

AT+WJOIN<CR>

+OK=<*bssid*>,<*type*>,<*channel*>,<*b_encry*>,<*ssid*>,<*rssi*><CR><LF><CR><LF>

Parameter:

bssid means network BSSID, it is formed with twelve hexadecimal Numbers, and the format is 001EE3A34455

type means Network Type

Table 6-3 Network Type

Value	meanings
0	Infra network
1	ADHOC network

channel means Channel Number

b_encry means Encryption Mode

Table 6-4 Encryption Mode

Value	Meanings
0	Open
1	Encryption

ssid means Wireless network name, it’s formed with 1~32 Character and embedded by double quotation marks

rssi means Network Signal Strength, it does not include minus, its unit is dBm,For example 50 means that the strength is -50 dBm.

6.2.2.2 AT+WLEAV

Function:

Disconnect the current network。

Format:

AT+WLEAV<CR>
+OK<CR><LF><CR><LF>

Parameter:

None

6.2.2.3 AT+WSCAN

Function:

Scan and return after finishing.

Format:

AT+WSCAN<CR>
+OK=<*bssid*>,<*type*>,<*channel*>,<*b_encry*>,<*ssid*>,<*rssi*><CR><LF>
<*bssid*>,<*type*>,<*channel*>,<*b_encry*>,<*ssid*>,<*rssi*><CR><LF>
……
<CR><LF>

Parameter:

Same as AT+WJOIN

6.2.2.4 AT+LKSTT

Function:

Query the network connection status。

Format:

AT+LKSTT<CR>
+OK[=*status*,*ip*,*netmask*,*gateway*,*dns*]<CR><LF><CR><LF>

Parameter:

Status means Connection Status

Table 6-5 Connection Status

Value	Meanings
0	Disconnect
1	connect

ip means IP address, its format is "192.168.1.22",it does not include quotation marks

netmask means Subnet Mask, Its format is same as IP address

gateway means Gateway address, its format is same as IP address

dns means DNS address, its format is same as IP address

6.2.2.5 AT+SKCT

Function:

Create a socket connection. In client mode, module wait for connection is over(success or failure) to return, and in server mode it return after creating a network.

Format:

AT+SKCT=*[protocol],[cs],[host_timeout],<port*><CR>

+OK=<*socket*><CR><LF><CR><LF>

Parameter:

protocol:Protocol Type,

Table 6-6 Protocol Type

Value	Meanings
0	TCP
1	UDP

cs:C/S mode,

Table 6-7 C/S mode

Value	Meanings
0	Client
1	Server

the meanings of *host_timeout is* shown as follows according to protocol and C/S mode.

Table 6-8 host_timeout

cs	protocol	Meanings
0	X	Name of target server, it can be filled with domain name or ip address, For example

		"192.168.1.100"or "www.sina.com.cn"
1	0	TCP connection timeout period, it means client will be automatically kicked out from server if it send nothing in effective period; Effective value range is 1~10000000,Unit:second,0 means never, default setting is 120 seconds
1	1	No Meanings

port means Port number

socket means socket number

6.2.2.6 AT+SKSND

Function:

Send data through the specified socket and return when it is over. This command send binary data, User should send original data after receiving the response(+OK) of module. Module automatically exits transmission after receiving the data of specified length and send data to the network, the redundant date will be rejected. Otherwise, module will be forced to constrainedly exit transmission mode and send the data has been received to the network when the module has waiting for timeout period(1 second).

Format:

AT+SKSND=<*socket*>,<*size*><CR>

+OK=<*actualsize*><CR><LF><CR><LF>

[data steam]

Parameter:

socket means socket number

size means the size of the data which prepare to be send, its unit is type.

actualsize means the size of the data which actually is send, its unit is type.

data steam means original data.

6.2.2.7 AT+SKRCV

Function:

Read data form RX buffer of the target socket ,and return after hashing finished. After receiving this command and sending the response(+OK) is over ,module will transmit the data of specified size in binary format

Format:

AT+SKRCV=<*socket*>,<*maxsize*><CR>

+OK=<*size*><CR><LF><CR><LF>

[data stream]

Parameter:

socket means socket number

maxsize means maximal data size allows to receive

size means actually size of the receiving data

data steam means original data

6.2.2.8 AT+SKSTT

Function:

Acquire the state of the specified socket, the first line of return value means the state of the message of the socket, if the socket mode is TCP server, then beginning from the first line, each line shows a socket state of a client which is joined in the server

Format:

```
AT+SKSTT=<socket><CR>
    +OK=<socket>,<status>,[host],[port],[rx_data]<CR><LF>
        [socket],[status],[host],[port],[rx_data]<CR><LF>
        ...
        <CR><LF>
```

Parameter:

socket means socket number

status means socket state

Table 6-9 Socket status

Value	Meanings
0	Disconnected
1	Detecting
2	Connected

host means IP address of the opposite terminal

port means port number of the opposite terminal

rx_data means data size in RX buffer

6.2.2.9 AT+SKCLS

Function:

Close the specified socket

Format:

AT+SKCLS=<*socket*><CR>

+OK<CR><LF><CR><LF>

Parameter:

socket means socket number

6.2.2.10 AT+SKSDF

Function:

Set the default sending socket of system. If user needs to enter transparent transmission mode in command mode, using this command can send the transparent data from serial port to the destination.

Format:

AT+SKSDF=<*socket*><CR>

+OK<CR><LF><CR><LF>

Parameter:

socket means socket number

6.2.3 System control type

6.2.3.1 AT+

Function:

Null command

Format:

AT+<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.2 AT+Z

Function:

Reset system

Format:

AT+Z<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.3 AT+E

Function:

Switch serial command to return

Format:

AT+E<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.4 AT+ENTS

Function:

Enable system to enter to sleeping mode. System will be awaked automatically after receiving any AT+Instruction in sleeping state.

Format:

AT+ENTS<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.5 AT+ENTM

Function:

Enable the serial to enter to transparent transmission mode. System exit this mode when it has received escape character according with escape term in transparent transmission mode

Format:

AT+ENTM<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.6 AT+RSTF

Function:

Return to manufacturer settings in flash. Systems need to restart and then the settings become effective.

Format:

AT+RSTF<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.7 AT+PMTF

Function:

Parameters which are saved in the memory are updated to the flash

Format:

AT+PMTF<CR>

+OK<CR><LF><CR><LF>

Parameter:

None

6.2.3.8 AT+IOC

Function:

GPIO input or output control. IO status is allowed to read when GPIO1 is set to input mode(the mode of AT+IOM is 1), IO status is allowed to write when GPIO1 is set to output mode(the mode of AT+IOM is 2)

Format:

AT+IOC=*[?][status]*<CR>

+OK*[=status]*<CR><LF><CR><LF>

Parameter:

status means IO Status

Table 6-10 IO Status

Value	Meanings
0	High level
1	Low level

6.2.3.9 AT+QMAC

Function:

Acquire physical address of the module.

Format:

AT+QMAC<CR>

+OK=<*mac address*><CR><LF><CR><LF>

Parameter:

mac address is twelve hexadecimal Numbers, format is 001EE3A34455

6.2.3.10 AT+QVER

Function:

Acquire version of system. the version message includes hardware version and firmware version.

Format:

AT+QVER<CR>

+OK=<*hard,firm*><CR><LF><CR><LF>

Parameter:

hard means hardware version, its format is string, such as" H1.00.00.1029"

firm means firmware version, its format is string ,such as " F0.02.02@ 18:25:25 Jul 28 2010"

6.2.4 Parameter Setting Type

6.2.4.1 AT+NIP

Function:

Set or query local IP address. The dynamic IP address cannot be queried if address type is set to DHCP.AT+LKSTT command can be used to query.

Format:

AT+NIP=*[!?][type],[ip],[netmask],[gateway],[dns]*<CR>

+OK*[=type,ip,netmask,gateway,dns]*<CR><LF><CR><LF>

Parameter:

type means address type

Table 6-11 address type

Value	Meanings
0	Use DHCP to assign IP address dynamically
1	assign static IP address

ip means IP address, data format is such as "192.168.1.22",not including quotation marks

netmask means subnet mask, data format is the same as IP address

gateway means Gateway address, Data format is the same as IP address

dns means DNS address, Data format is the same as IP address

6.2.4.2 AT+ATM

Function:

Set or query work mode of module

Format:

AT+ATM=*[!?][mode]* <CR>

+OK*[=mode]*<CR><LF><CR><LF>

Parameter:

mode means work mode

Table 6-12 work mode

Value	Meanings
0	Auto-work mode
1	Command mode

6.2.4.3 AT+ATRM

Function:

Set or query the message of the connection the module creates automatically in auto-work mode.

Format:

AT+ATRM=*[!?][protocol],[cs],[host_timeout],[port]*<CR>

+OK*[=protocol,cs,host,port]*<CR><LF><CR><LF>

Parameter:

protocol means protocol type,

Table 6-13 protocol type

Value	Meanings
0	TCP
1	UDP

cs means C/S mode,

Table 6-14 CS mode

Value	Meanings
0	Client
1	Server

host_timeout means that shown as follow,

Table 6-15 host_timeout

cs	protocol	Meanings
0	X	destination server name, you can input domain name or IP address, for example: "192.168.1.100"or "www.sina.com.cn"
1	0	TCP connection timeout period, the clients that connect with the server send noting in this effective period will be kicked out, effective value range is 1~10000000,its Unit is second,0 means never, default setting is 120 seconds
1	1	No meanings

port means port number

6.2.4.4 AT+SSID

Function:

Set or query wireless network name, namely SSID

Format:

AT+SSID=*[!?][ssid]*<CR>

+OK*[=ssid]*<CR><LF><CR><LF>

Parameter:

ssid means wireless network name, it’s formed with 1~32 characters, and embedded in double quotation marks

6.2.4.5 AT+ENCRY

Function:

Set or query wireless network encryption mode. What should are noted is that, every encryption modes need to set correct key to cooperate with AT+KEY command except OPEN mode.

Format:

AT+ENCRY=*[!?][encry mode]*<CR>

+OK*[=encry mode]*<CR><LF><CR><LF>

Parameter:

encry mode means encryption mode

Table 6-16 encryption mode

Value	Meanings
0	OPEN
1	WEP64
2	WEP128
3	WPA-PSK(TKIP)
4	WPA-PSK(CCMP/AES)
5	WPA2-PSK(TKIP)
6	WPA2-PSK(CCMP/AES)

6.2.4.6 AT+KEY

Function:

Set or query network key. What should are noted is that, before using this command to set network key, user must set the encryption mode with the command AT+ENCRY .

Format:

AT+KEY=*[!?][format],[index],[key]*<CR>

+OK*[=format,index,key]*<CR><LF><CR><LF>

Parameter:

format means key format

Table 6-17 key format

Value	Meanings
0	HEX
1	ASCII

index means key index,1~4 is used in WEP key, in other encryption modes it's set 0

key means key string, it's embedded in double quotation marks, according with different encryption modes, key size and key format is defined as follows

Table 6-18 key

Encryption mode	Key Format

	HEX	ASCII
WEP64	10 hexadecimal characters (Note 1)	5 ASCII characters (Note 2)
WEP128	26 hexadecimal characters	13 ASCII characters
WPA-PSK(TKIP)	64 hexadecimal characters	8~63 ASCII characters
WPA-PSK(CCMP/AES)	64 hexadecimal characters	8~63 ASCII characters
WPA2-PSK(TKIP)	64 hexadecimal characters	8~63 ASCII characters
WPA2-PSK(CCMP/AES)	64 hexadecimal characters	8~63 ASCII characters

Note1:hexadecimal characters means 0~9 and a~f(no division of majuscule and lowercase),for example"11223344dd"

Note2:ASCII character means the numbers (0~9) and characters (a~z and A~Z) in ASCII character set which is specified by ISO, for example "14u6E"

6.2.4.7 AT+BSSID

Function:

Set or query BSSID address of the target AP. The configuration is only effective in infrastructure network

Format:

AT+BSSID=*[!?][mode],[bssid]*<CR>

+OK*[=mode,bssid]*<CR><LF><CR><LF>

Parameter:

mode means BSSID Mode

Table 6-19 BSSID Mode

Value	Meanings
0	auto
1	specified

bssid means Network BSSID, its size is twelve hexadecimal numbers, format is such as 001EE3A34455

6.2.4.8 AT+CHL

Function:

Set or query the specified wireless channel

Format:

AT+CHL=*[!?][mode],[channel]*<CR>

+OK*[=mode,channel]*<CR><LF><CR><LF>

Parameter:

mode means channel mode

Table 6-20 channel mode

Value	Meanings
0	auto
1	specified

channel means wireless channel number, effective range is 1～14

6.2.4.9 AT+CHLL

Function:

Set or query wireless channel list. Wireless channel list is used to prescribe work channel range of module, the channel not included in the channel list will be not scanned, reasonably using this parameter can expedite the speed of scanning and networking of module.

Format:

AT+CHLL=*[!?][channel list]*<CR>

+OK*[=channel list]*<CR><LF><CR><LF>

Parameter:

channel list means wireless channel list, it uses hexadecimal format, it begins from the lowest bit, each bit means a channel, the default setting is 3fff,that means all of 1~14 channels.

6.2.4.10 AT+WPRT

Function:

Set or query wireless network type.

Format:

AT+WPRT=*[!?][type]*<CR>

+OK*[=type]*<CR><LF><CR><LF>

Parameter:

type means network type.

Table 6-21 network type

Value	meanings
0	Infrastructure network
1	ADHOC network

6.2.4.11 AT+WATC

Function:

Set or query whether to enable to create ADHOC network automatically. This parameter is only effective when wireless network type is set to ADHOC, it means whether to create a ADHOC network with the same SSID when networking is failed.

Format:

AT+WATC=*[!?][enable]*<CR>

+OK*[=enable]*<CR><LF><CR><LF>

Parameter

enable means the symbol of enabling.

Table 6-22 symbol of enabling

Value	Meanings
0	disabled
1	enabled

6.2.4.12 AT+WARM

Function:

Set or query whether to enable the wireless roam.

Format:

AT+WARM=*[!?][enable]*<CR>

+OK*[=enable]*<CR><LF><CR><LF>

Parameter:

enable means the symbol of enabling.

Table 6-23 enable symbol

Value	meanings
0	disabled
1	enabled

6.2.4.13 AT+WARC

Function:

Set or query the function of auto retry after the wireless network is disconnected or networking is failed. This parameter is only effective in the auto-work mode.

Format:

AT+WARC=*[!?][count]*<CR>

+OK*[=count]*<CR><LF><CR><LF>

Parameter:

count means retry times.

Table 6-24 retry times

Value	Meanings
0	No retry
1~254	1~254 times of retry
255	Retry for ever

6.2.4.14 AT+WBGR

Function:

Set or query BG mode of the wireless network and the maximum sending rate.

Format:

AT+WBGR=*[!?][bg mode],[max rate]*<CR>

+OK*[=bg mode,max rate]*<CR><LF><CR><LF>

Parameter:

bg mode mean BG mode

Table 6-25 BG mode

Value	Meanings
0	B/G fixed
1	B

max rate means the maximum sending rate, in B mode, only 0 to 3 is effective

Table 6-26 The maximum sending rate

Value	Meanings
0	1 Mbps
1	2 Mbps

2	5.5 Mbps
3	11 Mbps
4	6 Mbps
5	9 Mbps
6	12 Mbps
7	18 Mbps
8	24 Mbps
9	36 Mbps
10	48 Mbps
11	54 Mbps

6.2.4.15 AT+UART

Function:

Set or query data format of UART serial.

Format:

AT+UART=*[!?][baud rate],[data bit],[stop bit],[parity]*<CR>

+OK*[=baud rate,data bit,stop bit,parity]*<CR><LF><CR><LF>

Parameter:

baud rate means baud rate, effective range is from 1200 to 115200,

Table 6-27 baud rate

Value	Meanings
115200	115200 bps
57600	57600 bps
38400	38400 bps
19200	19200 bps
9600	9600 bps
4800	4800 bps
2400	2400 bps
1200	1200 bps

data bit means data bits

Table 6-28 data bits

Value	Meanings
0	8 bits
1	7 bits

stop bit means stop bits

Table 6-29 stop bits

Value	Meanings
0	1 bit
1	Not supported
2	2 bits

parity means parity bit

Table 6-30 Even parity

Value	Meanings
0	No parity
1	Odd parity
2	Even parity

6.2.4.16 AT+ATPT

Function:

Set or query the auto framing period of data. Data is automatically set frame period. This parameter is only effective when serial is in transparent transmission mode.

Format:

AT+ATPT=*[!?][period]*<CR>

+OK*[=period]*<CR><LF><CR><LF>

Parameter:

period means auto framing period, its range is 100 ~ 10000ms, and its units is millisecond, the smallest step is 100ms.

6.2.4.17 AT+ATLT

Function:

Set or query the data auto framing length of data. This parameter is only effective when serial is in transparent transmission mode.

Format:

AT+ATLT=*[!?][length]*<CR>

+OK*[=length]*<CR><LF><CR><LF>

Parameter:

length means auto framing length, its range is 64 ~ 1024 bytes.

6.2.4.18 AT+ESPC

Function:

Set or query escape characters. This parameter is used for serial to exit the transparent transmission mode.

Format:

AT+ESPC=*[!?][escape]*<CR>

+OK*[=escape]*<CR><LF><CR><LF>

Parameter:

escape means escape characters, its format is two ASCII characters expressed in hexadecimal, such as ASCII character '+' should be expressed as '2B'.

6.2.4.19 AT+ESPT

Function:

Set or query escape time. This parameter is used for serial to exit the transparent transmission mode.

Format:

AT+ESPT=*[!?][time]*<CR>

+OK*[=time]*<CR><LF><CR><LF>

Parameter:

time means escape time, its range is 100 ~ 10000ms,its unit is millisecond, the smallest step is 100ms.

6.2.4.20 AT+WEBS

Function:

Set or query whether to enable the internal WEB server.

Format:

AT+WEBS=*[!?][enable],[port]*<CR>

+OK*[=enable,port]*<CR><LF><CR><LF>

Parameter:

enable means the symbol of enabling.

Table 6-31 symbol of enabling

Value	Meanings
0	disabled
1	enabled

port means server port number, the default setting is 80.

6.2.4.21 AT+PASS

Function:

Set or query the system password.

Format:

AT+PASS=*[!?][pass]* <CR>

+OK*[=pass]*<CR><LF><CR><LF>

Parameter:

pass means system password, it's formed with 6 ASCII characters.

6.2.4.22 AT+IOM

Function:

Set or query GPIO1 mode.

Format:

AT+IOM=*[!?][mode]*<CR>

+OK*[=mode]*<CR><LF><CR><LF>

Parameter:

mode means work mode.

Table 6-32 work mode

Value	Meanings
0	System function
1	Input

2	Output

6.2.4.23 AT+CMDM

Function:

Set or query default command mode of the system.

Format:

AT+CMDM=*[!?][mode]*<CR>

+OK*[=mode]*<CR><LF><CR><LF>

Parameter:

mode means the type of command mode.

Table 6-33 Command Mode

Value	Meaning
0	AT+Instruction
1	Compatible protocol

6.3 Sample code

This section chiefly gives the sample codes of the PC for the control of WIFI module in command mode. If the module works in auto-work mode, it will be not need to refer to this section.

6.3.1 Description of sample code

The sample code is based on Language C, and it can be explanted to other systems. It's mainly gives an demonstration of process for the operation of WIFI module. while explanting, appropriate modification is needed according with own system situation.

6.3.2 Operation flow of WIFI module in command mode

Usually the operation flow of WIFI module in command mode is shown as the following figure. While module is in use, user can decide whether to do the operation of the command line according with the state of system.

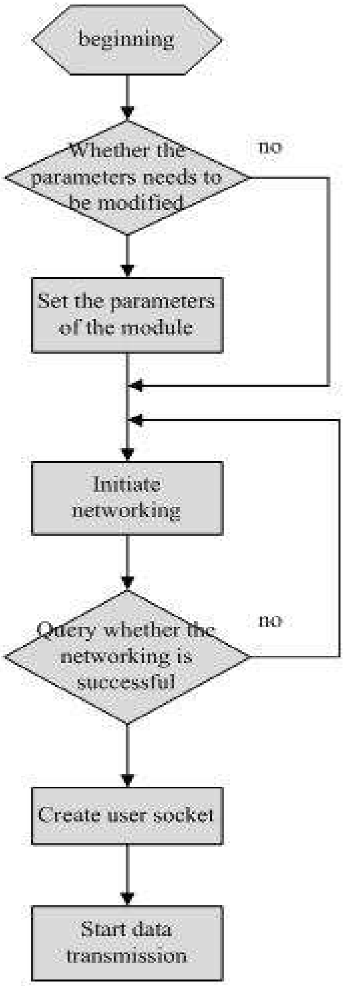

beginning
Whether the parameters needs to be modified
no
Set the parameters of the module
Initiate networking
Query whether the networking is successful
no
Create user socket
Start data transmission

figure6-3 the operation of WIFI module

6.3.3 main data framework of sample code

6.3.3.1 At command structure

Description,

'CmdName' means code name of the command of AT instruction.

'Flag' means whether the command has return symbol.

'Cmdbuf' means the content the command includes

'Cmdbuiflen' means the length of the command

```
typedef struct _TATCP_COMMAND{
      char    *CmdName;
     INT         Flag;
     char     * Cmdbuf;
     INT       *Cmdbuflen;
} TATCP_CMD;
```

6.3.3.2 The sending symbol of serial's AT instruction

```
unsigned char AtCmdSending;
```

Description,

The symbol means an AT instruction is being sent or waiting for return. The module can't continue to send down another instruction. If user's system is based on operation system programming, it can be achieve with the mechanism of signal quantum.

6.3.3.3 The symbol for serial waiting return of AT instruction

```
unsigned char ReciveAtCmdrep;
```

Description,

the symbol means the serial is waiting for the return of an AT instruction, if operation system is used, it can be used.

6.3.4 Operation of serial data

After the serial has sent a CMD, it needs to wait for return of the command. If there is no return for this command, timeout is needed, the system will force to exit the command after time out. It must be sure that ,in the process of sending AT instruction, there is one AT instruction in serial which is waiting for return.

6.3.4.1 The sample of serial sending instruction

```
int AtCmdSend(TATCP_CMD * AtCmd)
{
      unsigned char AtCmdbuf[512];
      int ret=0;
    ////
    ////AtCmd_Check();
    ///AtCmdCheck
    /////
      strcpy(AtCmdbuf, "AT+");
      strcat(AtCmdbuf, AtCmd->Cmdbuf);
      ReciveAtCmdrep=0;
      ComSendstr(AtCmdbuf);
AtcmdTimerId=StartTimer( MSG_CMD_TIMEOUT_CFM,TIMER_ATCMD_TIMEOUT);
    while(ReciveAtCmdrep!=1)
    {
         if(Atcmdtimeout==1)
          {
               ret=-1;
              break;
            }
    }
    StopTimer(AtcmdTimerId);
    return ret;
}
```

Description,

It needs the system supports added function of timeout processing in this sample code. The system will start the timer after serial sends a command, and set *Atcmdtimeout* to 1 in the specified time, in order to achieve the process after the module is time out.

6.3.4.2 The sample of serial receiving the return of AT instruction

It is used to receive the response message of AT instruction, after hashing sent a AT instruction ,the PC needs to wait for the response or timeout(more than 500 ms at least) of WIFI module. This sample is illustrated with the serial interrupt of 51 structure.

1. The function of serial receiving interrupt.

```
void COMM_INT() interrupt 4 using 3
{
     unsigned char    cBuf;
       if(RI)// receive data
      {
          RI = 0;
          cBuf = SBUF;
          ProcessUARTData(cBuf);
       }
       else if (TI)
      {
          TI = 0;
          if(iSendCounter < iUARTSendLen)
               SBUF = cpSendBufPtr[iSendCounter++];
      }
}
```

Description.

ProcessUARTData(cBuf) is used to deal with the data the serial receives.

2. The function of data processing, main data structure is described is as follow,

```
#define WIFIBUFLEN     1024
typedef struct WIFIRecBuffer
{
     unsigned char        gcATReceData[WIFIBUFLEN];    //
     unsigned int     gcATReceCount;                     ///data length
} WIFIRecBuffer;
struct WIFIRecBuffer    xdata    ATReceBuffer[1];     /// external ram of 51
```

3. Macro definition of AT instruction return status, the definition is mainly used to control the flow of serial receive the return of AT instruction.

```
#define WIFI_WAIT_SYN              0X00      //// serial initialization
#define WIFI_WAIT_RESP              0x01     //// serial waits for
                                                 Corresponding character
#define WIFI_RECEDATA               0x02     ////wait for data
```

```
#define WIFI_WAIT_OVER           0x03     ////wait for end
#define WIFI_WAIT_ERRCODE            0x04     ////wait for error
#define WIFI_SYN                         0X2B      ////receive the character
```

4. The function of parsing the return(ProcessUARTData(cBuf))

```
void ProcessUARTData(     IN unsigned char    UARTData)
{
    int i=0;
          switch (gcWIFICommunState)
        {
             case WIFI_WAIT_SYN:                // wait to receive
                if(UARTData==WIFI_SYN)
                {
                    gcWIFICommunState = WIFI_WAIT_RESP;
                }
              break;
             case WIFI_WAIT_RESP:
                AtResp[AtResplen++]=UARTData;
                if(strcmp(AtResp,"OK")==0)
                {
                    AtRespState=1;       ////response ok
                    gcWIFICommunState = WIFI_RECEDATA;
                    AtResplen=0;
                }
                else if(strcmp(AtResp,"ERR")
                {
                        AtRespState=0;       ////response ERR
                        gcWIFICommunState=WIFI_WAIT_ERRCODE;
                    AtResplen=0;
                }
                else
                {
                    printf("Recive unknown words\n");
                        AtRespState=0;       ////response ERR
                        gcWIFICommunState=WIFI_WAIT_SYN;
                    AtResplen=0;
                }
             break;
             case WIFI_RECEDATA:
             case WIFI_WAIT_OVER:
             case WIFI_WAIT_ERRCODE:
                ATReceBuffer[0].gcATReceData[ATReceBuffer[0].gcATReceCount]=
UARTData;
                ATReceBuffer[0].gcATReceCount++;
                if(strstr(ATReceBuffer[0].gcATReceData,"\r\n\r\n")!=NULL)
                {
                    ReciveAtCmdrep=1;
                    gcWIFICommunState = WIFI_WAIT_SYN;
                    ATReceBuffer[0].gcATReceCount=0;
                }
                else if(ATReceBuffer[0].gcATReceCount==WIFIBUFLEN)
                {
                    printf("At cmd recive error\n");
                    gcWIFICommunState = WIFI_WAIT_SYN;
                }
                else
                {
                    printf("Wiat next byte\n");
                }
                break;
             default:
                gcWIFICommunState = WIFI_WAIT_SYN;
                break;
        }
}
```

Description,

This function is used to deal with the data which is received by the serial, it should be used to judge and deal with when the serial has received a byte of data. The function will set the bit of ReciveAtCmdrep when it has received the return of the AT instruction, at this time ,the bit will be judged in AT instruction sending frame, and then the function will parse the different returns of AT instructions.

6.3.5 The function used to parse the return parameters of AT instruction

This function is used to parse the return parameters of AT instruction, and split the return parameters. The sample is as follow.

```
INT parse_line (char *line, char *argv[])
{
    INT nargs = 0;
    while (nargs < ATCP_MAXARGS) {
        /* skip any white space */
        while ((*line == ' ') || (*line == '\t')) {
            ++line;
        }
        if (*line == '\0') {/* end of line, no more args */
            argv[nargs] = NULL;
            return (nargs);
        }
        if (*line == '"'){/* argument such as    "xxxx" */
            line++; /* skip 1st <"> */
            argv[nargs++] = line;     /* begin of argument string  */
            /* find end of string */
            while (*line && (*line != '"')) {
                ++line;
            }
            if (*line == '\0') {/* end of line, but 2nd <"> is not found */
                argv[nargs] = NULL;
                return (-1);
            }
            *line++ = '\0';          /* terminate current arg   */
            /* skip any white space */
            while ((*line == ' ') || (*line == '\t')) {
                ++line;
            }
            if (*line == ','){
                line++; /* skip <,> */
            }
            else if (*line == '\0'){ /* end of line, no more args      */
                argv[nargs] = NULL;
                return (nargs);
            }
            else{ /* unexpected char */
                argv[nargs] = NULL;
                return (-1);
            }
        }
        else{
            argv[nargs++] = line;     /* begin of argument string  */
            /* find end of string */
            while (*line && (*line != ',')) {
                ++line;
            }
            if (*line == '\0') {/* end of line, no more args */
                argv[nargs] = NULL;
                return (nargs);
            }
            *line++ = '\0';          /* terminate current arg   */
        }
    }
    return (-1);
}
```

Description,

*char *line* points to the data received bg the serial, *char *argv[]* points to the finger used to save the return parameters, they are used the following parameters parsing.

6.3.6 The function of operating character string

The following functions is mainly used to parse the parameters of character string type in the return of AT instruction, and convert the parameters to hexadecimal or decimal which CPU display.

```
INT atodec(char Ch)
{
    INT dec = -1;
    if (Ch >= '0' && Ch <= '9')
        dec = Ch - '0';
    return dec;
}

INT strtodec(INT *dec, char *str)
{
    INT i = -1;
    INT dd = 0, sign = 1;
    if (*str == '-'){
        str++;
        sign = -1;
    }
    while(*str){
        i = atodec(*str++);
        if (i < 0) {return -1;}
        dd = dd*10 + i;
    }
    *dec = dd*sign;
    return (i<0?-1:0);
}
INT atohex(char Ch)
{
    INT hex = -1;
    if (Ch >= '0' && Ch <= '9')
        hex = Ch - '0';
    else if (Ch >= 'a' && Ch <= 'f')
```

```
        hex = Ch - 'a' + 0xa;
    else if (Ch >= 'A' && Ch <= 'F')
        hex = Ch - 'A' + 0xa;
    return hex;
}

INT strtohexarray(INT8U array[], INT cnt, char *str)
{
    INT hex;
    INT8U tmp, *des;
    des = array;
    while(cnt-- > 0)
    {
        hex = atohex(*str++);
        if (hex < 0)
            return -1;
        else{
            tmp = (hex<<4)&0xf0;
        }
        hex = atohex(*str++);
        if (hex < 0)
            return -1;
        else{
            tmp = tmp | (hex & 0x0f);
        }
        *des++ = (INT8U) tmp;
    }
    return (*str==0?0:-1);
}
```

6.3.7 The parsing sample of several AT instructions sending

6.3.7.1 The sending sample of simple instruction of control type

This command is only used to control the operation of the module, it does not need to schlep a lot of parameters data in AT instruction, and receiving the response means it has been operated correctly.

1. Take the operation of controlling the WIFI module networking as a example.

The data structure used in the operation of WIFI module networking is as follow,

```
#define   RespParm                    1
#define   NoRespParm                  0
#define ATC_CH_SET                   '='
#define ATC_CH_SAVE                  '!'
#define ATC_CH_QUERY                 '?'

typedef struct _JionResult{
      unsigned char BSSID[12];
      unsigned char Type;                 ///0 infra     1---ADHOC
      unsigned char   channel;
      unsigned char     encry;
      char ssid[32];
      int       rssi;
}TJION_RESULT;
```

2. The main function used to control the networking of WIFI module is shown as follow, while using this function, the system will hang out until networking is time out or the module has received the response of the command.

```
void WIFI_Jion(void)
{
      TATCP_CMD WIFIJoin;
      TJION_RESULT Jionr;
      unsigned char ErrorCode=0;
      char *arg = NULL;
      INT       argc = 0;
      int argpoint=0;
      INT err = 0;
      char *argv[ATCP_MAXARGS] ;
      char *    ATCmd="WJOIN\n";
      memset(WIFIJoin,0,sizeof(TATCP_CMD));
      memset(ATReceBuffer[0].gcATReceData,0,sizeof(WIFIRecBuffer));
```

```
WIFIJoin.Flag=RespParm;
WIFIJoin.Cmdbufl =ATCmd;
WIFIJoin.Cmdbuflen=strlen(ATCmd);
AtCmdSend(WIFIJoin);
if(AtRespState==1)
{
    arg = strchr(ATReceBuffer[0].gcATReceData, ATC_CH_SET);
    if(arg)
    {
        {
            argc = parse_line(arg, argv);
            if (argc <= 0)
            {
                printf("Recive Error parm\n");
                return;
            }
        }
        if (argc != 6)
        {
            printf("recvie parm number error\n");
        }
        else
        {
            if (strtohexarray(Jionr.BSSID, 6, argv[0]) < 0)
            {
                printf("Error Bssid\n");
                return ;
            }
            if (strtodec(&(Jionr.Type), argv[1]) < 0)
            {
                return ;
            }
            if(strtodec(&(Jionr.channel), argv[2]) < 0)
            {
                return;
                }
                if(strtodec(&(Jionr.encry), argv[3])<0)
                {
                    return;
                }
                strcpy((char *)Jionr.Ssid, argv[4]);
                if(strtodec(&(Jionr.rssi), argv[5])<0)
                {
                    return;
                }
            }
        }
    }
    else
    {
        ErrorCode=*(arg+2);
        printf("reciver error At cmd resp ERROR Code:%d",ErrorCode);
    }
}
```

6.3.7.2 The sending sample of the instruction of parameter setting type

The instruction of parameter setting type is mainly used to set the parameters of WIFI module for PC, AT+Instruction set includes many command which is used to set parameters.

1. Take the key setting as an example,

What used in key setting is mainly data structure.

```
typedef struct _WIFIKey{
        unsigned char PSK[64];
        unsigned char KeyLength;
        unsigned char KeyIndex;
        unsigned char KeyFormat;
}WIFIKey;
```

2. The main function of setting key is as follow.

```
void WIFI_SetKey(unsigned char NeedFlash)
{
        WIFIKey KeySet;
        WIFIKey KeyResult;
        TATCP_CMD ATWIFIJoin;
        unsigned char ErrorCode=0;
        char *arg = NULL;
        INT        argc = 0;
       char      WiretFlash;
        int argpoint=0;
        INT err = 0;
        char *argv[ATCP_MAXARGS] ;
        char *    ATCmd="KEY=";
        char    Atbuf[128];
        memset(WIFIKey,0,sizeof(WIFIKey));
        memset(ATReceBuffer[0].gcATReceData,0,sizeof(WIFIRecBuffer));
        memset(Atbuf,0,128);
        strcpy(WIFIKey.PSK,"12345678");
         WIFIKey.KeyLength=8;
        WIFIKey.KeyIndex=1;
        WIFIKey.KeyFormat=1;
        if(NeedFlash)
        {
                WiretFlash='!';
        }
        else
        {
                WiretFlash=NULL:
        }
        sprintf(Atbuf,"%s%c%d,%d,\"%s\"\n",ATCmd,WiretFlash,WIFIKey.KeyFormat,
WIFIKey.KeyIndex , WIFIKey.PSK);
        ATWIFIJoin.Flag=1;
        ATWIFIJoin.Cmdbuf=Atbuf;
        ATWIFIJoin.Cmdbuflen=strlen(Atbuf);
```

```
AtCmdSend(ATWIFIJoin);
if(AtRespState==1)
{
    arg = strchr(ATReceBuffer[0].gcATReceData, ATC_CH_SET);
    if(arg)
    {
        {
            argc = parse_line(arg, argv);
            if (argc <= 0)
            {
                printf("Recive Error parm\n");
                return;
            }
        }
        if (argc != 3)
        {
            printf("recvie parm number error\n");
        }
        else
        {
            if (strtodec(&(KeyResult.KeyFormat), argv[0]) < 0)
            {
                return ;
            }
            if(strtodec(&(KeyResult.KeyIndex), argv[1]) < 0)
            {
                return;
            }
            strcpy((char *)KeyResult.Psk, argv[2]);
        }
    }
}
else
{
    ErrorCode=*(arg+2);
```

```
            printf("reciver error At cmd resp ERROR Code:%d",ErrorCode);
        }
}
```

6.3.7.3 The sample of complicated AT+Instruction with return parameters

AT+Instruction as this type has a response with more parameters, network scan is a typical example.

1. The function of detaching the group of parameters

It is used to devide the long parameters in AT+Instruction response into groups.

```
INT parse_line_group (char *line, char *argv_group[])
{
        INT nargs = 0;
        while (nargs < ATCP_MAXARGS) {
                /* skip any white space */
                while ((*line == ' ') || (*line == '\t')) {
                        ++line;
                }
                if (*line == '\0') {/* end of line, no more args */
                        argv_group[nargs] = NULL;
                        return (nargs);
                }
                {
                        line++;
                        argv_group[nargs++] = line;       /* begin of argument group  */
                        /* find end of string */
                        while (*line!='\r' && (*(line+1) != '\n')) {
                                ++line;
                        }
                        if (*line == '\0') {/* end of line, but 2nd <"> is not found */
                                argv_group[nargs] = NULL;
                                return (nargs);
                        }
                        *line++ = '\0';           /* terminate current arg group      */
```

```
            *line++ = '\0';
            if (*line=='\r' && (*(line+1) == '\n')) {
                *line++ = '\0';          /* terminate current arg group     */
                *line++ = '\0';
                return (nargs);
            }
        }
    }
    return (-1);
}
```

2. Sample of module sending the scan command

   After sending the scan command, WIFI module will return a very long parameters section. The longest section can reach as much as 2Kbytes. Therefore we use this part as a example, the AT+Instruction used to scan is as follow.

```
void WIFIScan(void)
{
    TATCP_CMD WIFIScan;
    unsigned char ErrorCode=0;
    char *arggroup = NULL;
    char *arg = NULL;
    INT      arggroupc = 0;
    INT      argc = 0;
    int argpoint=0;
    INT err = 0;
    int i=0;
    char *argv[ATCP_MAXARGS] ;
    char *arggroupv[ATCP_MAXARGS] ;
    char *    ATCmd="WSCAN\n";
    memset(WIFIJoin,0,sizeof(TATCP_CMD));
    memset(ATReceBuffer[0].gcATReceData,0,sizeof(WIFIRecBuffer));
    WIFIScan.Flag=RespParm;
    WIFIScan.Cmdbuf =ATCmd;
    WIFIScan.Cmdbuflen=strlen(ATCmd);
    AtCmdSend(WIFIScan);
    if(AtRespState==1)
    {
        arggroup=strchr(ATReceBuffer[0].gcATReceData, ATC_CH_SET);
        //arg = strchr(ATReceBuffer[0].gcATReceData, ATC_CH_SET);
        if(arggroup)
        {
            {
                arggroupc = parse_line_group(arggroup, arggroupv);
                if (argc <= 0)
                {
                    printf("Recive Error parm\n");
                    return;
                }
            }
            for(i=0;i<arggroupc;i++)
            {
                argc = parse_line(&arggroupv[arggroupc], argv);
                if (argc <= 0)
                {
                    printf("Recive Error parm\n");
                    return;
                }
                else
                {
                    if (strtohexarray(Scanresult[arggroupc].BSSID, 6, argv[0]) <
0)
                    {
                        printf("Error Bssid\n");
                        return ;
                    }
                    if (strtodec(&(Scanresult[arggroupc].Type), argv[1]) < 0)
                    {
                        return ;
                    }
                    if(strtodec(&(Scanresult[arggroupc].channel), argv[2]) < 0)
                    {
                        return;
                    }
                    if(strtodec(&(Scanresult[arggroupc].encry), argv[3])<0)
                    {
                        return;
                    }
                    strcpy((char *)Scanresult[arggroupc].Ssid, argv[4]);
                    if(strtodec(&(Scanresult[arggroupc].rssi), argv[5])<0)
                    {
                        return;
                    }
                }
            }
        }
    }
    else
    {
        ErrorCode=*(arg+2);
        printf("reciver error At cmd resp ERROR Code:%d",ErrorCode);
    }
}
```

Appendix A Frequent Questions and Answers

Q1: Why can not the module search for the specified network?

A: The channel list user set doesn’t contain the channel which the specified networks work in.

Q2: Why can not the module join in the network?

A: Please go through the following reasons,

Whether the parameters SSID, Key, Channel and so on are consistent with the AP sets or not. Whether the module is specified BSSID, and the BSSID is not consistent with the AP sets.

Q3: Why does the module need about 10 seconds to response the command or connect to network automatically, when encryption mode is set to WPA/WPA2?

A: When encryption mode is set to WPA/WPA2, as the key format is ASCII, the module must first do the conversion to the key of ASCII format when it's power-on, this process increases about 10 seconds to the starting time. And when using WPA/WPA2 encryption, directly using PMK of hexadecimal format can eliminate this delay. The specific method is referred in Section 4.3.1.5.

Q4: The module has connected to the network successfully, why it can't show "Destination host unreachable" or "Request timed out" after doing the operation ping between the module and PC.

A: Please check the network setting, check whether the IP address and so on is correct or not.

Check whether the encryption mode is consistent with the AP sets or not, because in certain encryption mode, such as WEP encryption with open authentication, even if the key is not correct, module will join in the AP, but they can't communicate.

Maybe certain operating program or Windows Firewall prevents from the operation ping.

Q5**:** In auto-work mode, the ICMP connection sometimes connects and sometimes disconnects after the module has joined in the network, why?

A: The module will create a default network connection after hashing joined in network, if the TCP server which is the default target of the network connection, is configured unsuccessfully or not opened, the module will disconnect the wireless connection after failed TCP connection, and retry to connect in 10 seconds. And then it appears that ICMP connection sometimes connects and sometimes disconnects. To settle this question is correct configuration of TCP server and opening it.

Q6**:** In auto-work mode, why does the module not connect to the network automatically after resetting?

A: The module forces to go into the configuration mode according the state of MODE pin after start-up, the specific is referred in Section 4.3.1.5.

Q7**:** In auto-work mode, data sent to the module through serial will delay sometime to send to the network, why?

A: In auto-work mode, framing and sending data has two trigger qualification trigger time and trigger length, if the length of data doesn't reach the trigger length, and it will wait to be framed and sent coercively after trigger time, the specific is referred in Section 4.2.2.2.

Q8**:** In auto-work mode, why does the module not exit the transmission state, after inputting the escape character?

A: To exit transparent transmission has strict limits, the specific is referred in Section 4.2.2.4.

Q9: Why can not the configuration program search for the target module?

A: The serial setting of configuration program is not consistent with the serial setting of the module;

The module is in auto-work mode, please reset it , be sure LED1 and LED2 is illumed, and then retry the search.

Q10**:** To modify the parameters with configuration program, why does it show the error 'used prohibitive operating symbol'?

A: Please disconnect the network connection first, and then refer the modified parameters.

Q11**:** Why cannot web pages of the WEB server open?

A: The reasons maybe include,

Whether the WEB server is forbidden

Whether the server port is set correctly or not, if the port is set to the number except 80, then it's needed to input the port number in the address bar while using a browser, such as http://192.168.1.100:2000.

Q12**:** When user sets the serial to the baud rate it does not support, the module can't be connected to, then how to correct it ?

A: Resume it to the manufacturer setting, the approaches is as follow,

1. Open the serial debugging software, such as serial master, set the serial parameters to 115200bps/8 bits of data bits/1 bit of stop bits/no parity of parity bit/no flow control.
2. Input 'at+'(no contain quotation marks and contain enter) in the sending column of the software, choose periodic sending, the period is set to 50ms.
3. Reset the module, if it return '+OK', then stop the periodic sending.
4. Send the command 'AT+QVER' to look over the return message, if the message includes B1.xx field, then it joins in bootloader mode successfully, otherwise it's not in, retry from the 2th approach.

5. Send the command ’AT+QVER’(no return).
6. Wait for 1 second, and reset the module, then it can be resume to the manufacturer state.

Q13: In Wireless connection state, why can not the specified module be searched for?

A: The reasons includes,

The signal between the netcard and the specified module is weak.

System password of wireless connection setting is not consistent with the specified module.

MAC address in wireless connection setting is specified.

Q14: In some environment the module used, why is the quality of wireless connection always bad, and how to improve the wireless transmission?

A: The reasons which cause bad quality of wireless connection are multiple, such as those, the placement of AP is not reasonable, the distance between AP and module is too far, there are some obvious screens or shelter between AP and module, in the environment module works there are some disturbance of 2.4G band and so on. Some environmental problems can’t be resolved fundamentally, it can be only reduced for adverse effects with some methods, user can try to do the changes as follow,

1. Lay AP in open and no obvious shelter environment as much as possible, in particular, to avoid large areas of metal and the corners of wall.
2. Modify the setting of AP, change the channel far from the current channel, such as those, change the channel from 1 to 6, or from 6 to 13 and so on.
3. Modify the maximum rate of advanced wireless parameters, reduce it to 11Mbps or even lower.

Appendix B Revision History of the document

Version	Revised scope	Date
1.00	Original Version by ThaiEasyElec.com	Dec 5th 2012
1.01	Added 2.2.4.1 USB to Serial (optional)	Dec 6th 2012