

Monoprice

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139263 **Serial WiFi Router**  
**User Manual**



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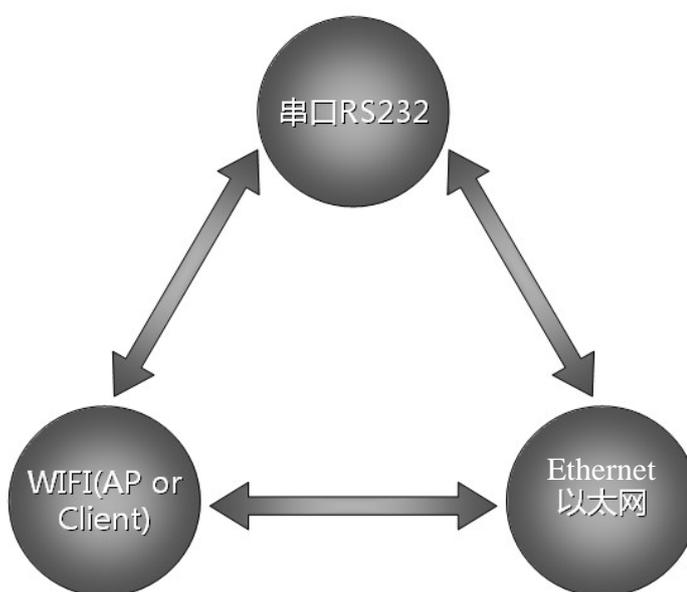
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## 1 Brief Introduction

HLK-WR02 is a serial wifi router developed by Shenzhen Hi-Link Electronic Co.,Ltd

This product is based on the universal serial interface network standard, built-in TCP / IP protocol stack, enabling the user serial port, Ethernet, wireless network (wifi) interface between the conversions.

Through the HLK-WR02 the traditional serial devices do not need to change any configuration; data can be transmitted through the Internet network. Provide a quick solution for the user's serial devices to transfer data via Ethernet



Picture1.F-structure

## 2 Summarize

### 2.1 Technical Specifications

Table2-1Technical Specifications

Network standard	wireless: IEEE 802.11n、IEEE 802.11g、IEEE 802.11b
	wired: IEEE 802.3、IEEE 802.3u
Wireless transmission rate	11n: maximum up to 150Mbps 11g: maximum up to 54Mbps 11b: maximum up to 11Mbps

Tracks number	1-14
Frequency range	2.4-2.4835G
Emission power	12-15DBM
Interface	WAN LAN, RS232, DC IN,ANTENNA
<b>Antenna</b>	
Antenna type	External Antenna 6DB
<b>Functional Parameters</b>	
WIFI work mode	Client/AP/Router
WDS Function	Support WDS wireless bridge connection
Wireless security	Wireless MAC address filtering
	Wireless security function switch
	64/128/152 bit WEP encryption
	WPA-PSK/WPA2-PSK、 WPA/WPA2 security mechanism
Network management	Remote Web management
	Configuration file import and export
	WEB software upgrade
<b>Serial to Ethernet</b>	
Maximum transmission rate	500000bps
TCP connection	Max connection number>20
UDP connection	Max connection number>20
Serial baud rate	1200~500000bps
<b>Other Parameters</b>	
Status indicator	Status indicator
Environmental standard	Operating temperature: -20-70℃
	Operating humidity: 10%-90%RH (noncondensing)
	Storage temperature: -40-80℃
	Storage humidity: 5%-90%RH (noncondensing)
Additional properties	Frequency bandwidth optional: 20MHz,40MHz,Automatic

## 2.2 Product Outline

The outline of HLK-WR02 serial WIFI server is as follows. Mechanical Dimensions: 85x85x25 mm, not including the antenna.



Fig 2-1 HLK-WR02 Outline

## 2.3 External Interface

HLK-WR02 serial wifisever is a serial-wifi-Ethernet device ,its external interface including RS232,DC IN,LAN,WAN,LED,RST. This section will detail the definition of each interface.

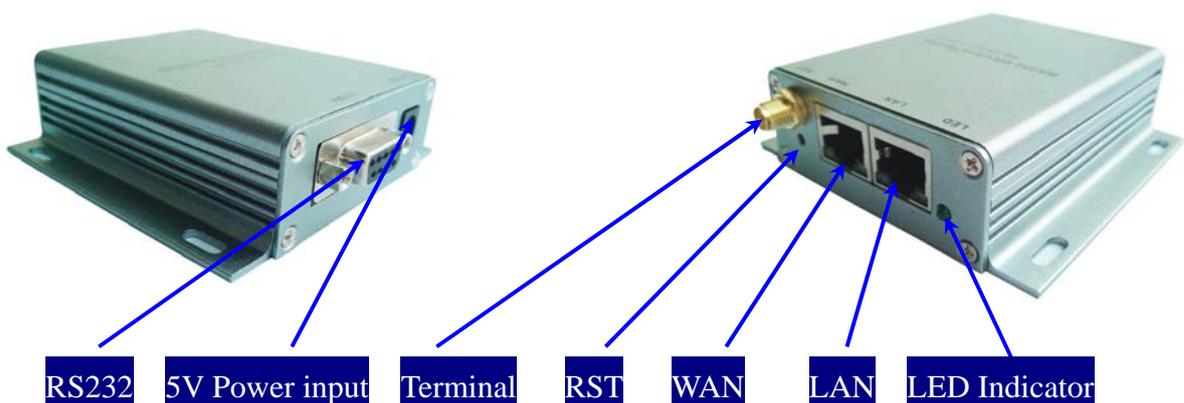


Fig 2-2 HLK-WR02Interface

### 2.3.1 RS232

The following figure shows a schematic diagram of the external interface of RS232. Interface, the definition is as follows:

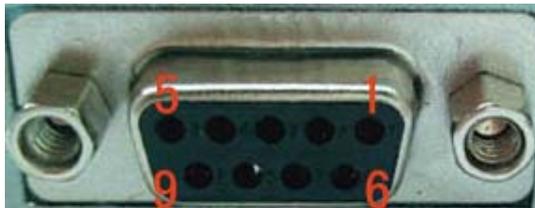
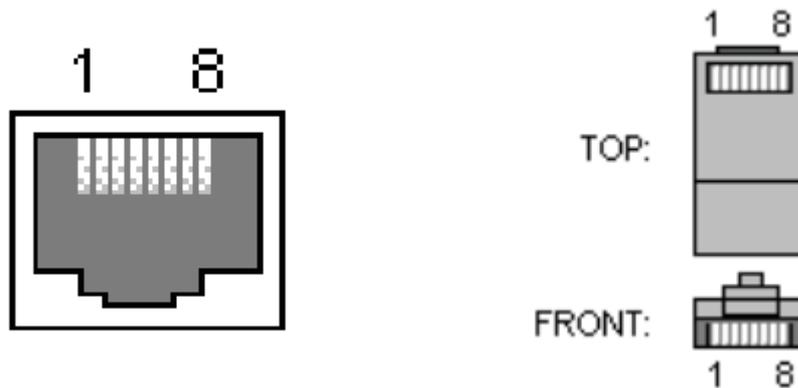


Fig 2-3 RS232 PIN

No	Function	Direction	Explanation
1	N/C	N/C	None
2	RXD	Input	Data reciving input
3	TXD	Output	Data sending output
4	N/C	N/C	None
5	GND	Input	Ground
6	N/C	N/C	None
7	N/C	N/C	None
8	N/C	N/C	None

### 2.3.2 LAN Interface and WAN interface

HLK-WR02 serial wifi server provides two network interface, WAN port and LAN port, the interface is a standard form of RJ-45 interface. RJ-45 interface definition is shown as below:



The following table shows the pin definitions of RJ-45 :

No	function	direction	explain
1	TX+	Output	Transmit Data+
2	TX-	Output	Transmit Data-
3	RX+	Input	Receive Data +
4	N/C	N/C	none
5	N/C	N/C	none
6	RX-	Input	Receive Data -
7	N/C	N/C	None
8	N/C	N/C	None

### 2.3.3 RST Button

RST button is used to reset HLK-WR02 Server to the factory settings.

**METHODS:**When the HLK-WR02 have startup complete,then using sharp object to press the RST button for at least 10 seconds, all parameters of the server can be set to the default value.

### 2.3.4 5V Power Input

Voltage range: 4.5 ~ 5.5V. The default configuration of HLK-WR02 for the power adapter is 5V/1A DC power supply. Power interface: the inner core is positive.

### 2.3.5 Antenna Terminal

Special SMA interface within the outer spiral needle, the interface can be equipped

with 2.4G SMA antenna inside the screw hole special.

### 2.3.6 LED Indicator light

Status indicating:

LED light blink: wifi is ok

LED light off : wifi is not ok

## 3 Networking mode Brief Introduction

This section focuses on describing application of the HLK-WR02. To introduce sorts of related networking scenarios.

### 3.1 Starlike Networking Structure

The most basic network structures of HLK - WR02 serial server is the star network topology. This kind of network topology are also common in the local area network (LAN), a network topology. Its main characteristic is through a network of each workstation nodes in the network equipment concentration equipment (such as a hub or switch) together, are distributed in each node stellate. This kind of network structure is more convenient in the equipment increase or decrease.

The folloing figure describes the Starlike Networking structure:

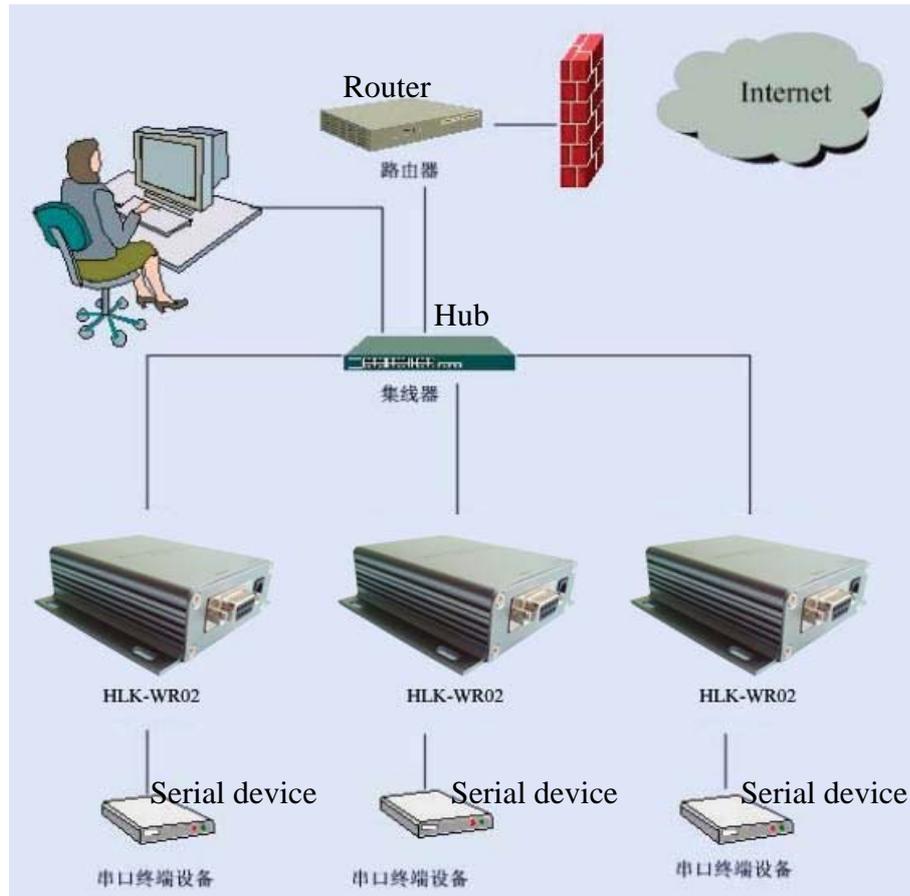


Fig 2-6 Starlike Networking

In this network structure, each terminal work as an independent node to connect to the server. The server can commune with each terminal by way of TCP or UDP. To achieve all of the serial port terminal is connected to the Internet.

### 3.2 Bus Networking structure

The character of Bus networking structure is that all the devices are directly connected to one bus, which is a set of network with low cost. However, all the devices in the network share the bandwidth of the bus, therefore, the network transmission rate will decline along with the increase in user. RS - 485 bus structure is typical sample of this structure. The bus structure diagram is as follows:

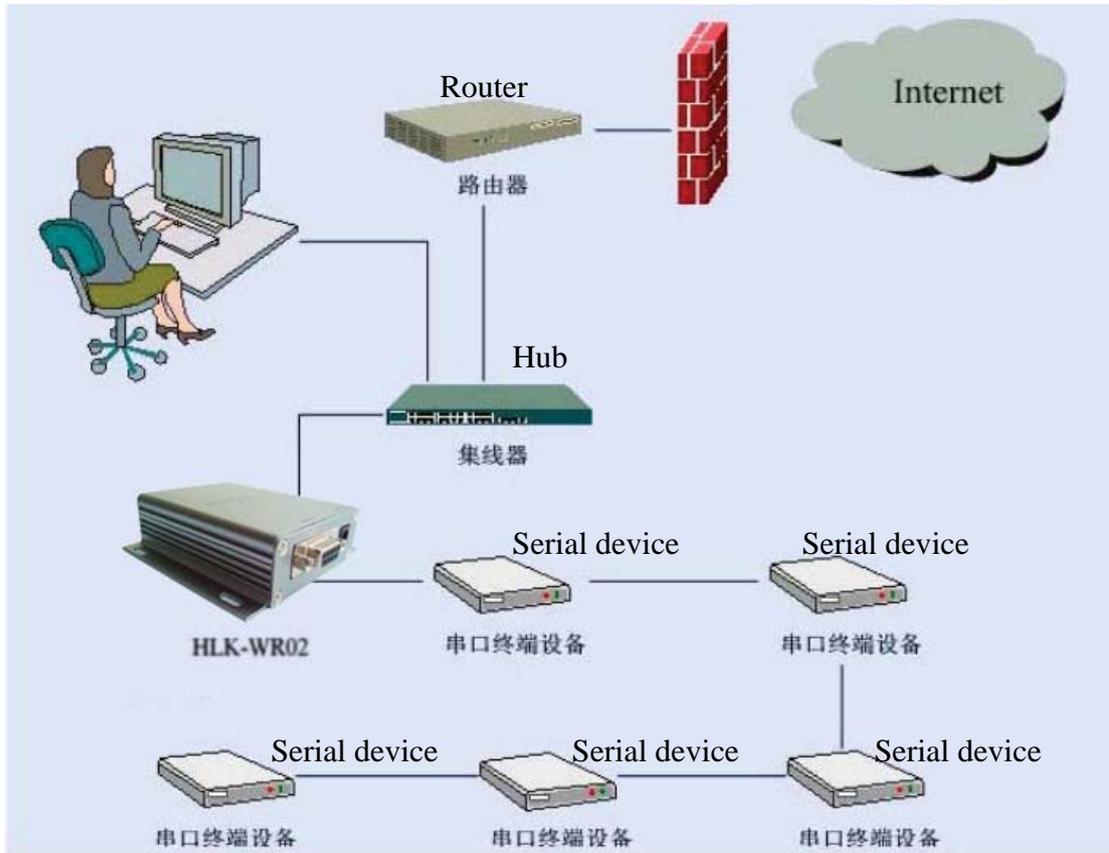
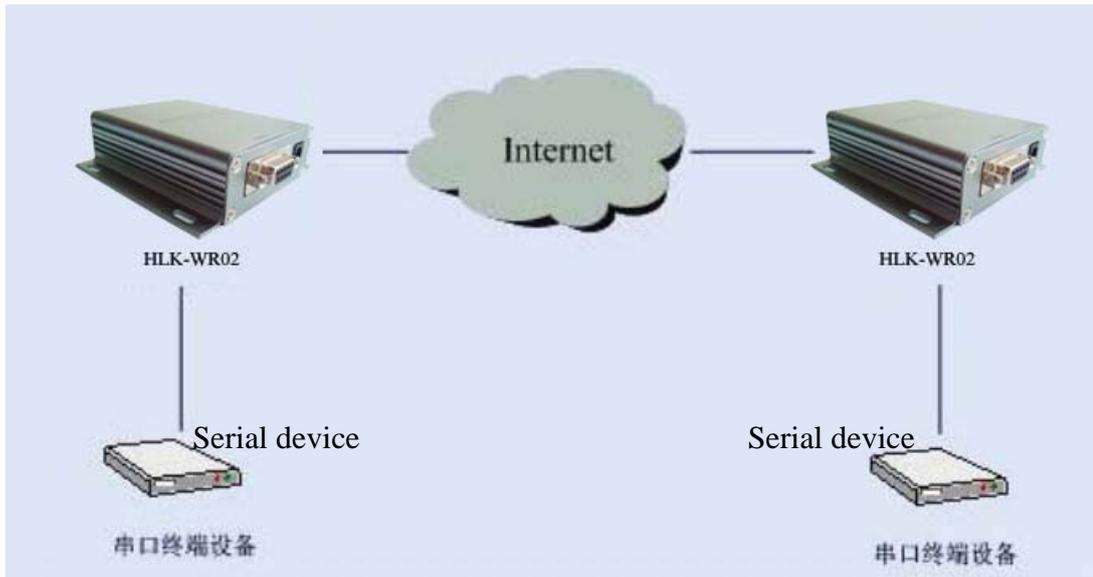


Fig 2-7 Bus Networking structure

In such a network structure, all the equipment through the same cable connect to the server. Network maintenance and extension of relatively is easier, the response speed of the equipment and network transmission rate is less than star bus structure.

### 3.3 Peer-to-peer Networking structure

Using the HLK - WR02, original serial device can be connected to peer-to-peer network structure. The characteristic of this structure is that all the devices in the network status are equal. For user's equipment , there does not exist master-slave relationship or a managed device. All user terminals can be equivalent to send and receive data. The structure diagram is as follows:



Using HLK - WR02 serial server, user's serial devices can be equivalent to connected to the Ethernet. Thus, to achieve peer-to-peer communications through Ethernet.

## 4 Quick start Guide

This section describes how to manage to use HLK-WP02 as soon as possible, users can become familiar with the major operations quickly with the serial server, according to the introduction of this section.

### 4.1 Preparatory work

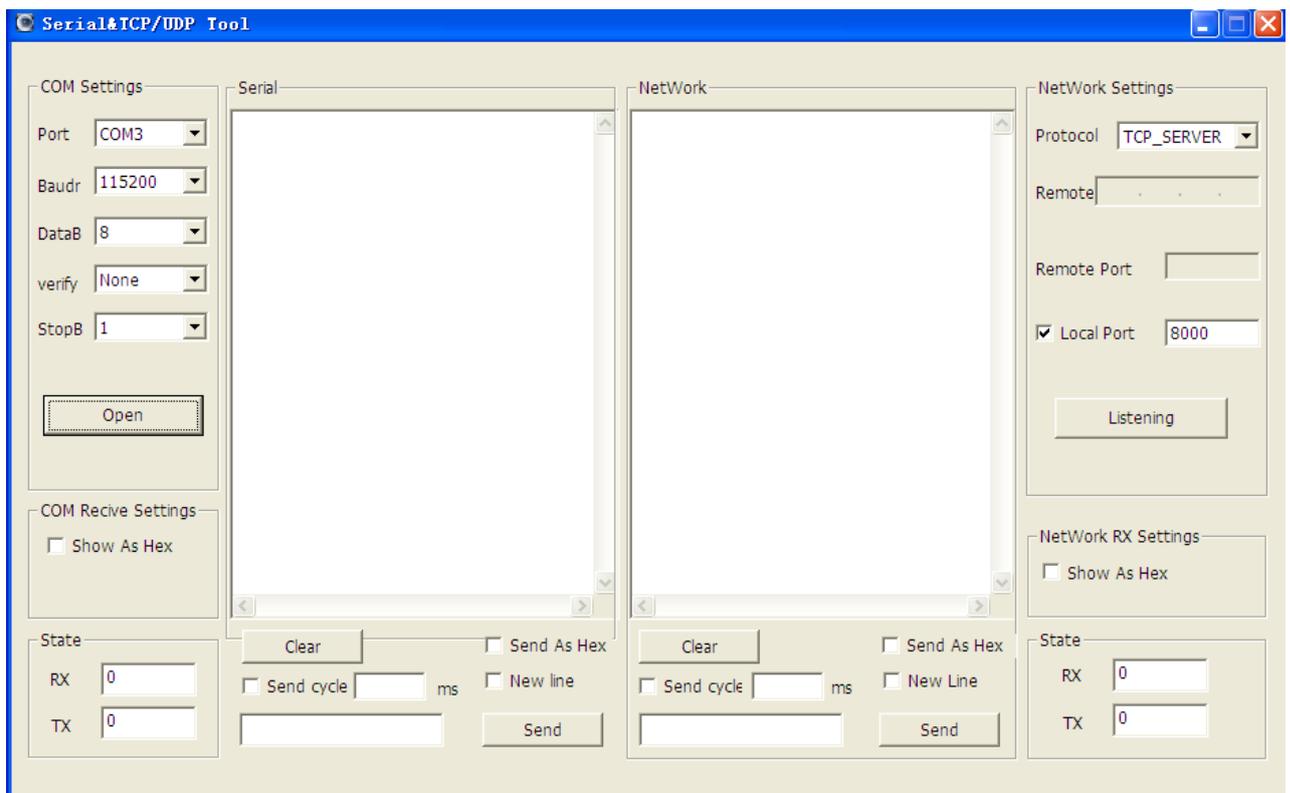
- Hardware
  - HLK-WR02 serial server and matching power supply
  - Ethernet cable
  - Direct serial line
- Software
  - Serial Debug software, such as serial port Debug assistant, serial master and so on.
  - TCP/UDP Debug software

## 4.2 Power-up Test

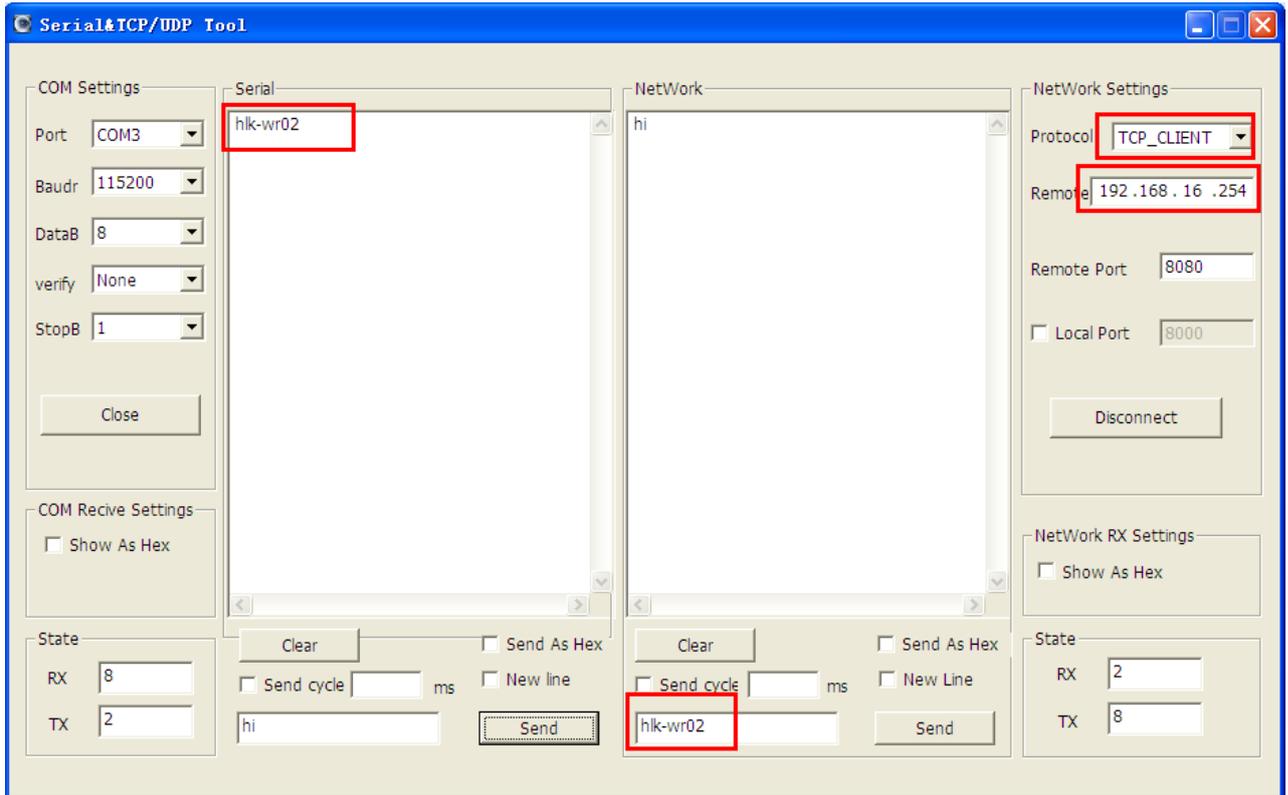
1. Power up the serial server. The Link light will flick at low frequency after power.
2. Connected the serial server with WIFI or network cable (or you can connect the PC and the serial server in the same LAN through hub or router ).
- 3 The IP address of the PC should be set to 192.168.16.X. The default IP address of the Serial Server is 192.168.16.254
- 4 Make sure the PC side can ping the serial server.

## 4.3 Fuction Test

1. Power on the HLK-WR02, Connect the RS232 and the enترنت, make sure you PC can ping 192.168.16.254:
2. Start the serial Debug software, we use Serial&TCP\_UDP Tool.exe in this sample;



3. Start a TCP client like the below:



## 5 Product parameter configuration and instruction

HLK-WR02 serial server has built-in Web Server, users can configure the parameters of the serial server via web pages. Also, you can login to the website to see the current serial server parameter settings.

### 5.1 Serial Server Login

When you have enter the websit, you needs to change the password to avoid non-administrator rewritten it illegally.The default user Name and password of the HLK-WR02 serial server are admin/admin.Please rewrite the passward after first use.



图 4-1 用户登录界面

Note: HLK-WR02 serial server only provide user login password setting. Please keep the rewritten password firmly in mind.

## 5.2 Serial server Parameter inquiry

After passing the IE browser to log in to the serial server, you can see the screen shown below. This page shows the main current operating parameters of serial server.

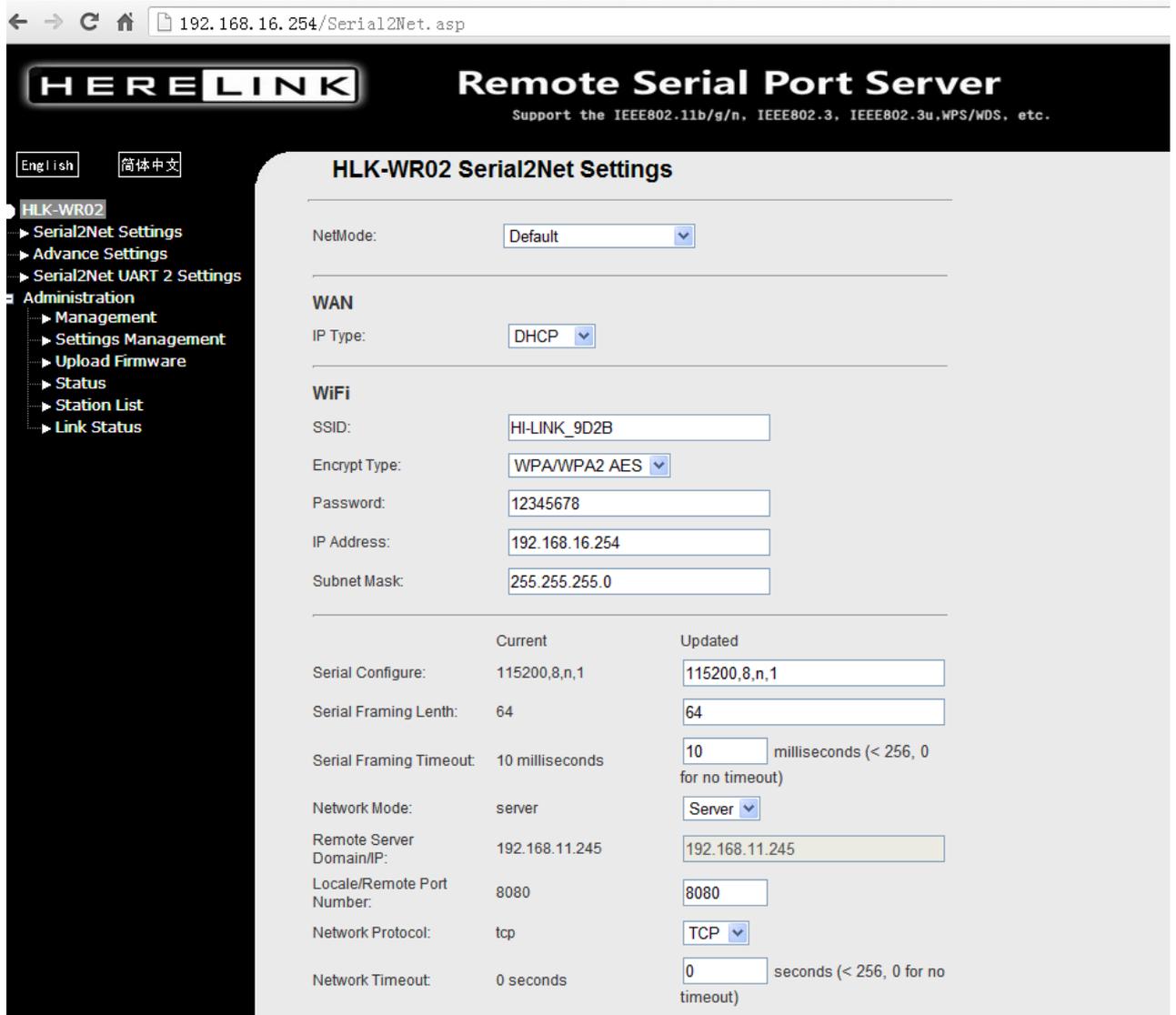


Fig 5-2 WEB Default Parameter

Through the correct module address (default address:http://192.168.16.254),you can access to the WEB configuration page.

The page can be divided into 3 areas:

- 1 Network configuration area
- 2 Serial function configuration areas
- 3 Configuration submit area

### 5.3 WEB network configuration

#### Net mode selection:

Default – default work mode

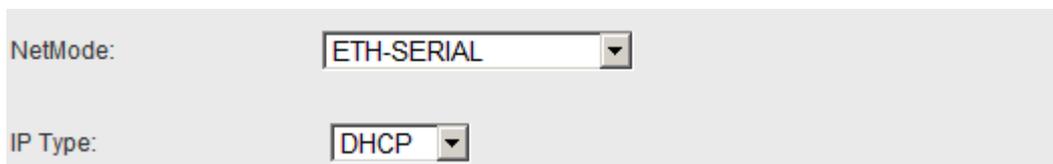
ETH-SERIAL – Serial to Ethernet

WIFI (CLIENT)-SERIAL – serial to WIFI CLIENT

WIFI (AP)-SERIAL) – Serial to WIFI AP

Choose different work mode , the web will show you different page. Mode configuration page is as follows:

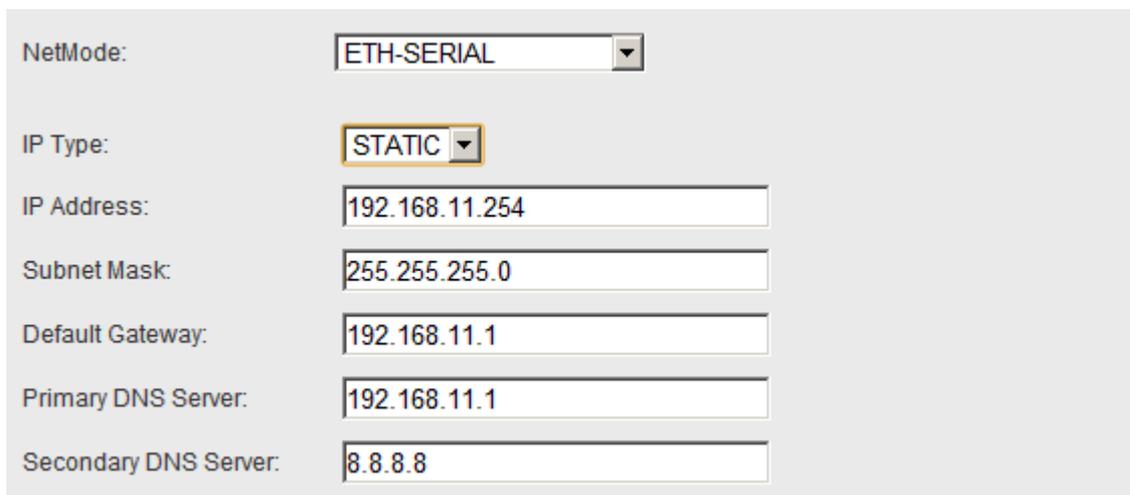
#### 5.3.1 Serial to Ethernet-dynamic ip



The screenshot shows a configuration interface with two dropdown menus. The first dropdown is labeled 'NetMode:' and is set to 'ETH-SERIAL'. The second dropdown is labeled 'IP Type:' and is set to 'DHCP'.

Fig 5.3.1. Serial to Ethernet-dynamic

#### 5.3.2 Serial to Ethernet-static ip



The screenshot shows a configuration interface with several fields. The 'NetMode:' dropdown is set to 'ETH-SERIAL'. The 'IP Type:' dropdown is set to 'STATIC'. Below this, there are text input fields for 'IP Address:' (192.168.11.254), 'Subnet Mask:' (255.255.255.0), 'Default Gateway:' (192.168.11.1), 'Primary DNS Server:' (192.168.11.1), and 'Secondary DNS Server:' (8.8.8.8).

Fig5.3.2. Serial to Ethernet-static

### 5.3.3 Serial to WIFI CLIENT-dynamic ip

NetMode:	WIFI(CLIENT)-SERIAL ▾
SSID:	Hi-Link_
Encrypt Type:	WPA2 AES ▾
Password:	12345678
IP Type:	DHCP ▾

Fig 5.3.3 serial to WIFI CLIENT dynamic

### 5.3.4 Serial to WIFI CLIENT-static ip

NetMode:	WIFI(CLIENT)-SERIAL ▾
SSID:	Hi-Link_
Encrypt Type:	WPA2 AES ▾
Password:	12345678
IP Type:	STATIC ▾
IP Address:	192.168.11.254
Subnet Mask:	255.255.255.0
Default Gateway:	192.168.11.1
Primary DNS Server:	192.168.11.1
Secondary DNS Server:	8.8.8.8

Fig 5.3.4. Serial to WIFI CLIENT-static

### 5.3.5 Serial to WIFI AP

NetMode:	<input type="text" value="WIFI(AP)-SERIAL"/>
SSID:	<input type="text" value="Hi-Link_"/>
Encrypt Type:	<input type="text" value="WPA2 AES"/>
Password:	<input type="text" value="12345678"/>
IP Address:	<input type="text" value="192.168.11.254"/>
Subnet Mask:	<input type="text" value="255.255.255.0"/>

Chart5.3.5. Serial to WIFI AP

### 5.4 WEB serial configuration

Serial Web configuration page (Serial2Net.asp) is as follows:

#### Serial Settings

	Current	Updated
Serial Configure:	115200,8,n,1	<input type="text" value="115200,8,n,1"/>
Serial Framing Lenth:	64	<input type="text" value="64"/>
Serial Framing Timeout:	10 milliseconds	<input type="text" value="10"/> milliseconds (< 256, 0 for no timeout)
Network Mode:	client	<input type="text" value="Client"/>
Remote Server Domain/IP:	192.168.11.245	<input type="text" value="192.168.11.245"/>
Locale/Remote Port Number:	8080	<input type="text" value="8080"/>
Network Protocol:	udp	<input type="text" value="UDP"/>
Network Timeout:	0 seconds	<input type="text" value="0"/> seconds (< 256, 0 for no timeout)
		<input type="button" value="Submit"/>

**Current** shows the current configuration , **Updated** shows the current revision parameters. **Submit** submit the revision.

**Serial Configure:** Serial configuration format: Baud rate, data bits, parity bit, stop bit.

For example: "115200,8,n,1".

**Serial Framing Length:** The Length of Serial Framing

**Serial Framing Timeout:** The time of Serial Framing

**Network Mode:** choose Client、Server or none。

**Remote Server Domain/IP:** Remote Server Domain/IP address

For example: 192.168.11.245 or [www.hlktech.com](http://www.hlktech.com) .

**Local/Remote Port Number:** The specified parameter is not the same under the different network modes. Client specifies the port number on the remote, Server specified local port number.

**Network Protocol:** Use tcp or udp Protocol

**Network Timeout:** Under the server network mode, no data transmission within the timeout period, the connection will be disconnected. 0 specifies never disconnected.

## 5.5 Submitting Alteration

Click the button 'Apply' to submit the configuration of the current page. If some parameters of the network have changed, the submission process may take about 25 seconds. If you only modify the serial functional configuration, the submission process will be completed soon.

Click the button 'Cancel' to reload the page, the modified configuration will be lost.

## 6 Function Description

The module can be divided into four major modes: default mode, serial to Ethernet, serial to WIFI CLIENT and serial to WIFI AP.

## 6.1 Serial to Ethernet

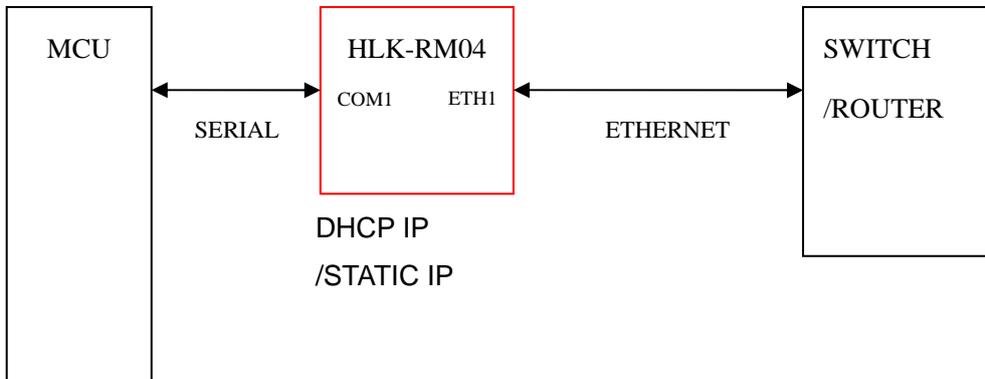


Fig6.1.serial to Ethernet model

(ETH1 works as WAN, ETH2 works as LAN.)

In this mode, ETH1 enable, WIFI, ETH2 function close. Through the appropriate settings, the data between COM1 and ETH1 network can achieve mutual conversion.

Ethernet can be configured as dynamic IP address (DHCP), can also be configured as static IP address (STATIC).

## 6.2 Serial to WIFI CLIENT

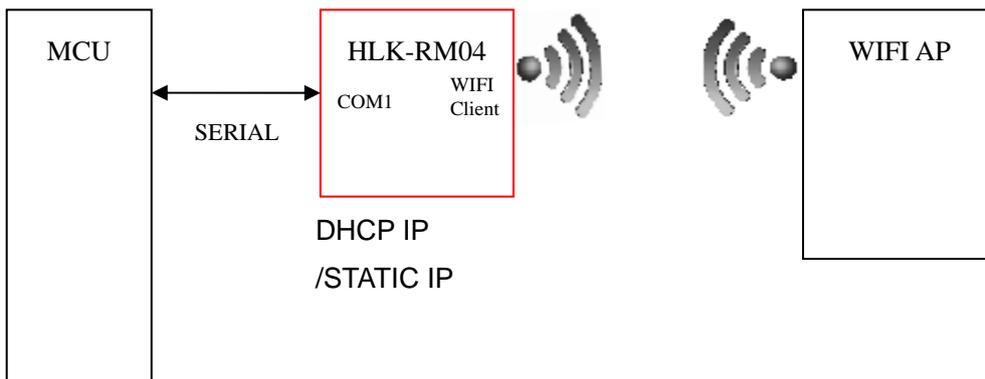


Fig6.2..Serial to WIFI CLIENT model

(ETH1 works as WAN, ETH2 works as LAN.)

In this mode, WIFI enable, module works in the client mode, ETH1, ETH2 function close. Through the appropriate settings, the data between COM1 and WIFI network can achieve mutual conversion.

WIFI CLIENT can be configured as dynamic IP address (DHCP), can also be configured as static IP address (STATIC).

WIFI safety: support all encryption methods at present.

### 6.3 Serial to WIFI AP

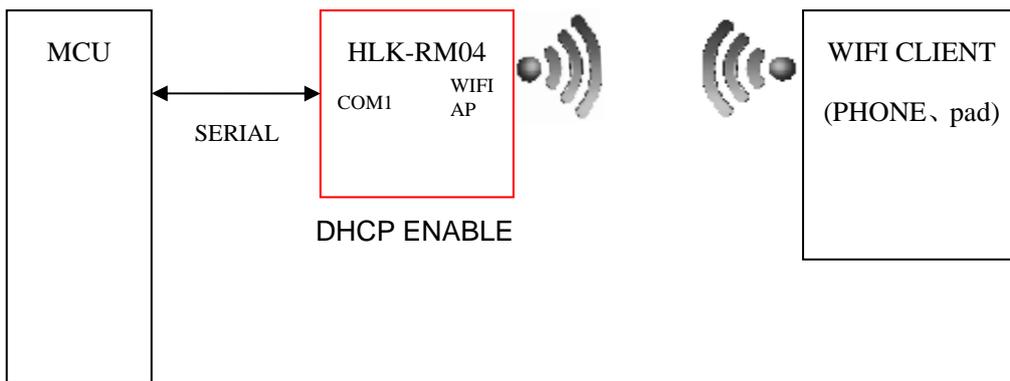


Fig6.3.. Serial to WIFI AP model

(ETH1 works as WAN, ETH2 works as LAN.)

In this mode, WIFI enable, module works in the AP mode, ETH1, ETH2 function close. Through the appropriate settings, the data between COM1 and WIFI network can achieve mutual conversion.

WIFI safety: support all encryption methods at present.

In this mode, WIFI device can connect with the module and become the device under WIFI LAN.

## 6.4 Default mode

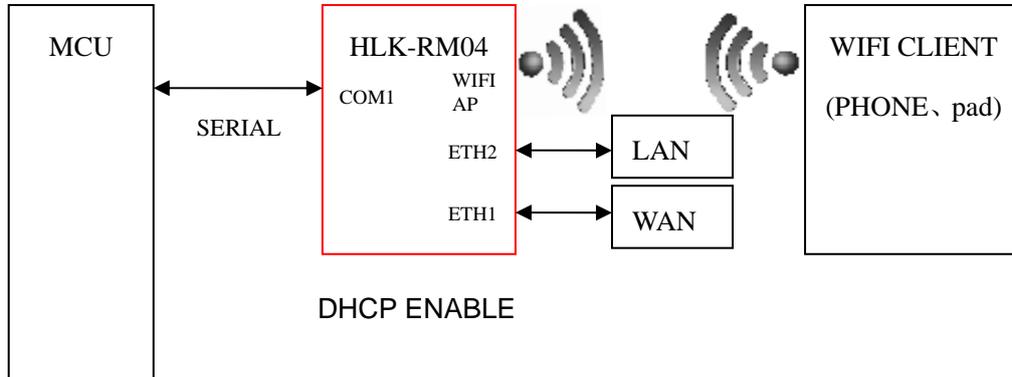


Fig6.4..Default mode model

In this mode, WIFI enable, module works in the AP mode, ETH1, ETH2 function enable. ETH1 works as WAN, ETH2 works as LAN. Through the appropriate settings, the data between COM1 and network can achieve mutual conversion.

WIFI safety: support all encryption methods at present.

In this mode, WIFI device can connect with the module and become the device under WIFI LAN.

WAN default IP is dynamic IP address. LAN, WIFI for the same local area network, enabled by default DHCP server.

There are four mode for serial-net conversion: TCP Server、TCP Clinet、UDP Server、UDP Client.

### TCP Server

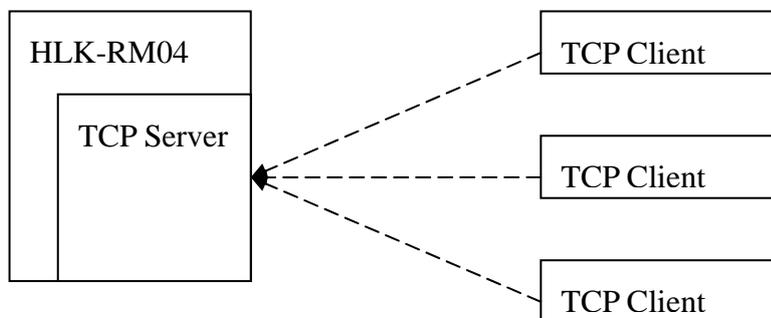


Fig6.4.1.TCP Server

In this mode, the module is listening on the specified port, waiting for TCP Client connection, if connected, all TCP data is sent directly to the serial port end, the data of

the serial end sent to TCP Client end

### TCP Client

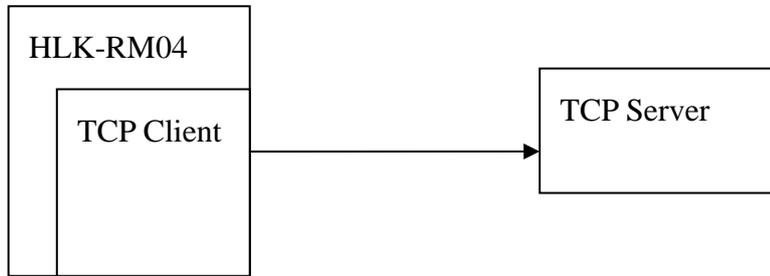


Fig6.4.2..TCP Client

In this mode, the module is connected to the specified domain / IP port. All the data sent from the TCP Server-side end will be sent directly to the serial port, the data from the serial end sent to the TCP Server-side. Abnormal network disconnect will cause the module active reconnect. TCP Active reconnection function enable, TCP Server initiative disconnected, the module will immediately take the initiative to reconnect, and otherwise the module will not reconnect.

### UDP Server

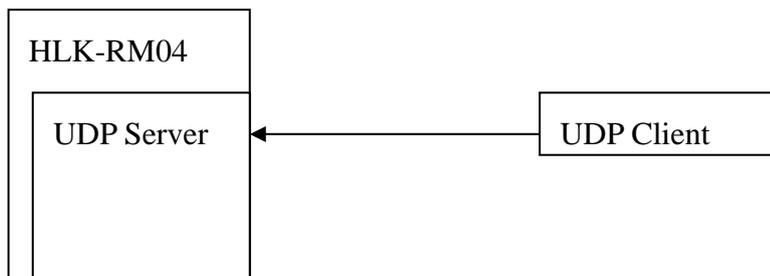


Fig6.4.3.UDP Server

In this mode, the module opens the local designated port, once received the data sent to the port, the module will send the data to the serial port, and record the remote ip, port. The module will record only the last information on the remote connection. Serial received data will be sent directly to the recorded remote ip, port.

## UDP Client

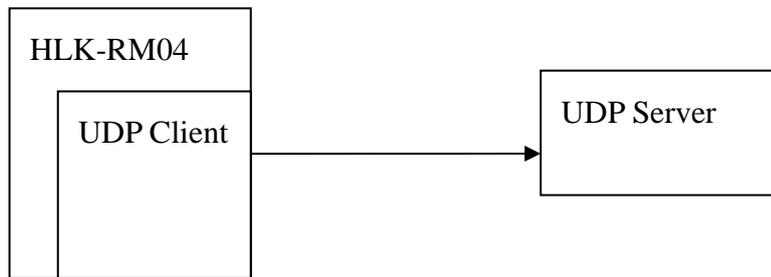


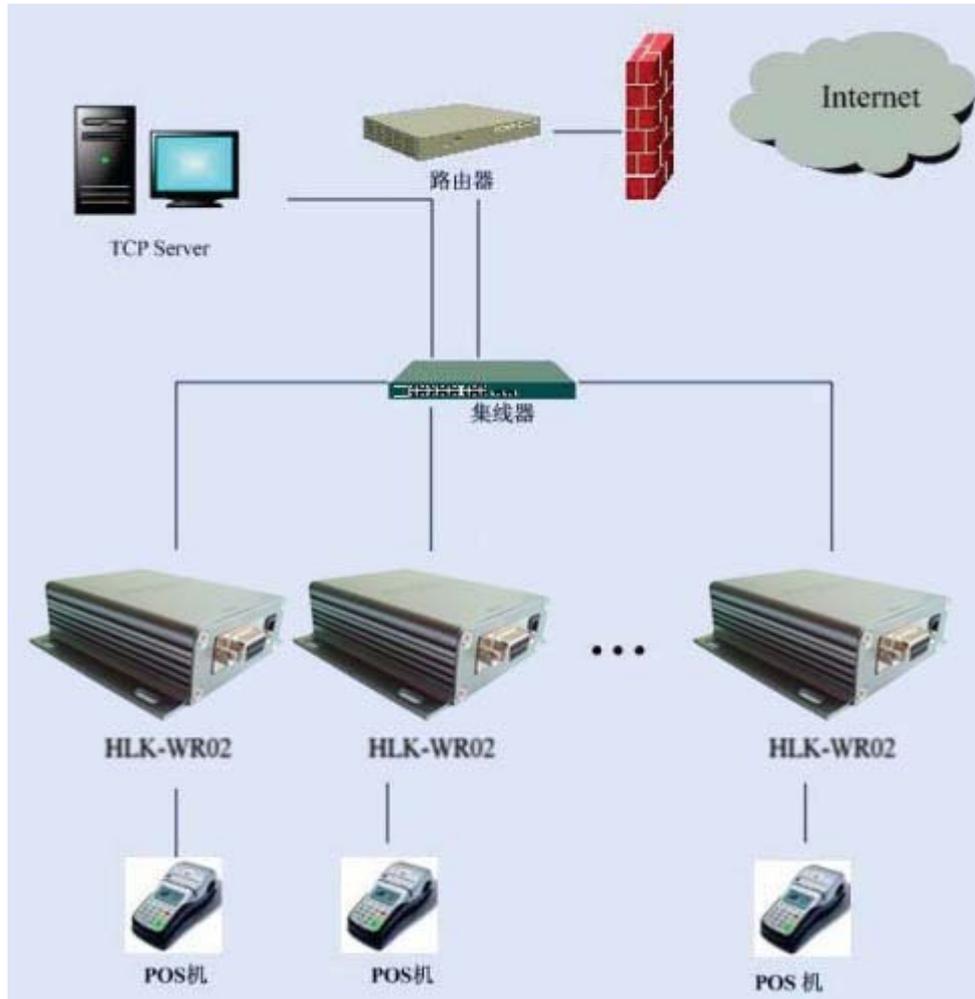
Fig6.4.4..UDP Client

In this mode, the module directly sends the serial data to the specified ip, port. The serial data returned from the server-side will be distributed to serial port.

## 7 Typical application example

### 7.1 Active Serial devices connected to the Internet

#### 7.1.1 Application scenarios



Active serial equipment networking refers to a way which the equipment initiate the connection and process the data interaction (upload or download) compared with a backend server. Typical active devices, such as POS machine, etc., started to connect after the completion of the backend server as soon as possible in each credit card transaction, and upload data. Active serial equipment networking topology structure as shown in the above. Among them, the backend Server work as a TCP Server , the device access to the network via a serial port Server , also as a TCP Client end.

### 7.1.2 Reference setting (Using Access Control Attendance Machine as an example)

- Network Settings
  - ◆ DHCP enable
  - ◆ Static IP address is available also
- Operation mode
  - ◆ Protocol Type: TCP > C/S Mode: Client
  - ◆ Server IP Address: backend server IP address, such as 192.168.16.254
  - ◆ Port Number: backend server port number, such as 8080

### 7.1.3 Reference Setting figure

**HERE LINK Remote Serial Port Server**  
Support the IEEE802.11b/g/n, IEEE802.3, IEEE802.3u,WPS/WDS, etc.

English 简体中文

- HLK-WR02
  - Serial2Net Settings
  - Advance Settings
  - Serial2Net UART 2 Settings
  - Administration
    - Management
    - Settings Management
    - Upload Firmware
    - Status
    - Station List
    - Link Status

NetMode: Default

**WAN**

IP Type: DHCP

**WiFi**

SSID: HI-LINK\_9D2B

Encrypt Type: WPA/WPA2 AES

Password: 12345678

IP Address: 192.168.16.254

Subnet Mask: 255.255.255.0

	Current	Updated
Serial Configure:	115200,8,n,1	115200,8,n,1
Serial Framing Lenth:	64	64
Serial Framing Timeout:	10 milliseconds	10 milliseconds (< 256, 0 for no timeout)
Network Mode:	server	Server
Remote Server Domain/IP:	192.168.11.245	192.168.11.245
Locale/Remote Port Number:	8080	8080
Network Protocol:	tcp	TCP
Network Timeout:	0 seconds	0 seconds (< 256, 0 for no timeout)

Apply Cancel

Fig 7.1.3 Reference Config Parameter

## 7.2 Passive serial devices connected to the Internet

### 7.2.1 Application scenarios

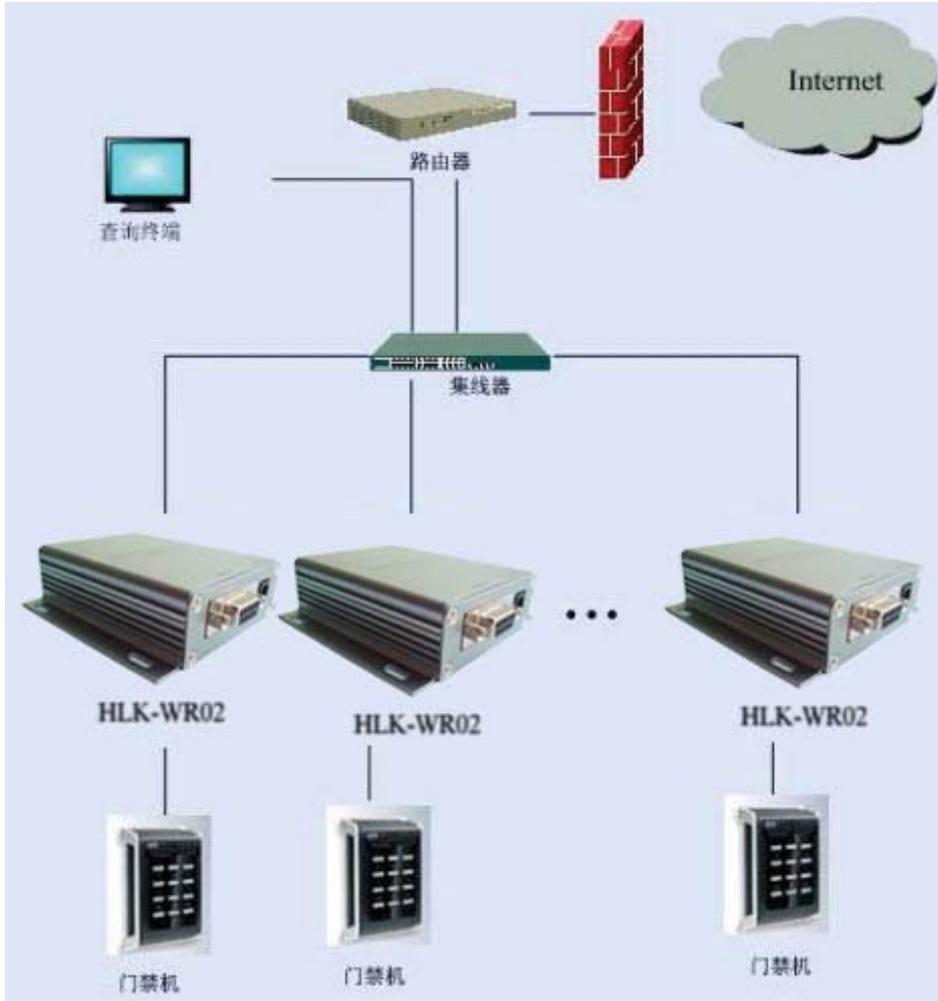


图 7-3 被动型串口设备联网

Passive serial device networking refers to a way in which all equipment in the system has been waiting for connection in a passive state, only the background server initiate to connect with equipment, and request or download data. Some typical applications, such as sensor networks, entrance guard controller and so on, each sensor terminal or entrance guard controller is collecting data all the time in realtime. The data collected did not upload at once, but temporarily stored in the device. While the backend server periodically connect the equipment every once in a while actively, and request to upload or download data. At this time, The backend Server work as a TCP Client , while the equipment is a TCP Server end.

At this point, if the customer uses virtual uart software, we suggest that the customer can

set the network to active network model introduced in section 5.1 , keep the equipment online for a long time . In case the uart software in the original user on the server side can real-time inspection to the existence of the uart equipment.

Reference setting (Take sensor as an example)

- Networking Setting
  - ◆ IP address: 192.168.2.X
  - ◆ Mask: 255.255.255.0
  - ◆ Gateway: 192.168.2.1
  - ◆ DNS: 192.168.2.1
- Operation mode setting
  - ◆ Start Automatic operation mode
  - ◆ Protocol Type: TCP
  - ◆ C/S mode: server
  - ◆ Port No.:60000
  - ◆ Time Out: 120

### 7.3 Equivalent serial devices connected to the Internet

#### 7.3.1 Application scenarios

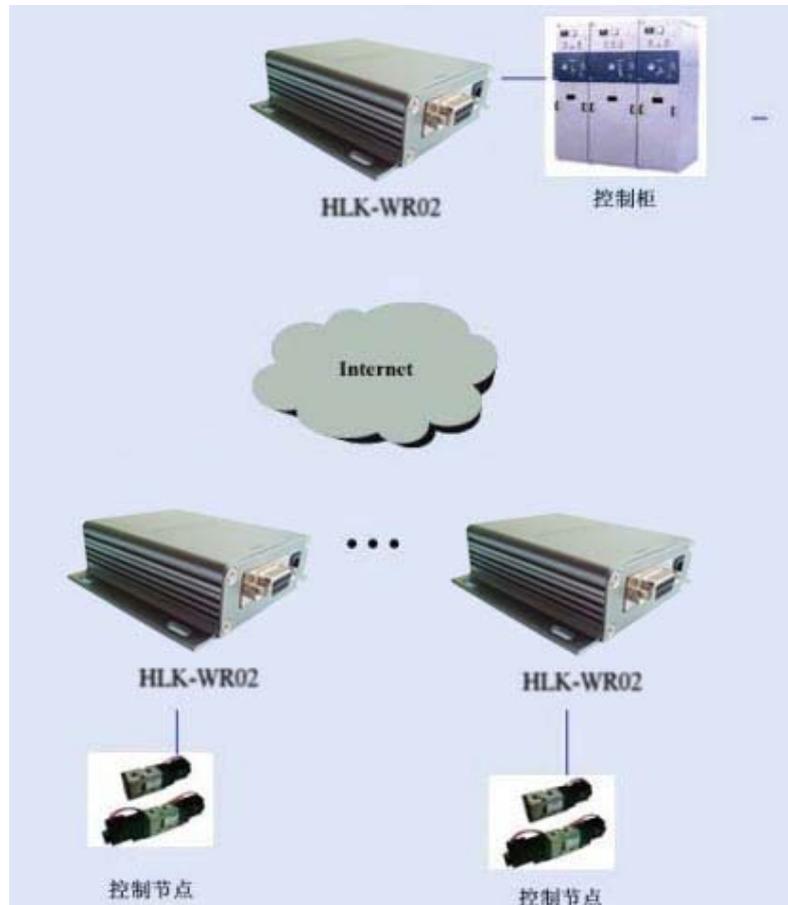


图 7-4 对等串口设备联网

Peer-to-peer networking refers to all the equipment in the system make up a private network to communicate with each other, instead of a PC as a server. All of the devices are connected via a serial port or 485 bus. This kind of networking mode all the equipment at any time are likely to send data. Typical application scenario is the direct connection between the controller and each control node in the industrial field. This in the network can use several uart server to connect, the parameter configuration of the equipment.

#### 7.3.2 Reference setting

##### Device 1

##### ◆ Network setting

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

◆ Operation setting

- Protocol Type: TCP
- C/S mode: server
- Port No.: 8080
- Timeout: 0

## Device 2

◆ Network Settings

- IP address: 192.168.0.2
- Mask: 255.255.255.0
- Gateway: 192.168.0.1
- DNS address: 192.168.0.1

◆ Operation mode

- Start automatic operation mode
- Protocol type: TCP
- C/S mode: client
- Server address: 192.168.0.1
- Port No.: 8080

## Service 3

◆ Network settings

- IP address: 192.168.0.3
- Mask: 255.255.255.0
- Gateway: 192.168.0.1
- DNS : 192.168.0.1

◆ Operation mode setting

- Start Automatic operation mode
- Protocol Type: TCP

- C/S mode: Client
- Server Address: 192.168.0.1
- Port No: 8080

## 8 Restore Factory Value

1. Through the Web Page.

LogIn the web page 192.168.16.254/Serial2Net.asp, Click the ‘load default’ button as below,the server can restore to factoty value then.

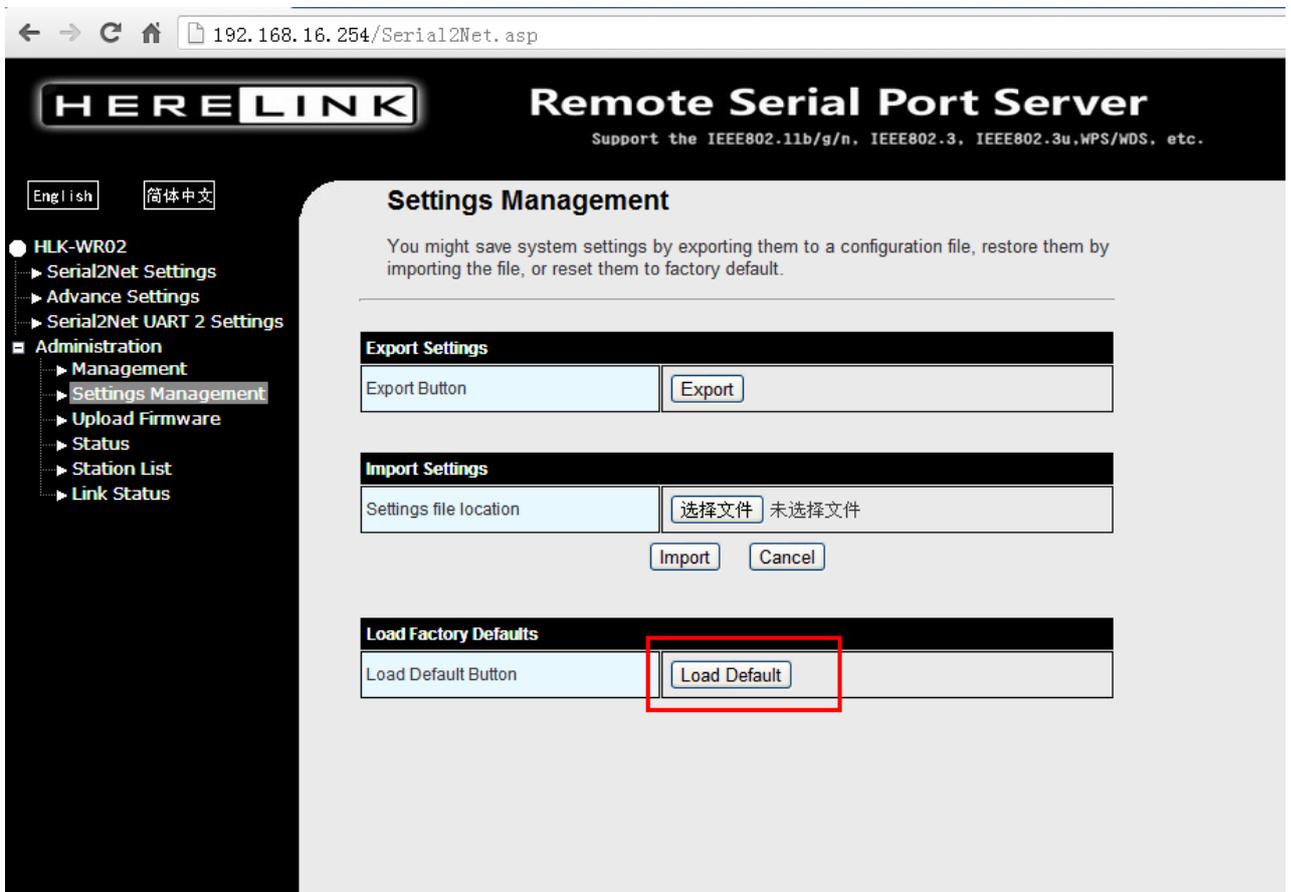


Fig 8-1Load Default

2. You can also manually restore factory Value.

There is a botton under the antenna of the serial server HLK-WR02, press the button more than six seconds, until the LED is on, you can reset the value for the factory.

## 9 Firmware upgrade

1. Restore the factory value.

Caution:

This device complies with Part 15 of the FCC rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or change to this equipment. Such modifications or change could void the user's authority to operate the equipment.

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement.

To maintain compliance with FCC's RF exposure guidelines, this equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body.