CONVERTER RS-485/ ETHERNET

PD9

SERVICE MANUAL

Contents

1. Quick Start 3
1.1. Hardware Testing Environment 3
1.1.1. Hardware Prepare 3
1.1.2. Hardware Connection 4
1.2. Network Test Environment 4
1.3. Default Parameter 5
2. Brief Introduction 5
2.1. Introduction 5
2.2. Features 5
2.3. Basic Parameter 6
3. Hardware Parameters 8
4. Product Function 8
4.1. Network Basic Function 9
4.1.1. Static IP/DHCP/Subnet Masks/Gateway 9
4.1.2. DNS Server Address 10
4.1.3. Webserver 11
4.1.4. Restore to Factory Set 11
4.1.5. Firmware Upgrade 12
4.2. Socket Communication 13
4.2.1. TCP Client Mode 14
4.2.2. TCP Server Mode 16
4.2.3. UDP Client Mode 18
4.2.4. UDP Server Mode 19
4.2.5. HTTPD Client 20
4.3. Impersistent Connection (TCP Short Link) 21
4.4. Clean the buffer data 22
4.5. Modbus Gateway 23
4.6. Other functions 24
4.6.1. Heartbeat Packet Function 24
4.6.2. Registration Package Packet Function 25
4.6.3. The number of the client connected 26
4.6.4. Serial Port Packaging Mechanism 27
4.6.5. Flow Calculation 27
5. Setting Protocol 28
5.1. Network Setting Protocol 28
5.1.1. Set Parameter Process 28
5.1.2. Setting Command Content 28
5.1.3. Commands' Return Content 34
5.1.4. Listening Report Method 37
6. Parameter Configuration 37
6.1. Software Configuration 37
6.2. Webpage Configuration 40

1. Quick Start

Module PD9 is used to realize data transparent transmission between Ethernet interface and the serial port and the protocol converter. The serial port is the RS485 data and in the Ethernet interface, it is the net data package. Users can configure the parameters via the webpage or set-up software, set one time and save forever

1.1. Hardware Testing Environment

1.1.1. Hardware Prepare

- DC5V 1A power adapter (delivered in set)
- Network cable
- PD9 (delivered in set)
- PC

F9ig 1.1.1-1 Hardware Prepare

1. Testing Aim

- Have a quick recognize to the PD9 and have a basic recognition
- Testing is there is any issue in the product.

2. Data Direction

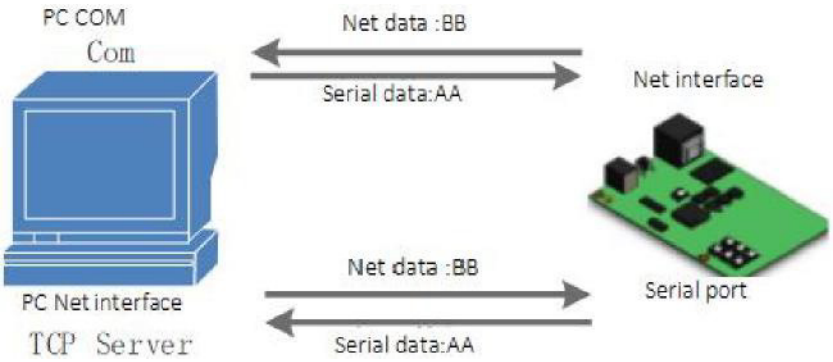


Fig. 1.1.1-2 Data Direction

1.1.2. Hardware Connection

Fig. 1.1.2-1Hardware Connection

PD9 connects to PC by serial port and RJ45 Port. Then power on PD9 with our AC adapter.The above picture will show you the connection.

Notes:

- Power adapter (5V) and connection cable are provided in delivery set.
- RS485 is involved.
- PCs in above picture is the same one.

1.2. Network Test Environment

Please check PC setting after hardware connection.

1) Disable PC Firewall and anti-virus software.

2) Disable the network card nothing to do with testing and just leave one local connection.

3) As for PD9 connect with PC directly, should set static IP for PC, which in the same network segment with PD9, like 192.168.0.201.

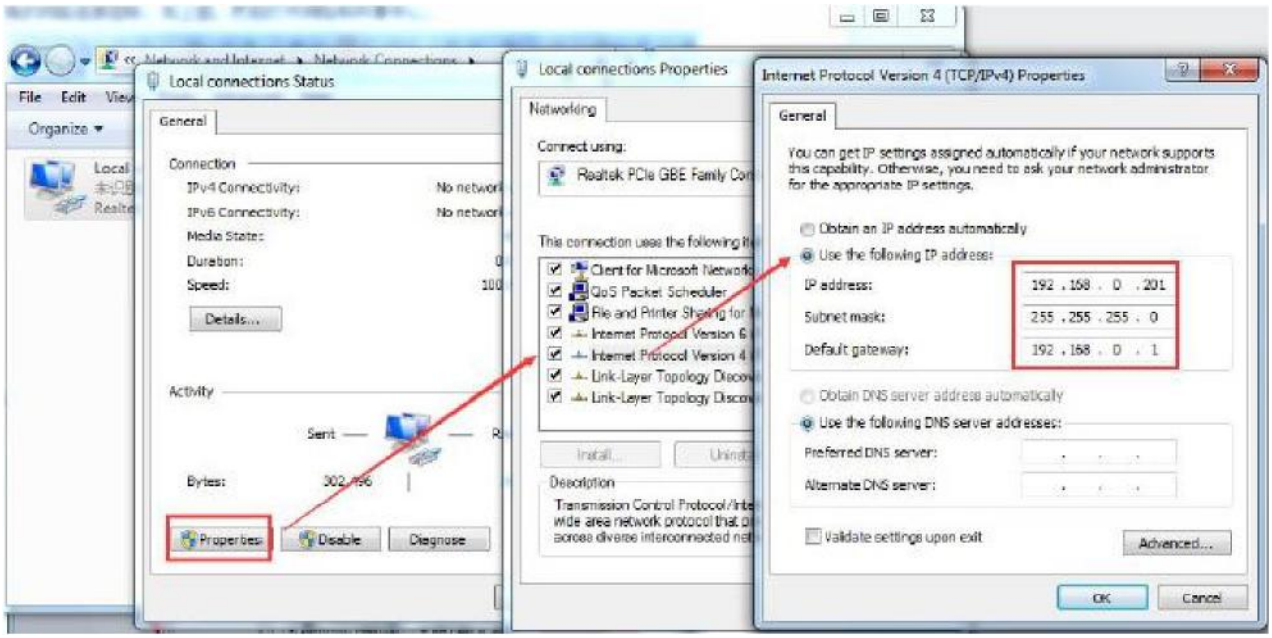


Fig.1.2- 1 PC Local Connection Configuration

1.3. Default Parameter

Default parameter is as below:

Item	Content
User name	admin
Password	admin
IP address	192.168.0.7
Subnet mask	255.255.255.0
Default gateway	192.168.0.1
Default work mode of port	TCP Client
Default remote port	8324
Default local port of port	0
Remote IP address	192.168.0.201
Baud Rate	115200
Parity bit/Data bit/Stop bit	None/8/1

Table 1.3-1 Default Parameters

2. Brief Introduction

2.1. Introduction

PD9 Modbus RS485 to Ethernet converter can realize bidirectional transparent transmission between RS485 and Ethernet. It carries ARM processor, low power, fast speed, high stability. Via web-page or software, rs485 to Ethernet Converter can realize serial data and TCP/IP data package transparent transmission.

2.2. Features

- ARM base on Cortex-M0 kernel, and reliable TCP/IP protocol stack
- Industrial working temperature range from -40C ~85C
- Auto-MDI/MDIX, RJ45 port with 10/100Mbps
- Support TCP server, TCP client, UDP server, UDP client, HTTPD client and modbus TCP work mode
- Serial port baud rate can be set from 600bps to 460.8Kbps, parity: None, Odd, Even, Mark, Space

- Supports self-defined heartbeat package, keep the connection can never crash
- Supports self-defined registration package, check the station of the connection, which also can used as the self-defined package head. Users can use the MAC as the registration package.
- Under the TCP server mode, the number of the client connected to the server can be set from 1-8, default 4. the IP of the client connected can be dispaly. Each connection calculates the data received/transmitted.
- Under the TCP server mode, if the number of the clients number is 8, kick the old one or not can be set.
- Configure the parameters via the webpage, AT command, serial protocol and net protocol, provides setting protocol, and users can put into their software.
- Supports TCP client short connection, the disconnection interval can be set.
- Supports timeout restart(no data and restart), the restart time can be set.
- Before the TCP connection build, client the buffer data or not can be set
- Supports DHCP, obtain the IP automatically.
- The global unique MAC address bought from IEEE, also users can define MAC address
- Supports DNS function, and analyze the domain name. The DNS server address can be set.
- Upgrade firmware via network.
- Supports hardware and software restore default settings
- Running across the gateway, converter and the router
- Running in LAN or in access the external net.

2.3. Basic Parameter

Classify	Parameter	Value
Hardware Parameters	Input Voltage	DC5～36V
	Working Current	130mA@5V
	Net interface format	RH45,10/1000Mbps
	Serial baud rate	600~460.8K(bps)
	Serial port	RS485*1
Software parameters	Net protocol	IPV4, TCP/UDP, ARP, ICMP, IPV4
	IP access way	Static IP, DHCP
	DDNS	supports

	User Configuring	Software configuring and webpage configuring AT command
	Transmit way	TCP server, TCP client, UDP server, UDP client
	Similar RFC2217	support
	HTTPD client	support
	TCP server	At most support 8 TCP client to connection
	Net buffer	Send:16Kbyte; receive:4Kbyte
	Serial buffer	receive:1Kbyte
	Average delay	<10ms
	Related software	set-up software
	Packaging mechanism	4 bytes packaging time, 1024 bytes packaging length.
Others	Certification	CE, FCC, ROHS
	Protection	1.5KV electromagnetic isolation
	Dimension	71.0*60.0*25.0mm(L*W*H)
	Operating Temp.	-40～+85°C
	Storage Temp	-40~105°C
	Operating Humidity	5～95%RH
	Storage Humidity	5～95%RH
	Packaging	Electrostatic bubble

Fig. 2.3-1 Basic Parameters

3. Hardware Parameters

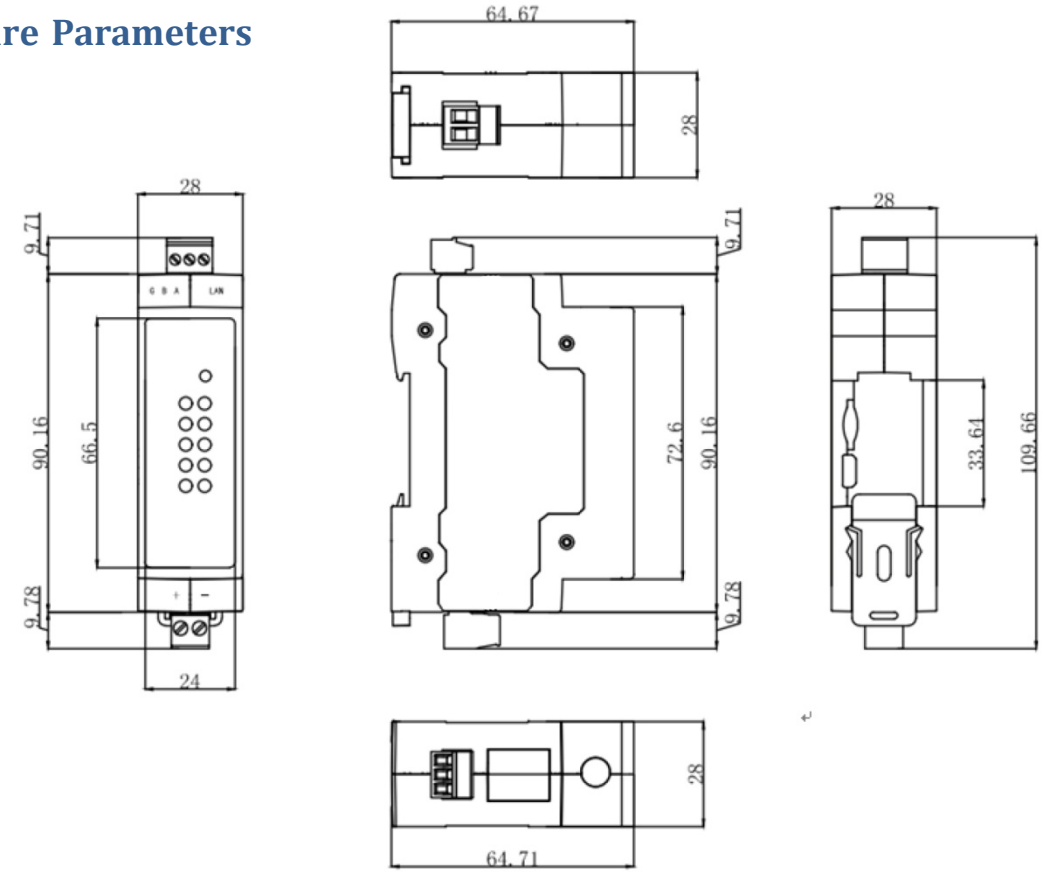


Fig. 3-1 Dimension

4. Product Function

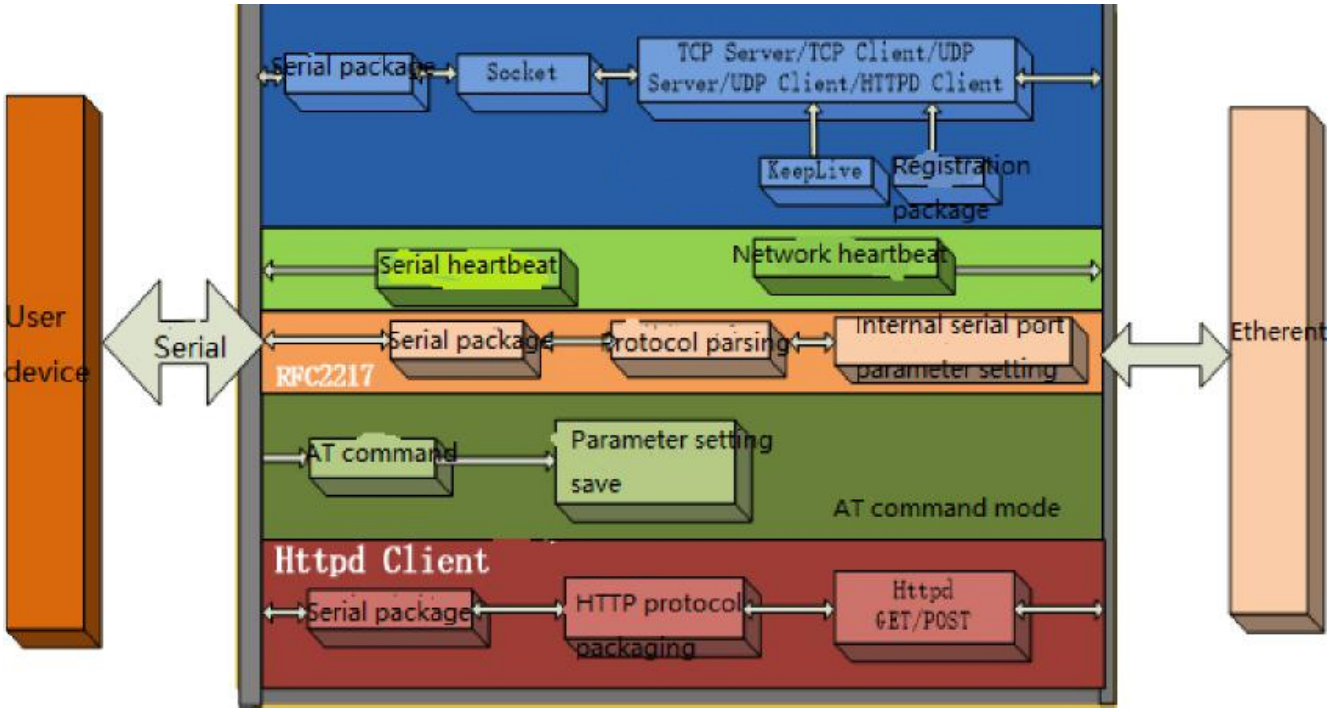


Fig. 4-1 PD9 Function Diagram

4.1. Network Basic Function

4.1.1. Static IP/DHCP/Subnet Masks/Gateway

1. The IP of the module is the symbol in the LAN, which can be distinguish from the other device.

- Static IP

Manual setting the static IP, meanwhile please writing the IP, subnet and gateway. Static IP adjust to the scenario that P and the device correspond.

Advantage: the device access to the IP that can not distribute can searched by the broadcast

Disadvantage:different segment of the different LAN need to configuring.

- DHCP

The DHCP is to obtain the IP, gateway and DNS from the gateway automatically to reduce the tedious step for setting the IP. Adjust to the scenario there is no requirement to the IP.

Advantage: communicate directly when access router which can distribute the DHCP to reduce the tedious step to set the IP and the subnet masks.

Disadvantage:access the net without DHCP, just like connect the PC directly, the module can not work normally.

Related AT command:

Command name	Instr
AT+WANN	Setting and query the IP access way, subnet and the gateway parameters of the PD9

Table 4.1.1-1 Related AT Command

2. Subnet masks: to mark which subnet is the host in from the IP address bites and which bites mark the host masks.

3. Gateway: IP address of the router in the LAN, if there is something wrong with the setting, user will can not access the external net. If user do not use the router and so on device, keep default and do not set.

4. Setting software.

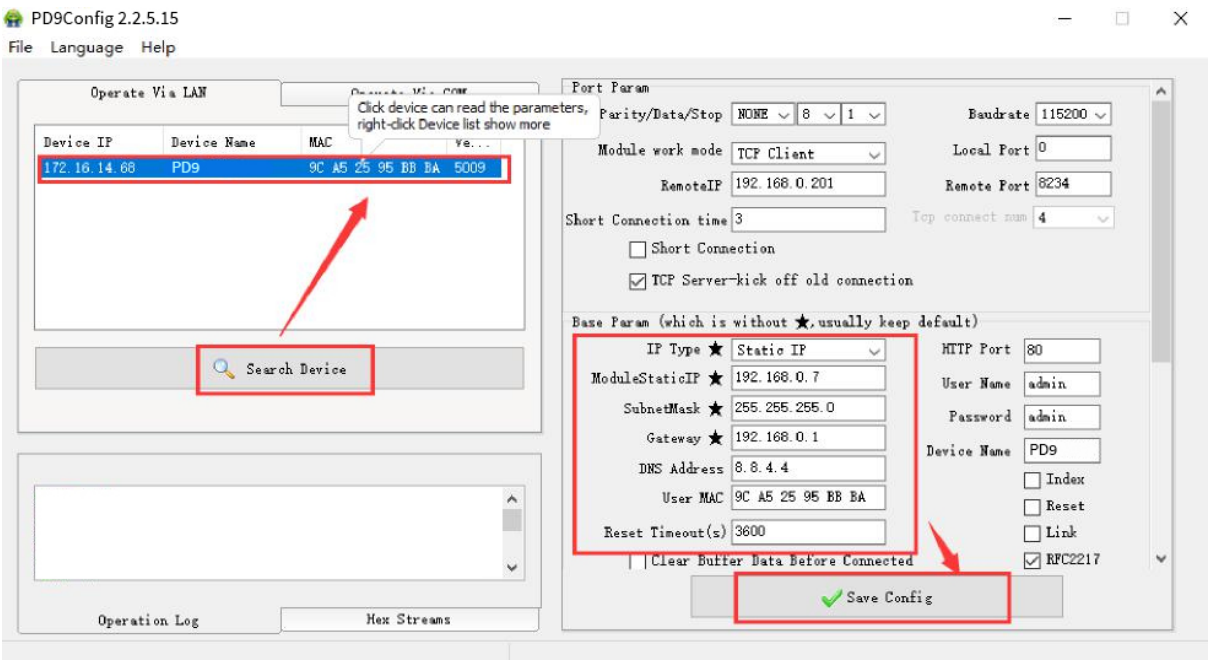


Fig. 4.1.1-1 Setting Software

4.1.2. DNS Server Address

DNS server is used to converter the domain name in to the IP address that net can recognized. The server address of the PD9 can be configured. After setting, all the questing will be sent to this address when the PD9 need to DDNS.

Under the static IP mode, DNS server address default is 8.8.8.8. and under the DHCP mode, DHCP server address can be acquire automatically.

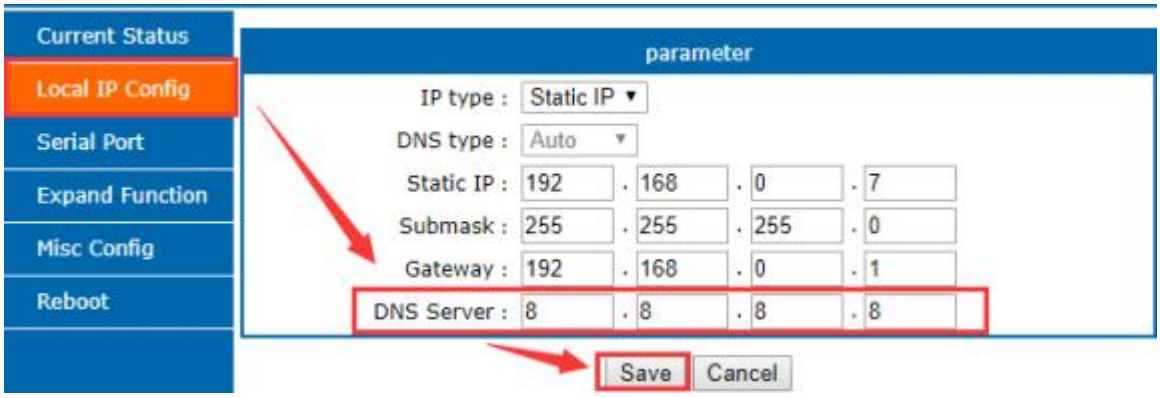


Fig. 4.1.2-1 Local IP Config

Related AT command:

Command name	Instr
AT+DNS	Setting and query the DNS server address of the PD9

Table 4.1.2-1 Related AT Command

4.1.3. Webserver

PD9 supports build-in webserver, same as the normal webserver. User can setting the parameters via the webpage also can check the related status. Default port of the webserver is 80, and this port can be modified/ after modify, user also can access the build-in webpage to access via the other port.

The default home page is the current state interface, refreshed every 10s, showing PD9 working status:

Total number of data sent by the network: Can judge how much data is sent to the external network.

Total data received by the network: Can determine how much data is sent from the network to the module.

Connected remote IP/network send/receive: Through this item, you can see which device is connected to PD9. How much data is sent and received by this connection. Currently, only 4 connection status displays are supported.

In UDP Server mode, only the send/receive data is displayed, and the connection IP is not displayed.

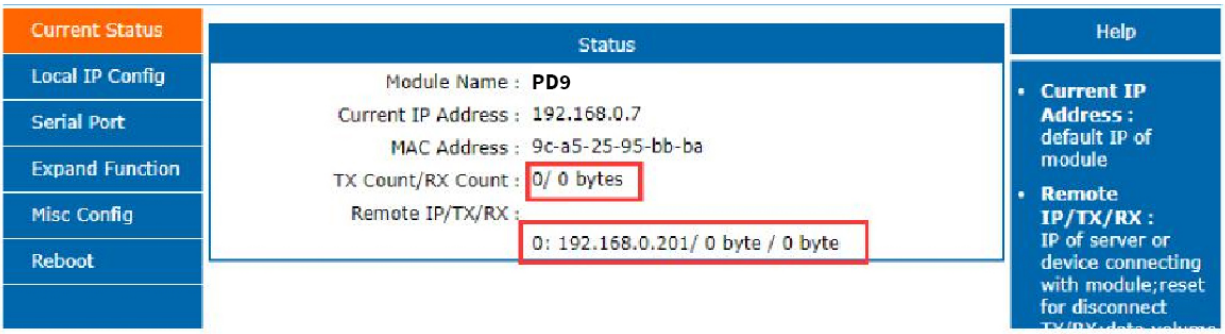


Fig. 4.1.3-1 Current Status

4.1.4. Restore to Factory Set

1) Hardware restore:

Press the Reload button for 5s to 15s to restore the factory settings. If it is less than 5s or exceeds 15s, the factory reset will not be performed. When the module is configured with incorrect parameters, or if you have forgotten the previously set password, you can restore the factory settings.

2) Software restore:

Restore the factory settings by setup software setting function or send the factory reset command via the network protocol.

3) AT command restore:

Enter the AT command mode, restore via the command.

Related AT command:

Command name	Instr
AT+RELD	Restore to factory setting

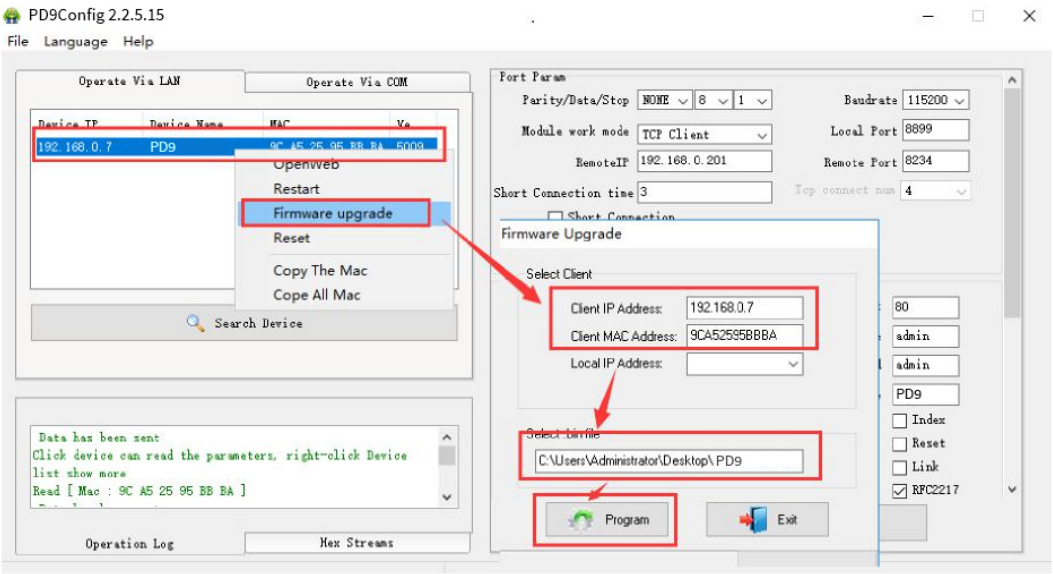
Table 4.1.4-1 Related AT Command

4.1.5. Firmware Upgrade

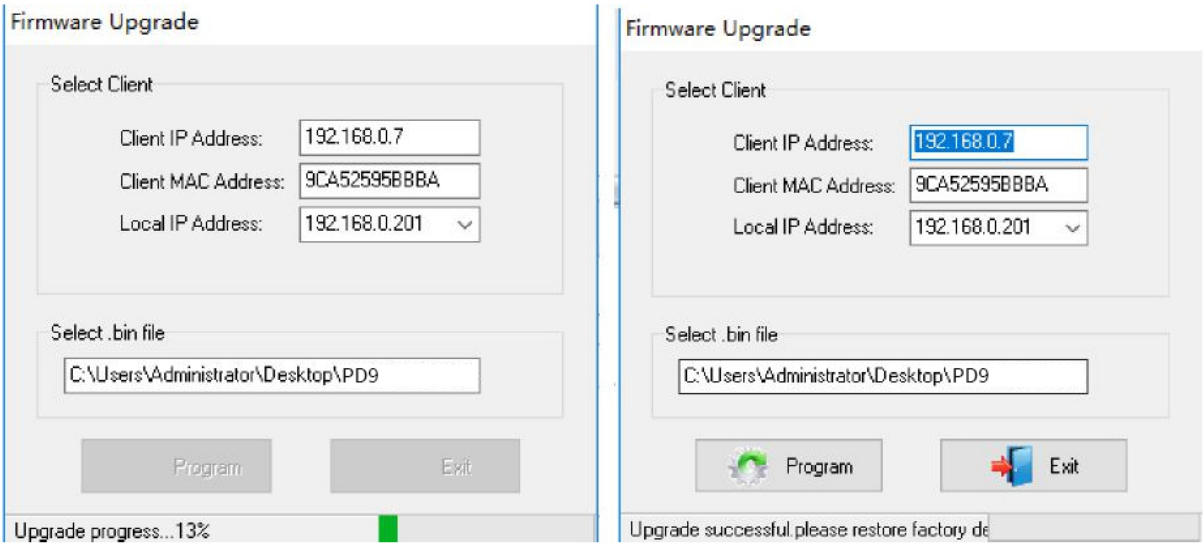
The way to upgrade the PD9 firmware is to upgrade through the network. It is simple and convenient to upgrade the firmware through the network. By upgrading the firmware, you can get more cutting-edge applications. The specific upgrade method is as follows.

1) Upgrade the firmware with a wired network. Before upgrading, turn off the wireless and virtual machine network cards to ensure that the computer only keeps one wired network card. The module and the computer can be connected to the router at the same time or the module can be directly connected to the computer.

2) After the hardware is connected, upgrade the firmware by setup software, do not change the IP and MAC addresses, set the firmware path (it is recommended not to have a Chinese path), and then click to upgrade the firmware.



3) There is a progress bar during the upgrade. When the progress bar reaches 100%, the setup software will prompt that the upgrade is successful and the upgrade is complete. Re-search the module after the upgrade is complete.

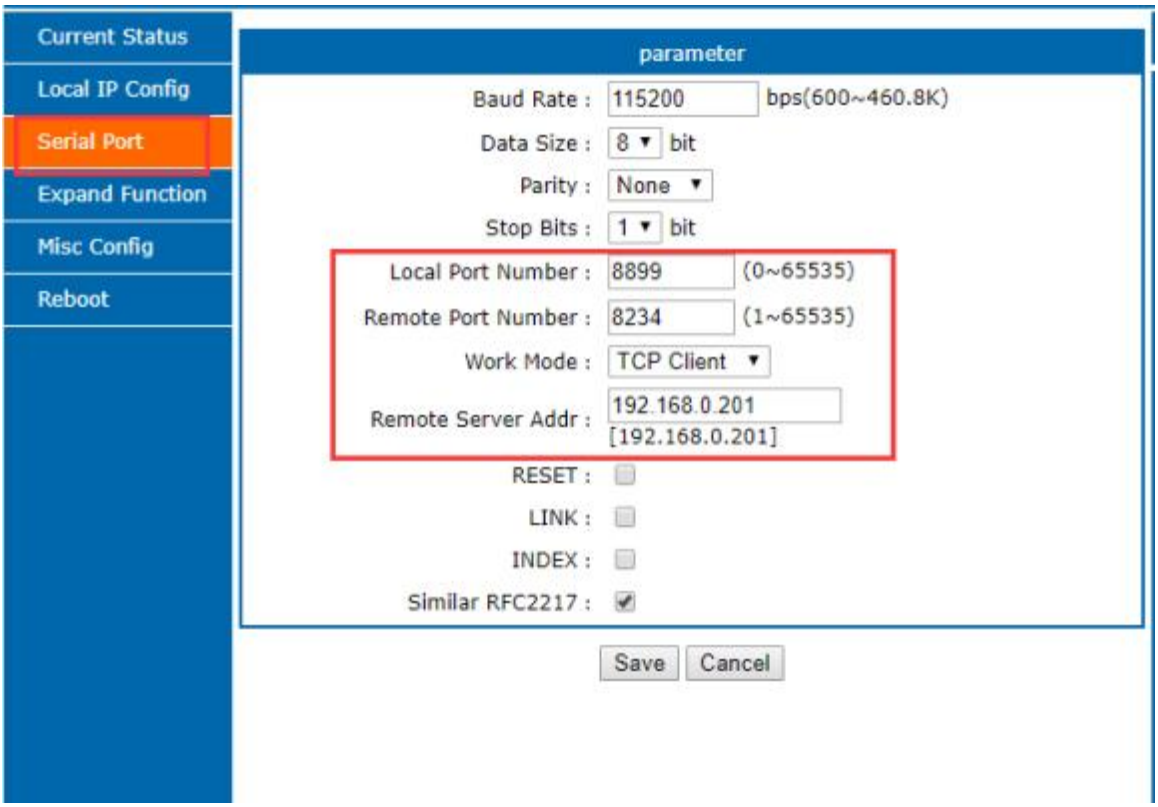


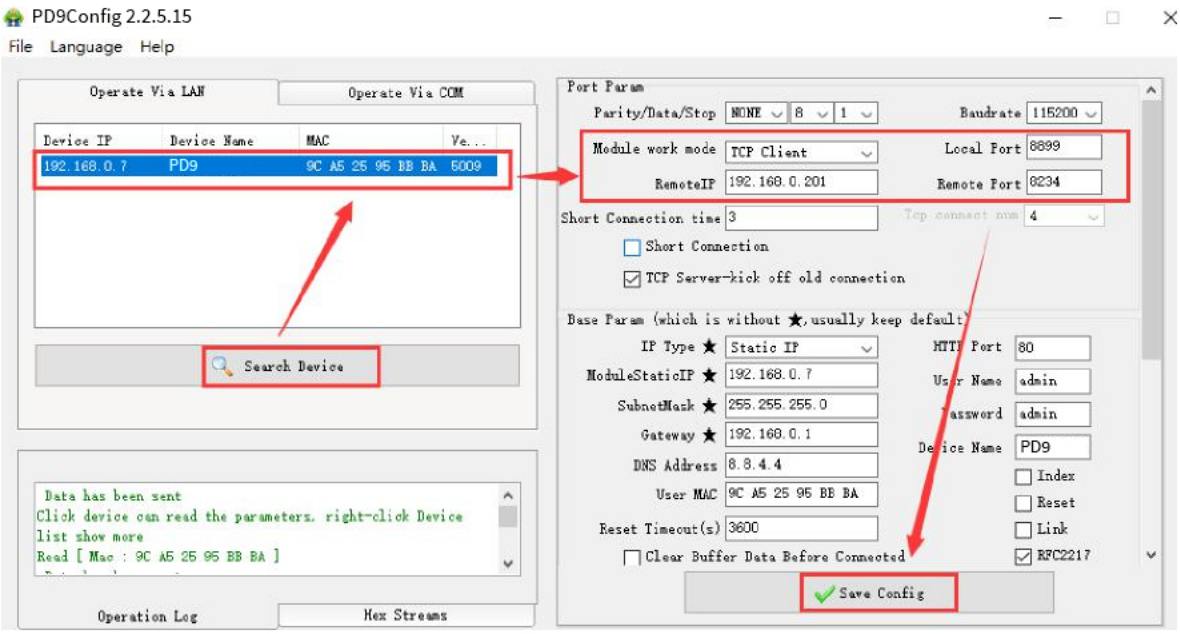
4.2. Socket Communication

There are five work modes for the socket of the PD9:TCP Client, TCP Server, UDP Client, UDP Server, Httpd Client.

Set via the webpage or the set-up software

The webpage are as bellows:





Related AT command

Command name	Instr
AT+SOCK	Setup PD9 Socket working mode / target IP / target port

4.2.1. TCP Client Mode

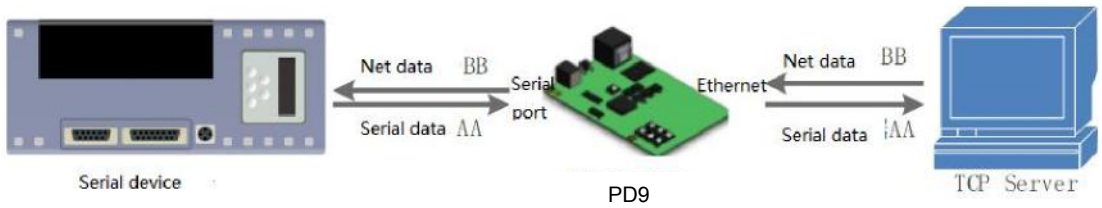


Fig. 4.2.1-1 TCP Client

1) TCP client provides the client connection for TCP net server. Query the server automatically can build the connection to realize the data transmission. Different from UDP mode, in this mode, connection has status of disconnection and remaining to make sure the data transmission reliable.

2) Identify disconnects. After connection built, it sends keepalive searching packet every 15 seconds. Once there is an interrupt, it can be detected rapidly then make PD9 disconnect from former connection and reconnect.

3) Please notice the remote IP/domain name and the remote port when connecting the TCP server. Remote IP can be the device in the same LAN or the device in other LAN. If user want to connect the server across the net, there must be a public IP or the domain name for the server.

4) It supports Synchronous baud rate (Similar RCF2217), also supports short connection function.

5) Under the same LAN, if 302 is set to static IP, keep the IP and gateway of 302 in the same network segment, and set the gateway IP correctly. Otherwise, communication will not be possible.

6) PD9 work as TCP Client, It connects to the target IP/Port automatically,will not accept other connection request.

7) When 302 is used as the TCP Client, it is recommended to set the local port number of 302 to 0. In this way,

302 can access the server with a random port number, which can solve the problem of reconnection failure caused by the server determining that the connection state is abnormal.

8) Test

① Open PD9Config software.

Set PD9 as TCP Client, Destination IP: 192.168.0.201. Destination port:8234.

Save the parameters and then research again to check if the parameters are correct . Also users can set the work mode ,remote IP and the remote port via the webpage.

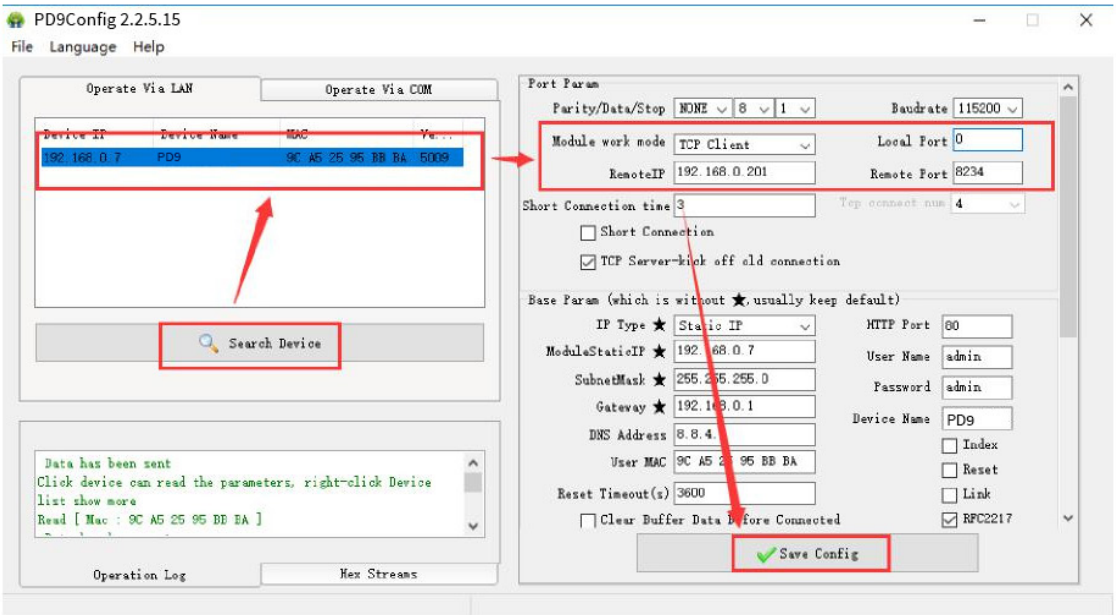


Fig. 4.2.1-2Configuration

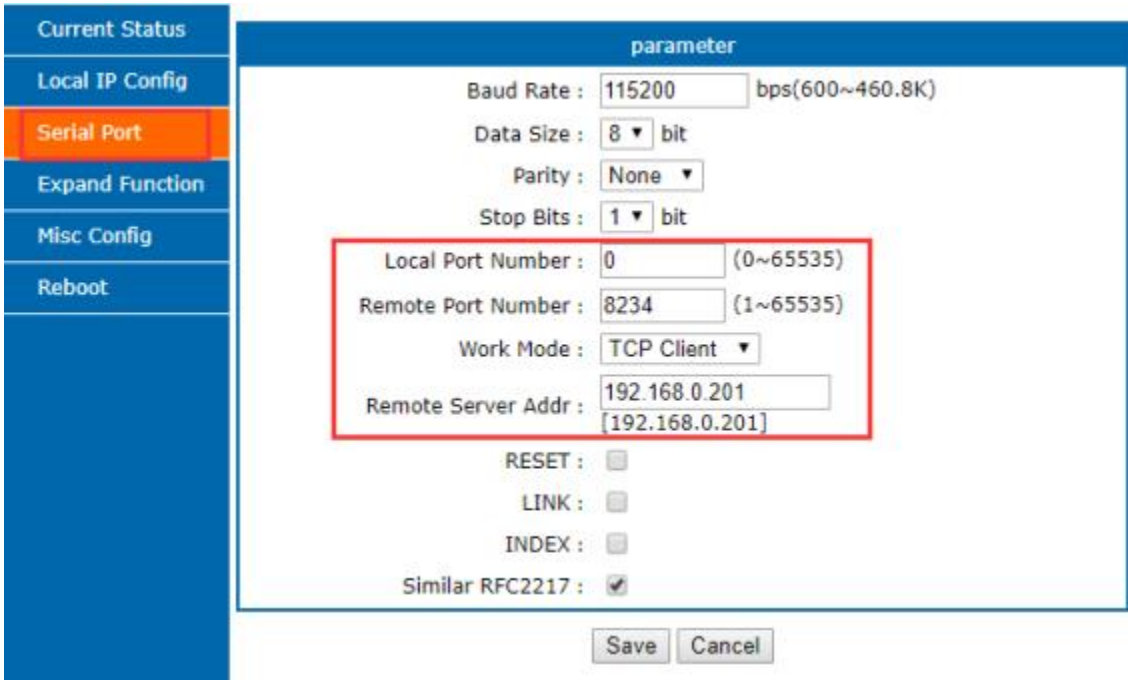


Fig. 4.2.1-3 Serial Port

4.2.2. TCP Server Mode

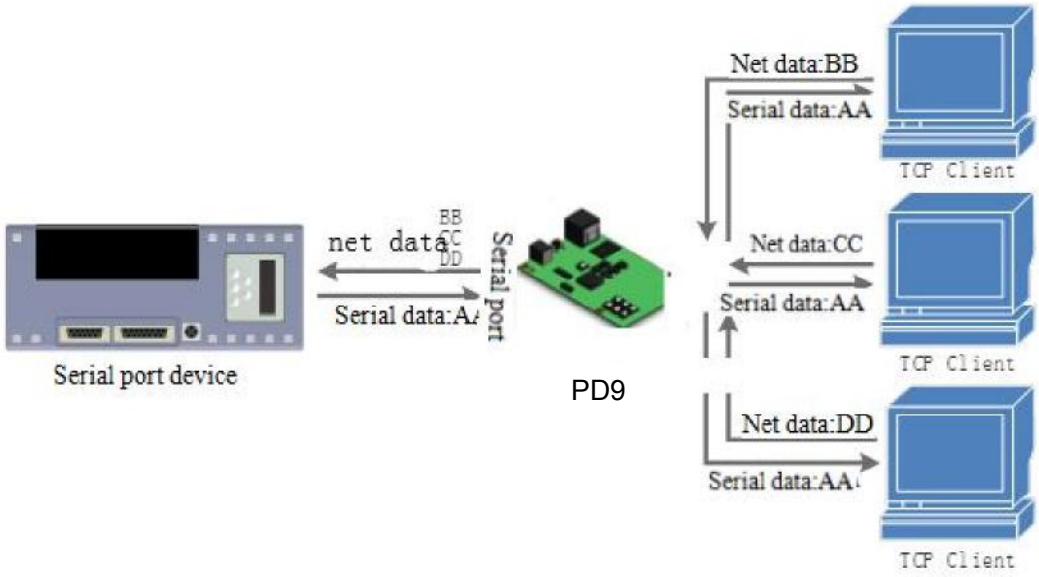


Fig. 4.2.2-1 TCP Server Mode

1) PD9 In the TCP Server mode, there is also a KeepAlive function for real-time monitoring of the integrity of the connection.

2) Usually used for communication with TCP clients in the LAN. It is suitable for scenarios where there is no server in the LAN and there are multiple computers or mobile phones requesting data from the server. As with TCP Client, there is a difference between connection and disconnection to ensure reliable exchange of data.

3) This mode supports independent synchronous baud rate function (RFC2217) function.

4) In TCP Server mode, the PD9 actively listens to the local port and responds with a connection request and creates a connection. When the serial port of the PD9 receives the data, it also sends it to all devices that establish a connection with the PD9 server. If you access the PD9's TCP server across the public network, you need to do port mapping on the router.

5) It support 8 clients connections at max. (the number can be set.) the local port is fixed, can not be “0”

6) Under TCP Server mode, when the number of connected clients exceeds the set maximum value, the default is to replace the old connection with a new one, can modify this function in the web page.

7) <u>Test Example</u>

① Set PD9 as TCP Server Mode, local port 20108, same as default. Also can set in the webpage.

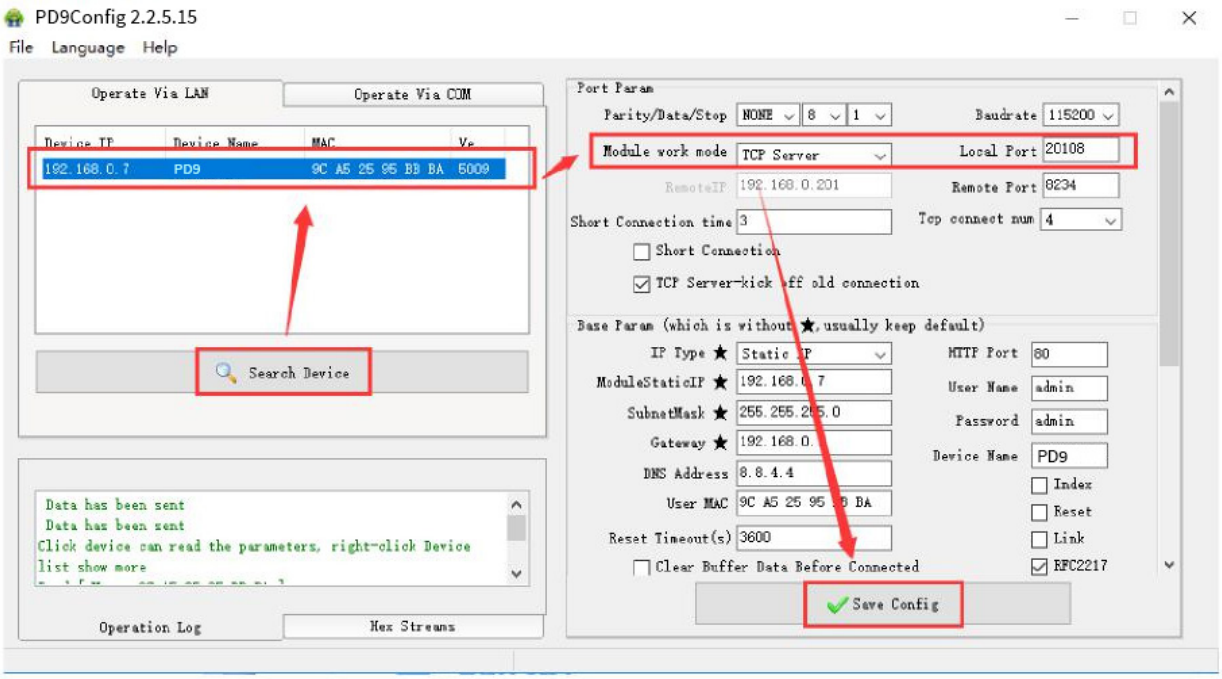


Fig. 4.2.2-2 TCP server mode (software)

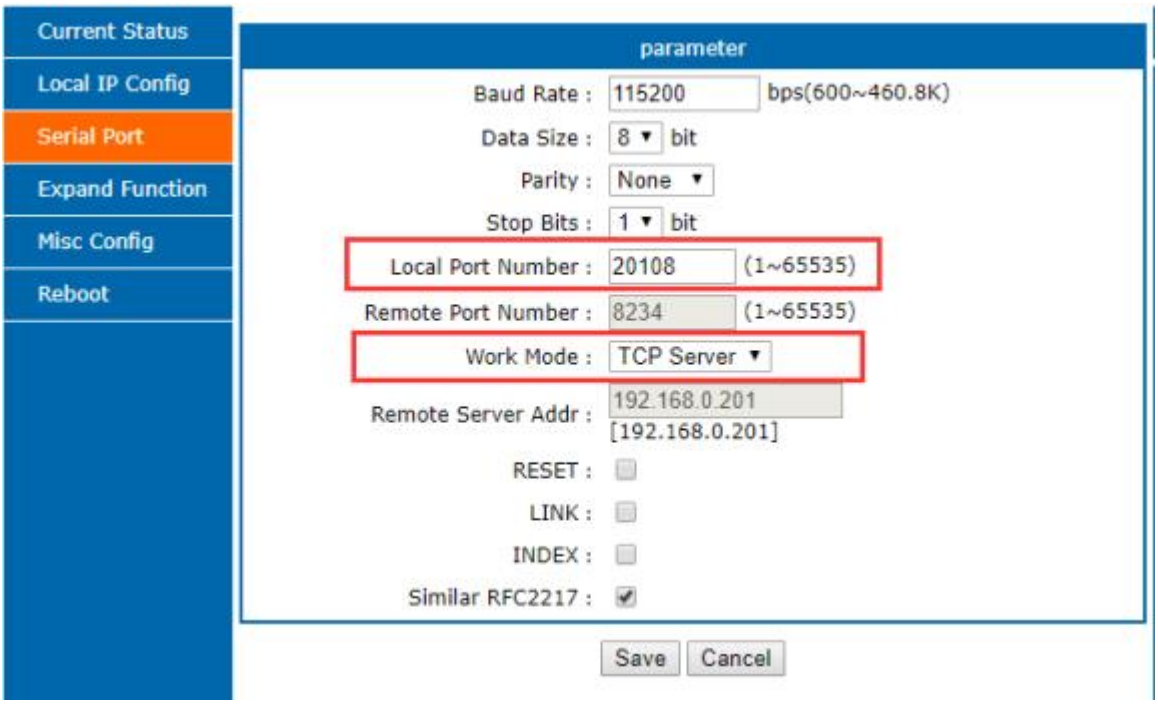


Fig. 4.2.2-3 TCP server mode (webpage)

4.2.3. UDP Client Mode

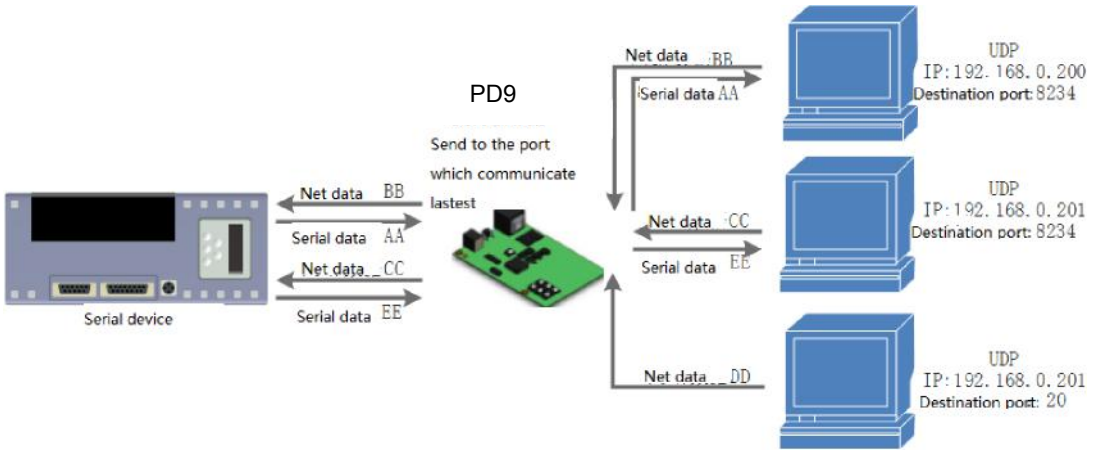


Fig. 4.2.3-1 UDP Client

1) It subjects to UDP protocol, no connection, just only sending data. No difference of the connection and disconnection, no requirement with the packet loss, small data package and quick frequency and the data sent to the appointed IP.

2) PD9 only communicate with destination port of IP. Otherwise, the data cannot be received.

3) Under this mode, destination Address is 255.255.255.255, then it can make UDP broadcast and receive broadcast data. The firmware in the 4015 and later firmware supports the broadcast in the network segment, such as the broadcast mode of xxx.xxx.xxx.255

4) Multicast is not supported in UDP mode.

5) Example：

① Open PD9Config, E45 Setup Software: Set PD9 to UDP client mode and the target port is 8234.

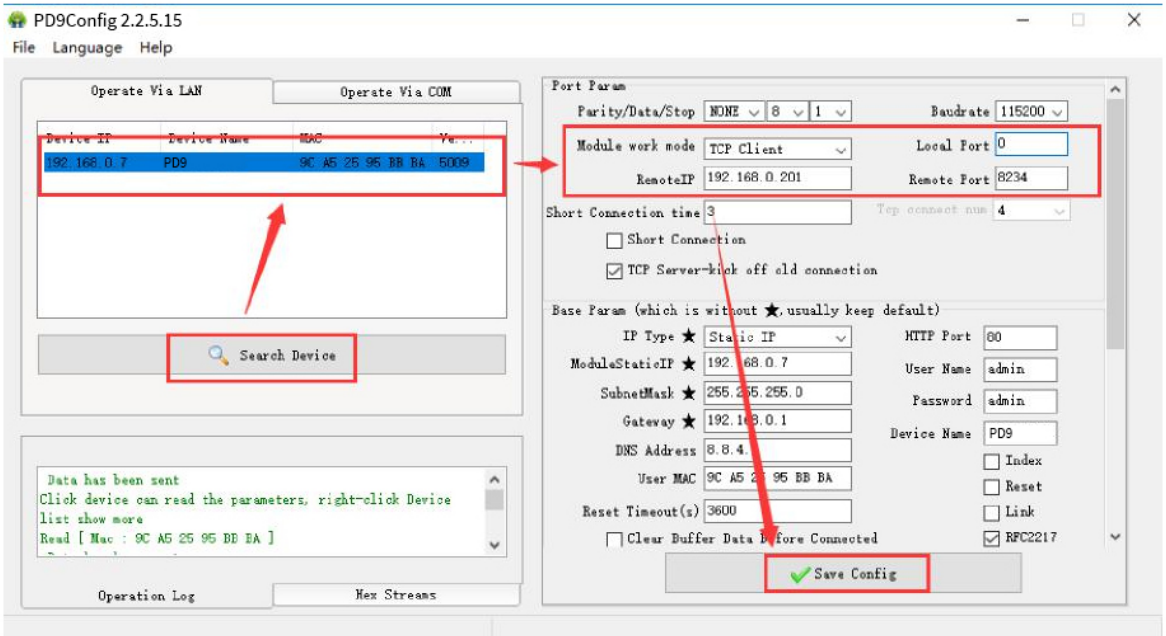


Fig. 4.2.3-2 UDP Client (software)

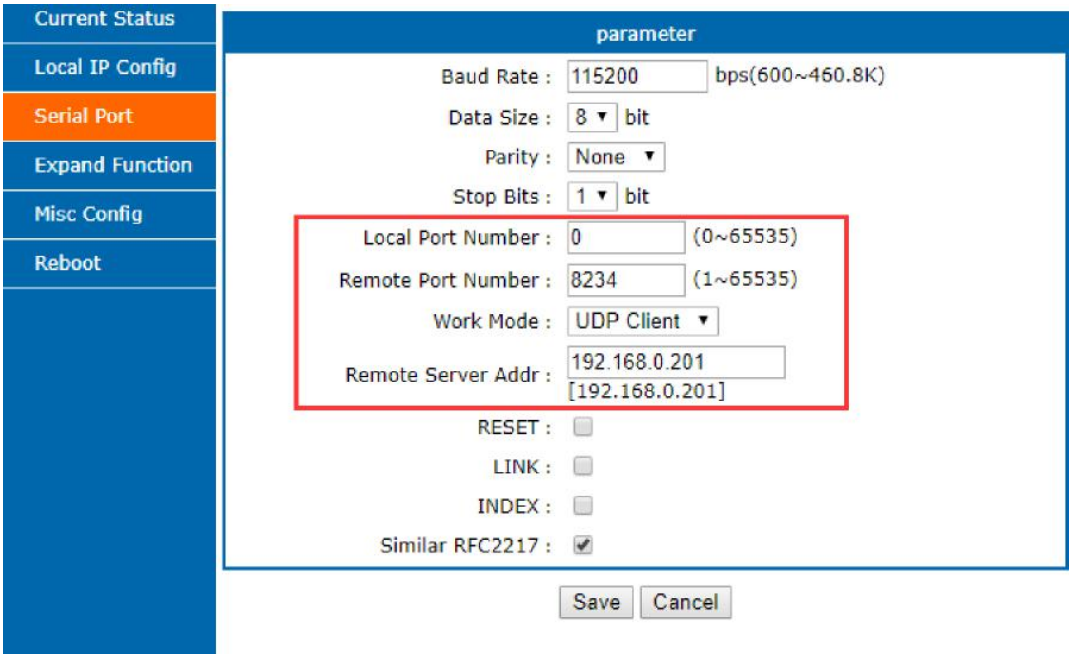


Fig. 4.2.2-3 TCP server mode (webpage)

4.2.4. UDP Server Mode

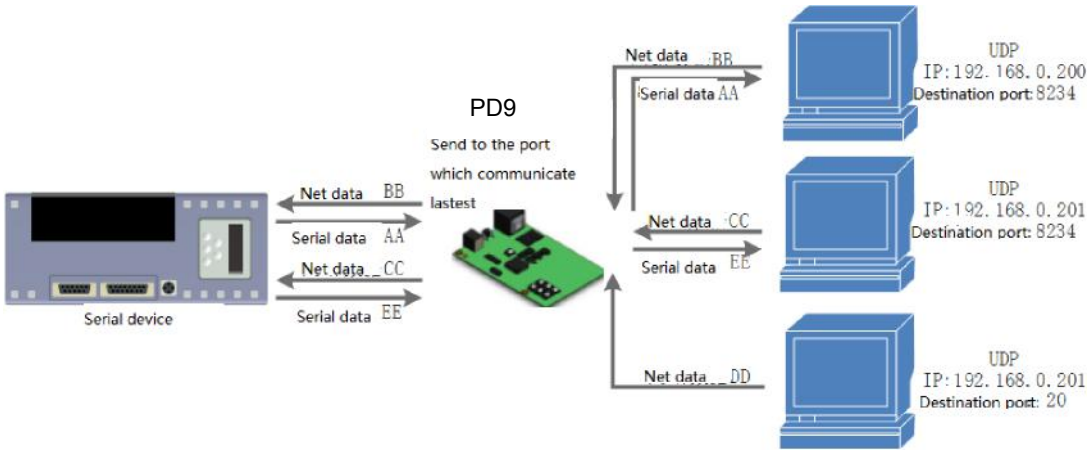


Fig. 4.2.4-1 UDP Server Mode

1) Base on normal UDP, it doesn't verify source IP address. Every time PD9 receive one UDP data packet, it changes destination IP to where data comes and it sends the data to the IP and port which communicate latest.

2) Used in the scenario several net device want to communication with the module with high speed and do not want to use the TCP mode.

4.2.5. HTTPD Client

1) In this mode, the user's terminal device can send request data to the specified HTTP server through PD9, and then PD9 receives the data from the HTTP server, parses the data and sends the result to the serial device.

2) User do not need to pay attention to the data conversion process between the serial port data and the network data packet, and the data request of the serial port device to the HTTP server can be realized by simple parameter setting.

3) When PD9 sends data to HTTP server via serial port, set the URL, header remote domain name, IP and port and save, then it only needs to send the header of requested data; PD9 will automatically add information such as URL and header. The returned data, user can choose whether to remove the header.

4) Test example:

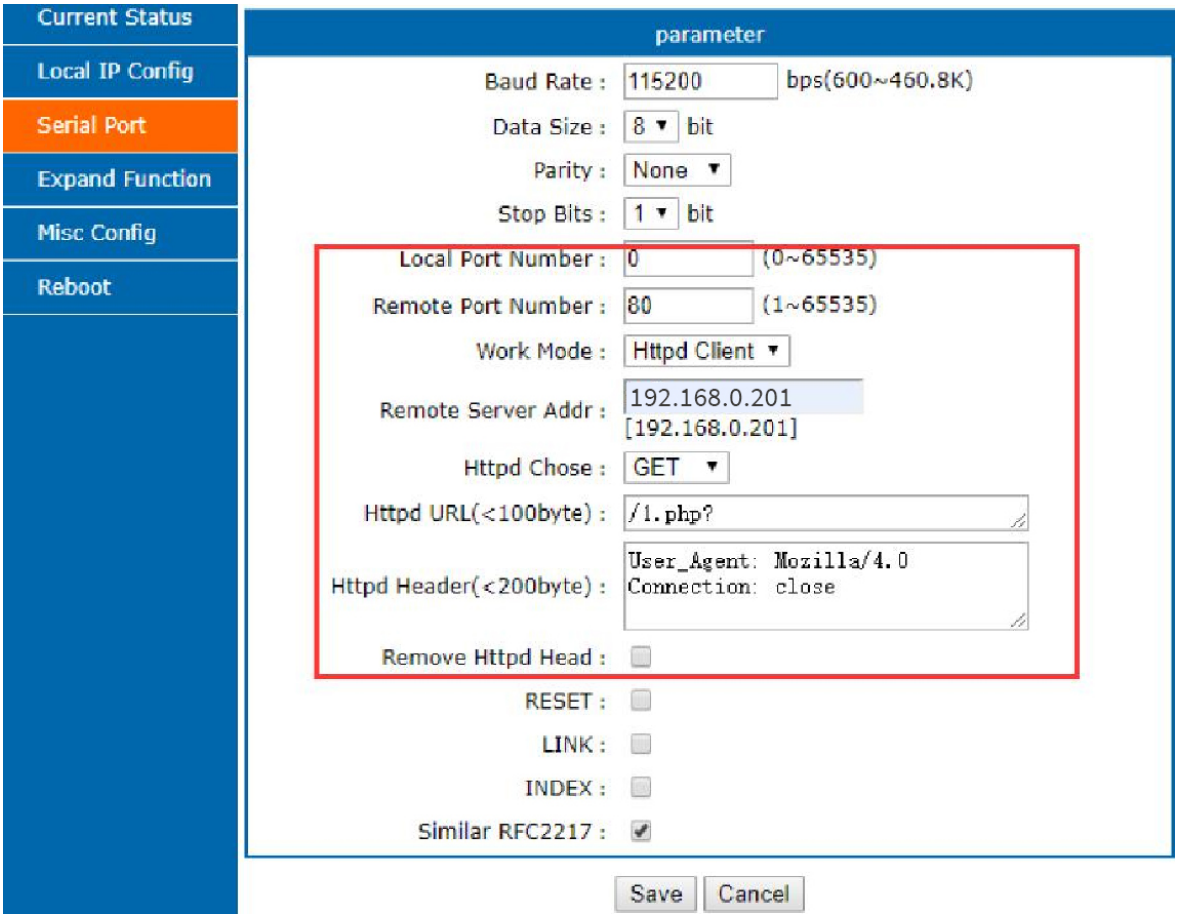


Fig. 4.2.5-1 Httpd Client web page settings

1. Set PD9 as HTTPD Client in webpage, and set the corresponding target port number and destination IP/domain name.

2. Set the Httpd request method and the URL and header information of the request packet at the web page.

3. Whether the header of the information replied by the Httpd server is removed can also be set in the web page.

4. After the setting is completed, click Save and restart PD9 to take effect.

5. Open the serial port to send data, then the serial port data will be submitted to the web server, and the serial port will also receive the information replied by the server.

6. For details on sending a request, refer to the "Httpd Client Mode Description" Fig., as shown below:

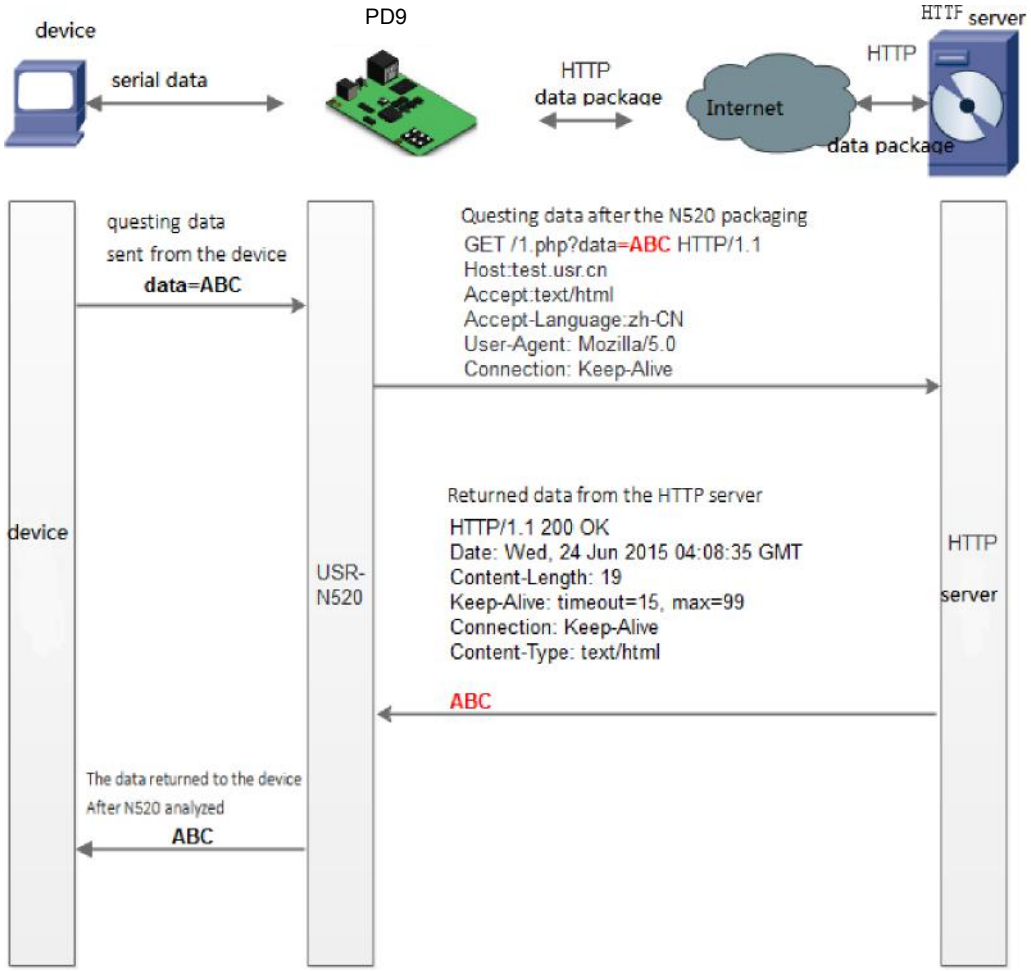


Fig. 4.2.5-2 HTTPD Client Mode

4.3. Impersistent Connection (TCP Short Link)

The use of TCP impersistent connections is mainly to save server resources, and is generally applied to a multi-point scenario. With short connections, you can ensure that the existing connections are useful connections and do not require additional controls for filtering.

The TCP impersistent connection function is applied to the TCP Client mode. After the short connection function is enabled, the message is sent. If there is no data reception in the serial port or network port within the set time, the connection will be automatically disconnected.

This function default disable, the time disconnection can be set from 2~255s, default is 3s.

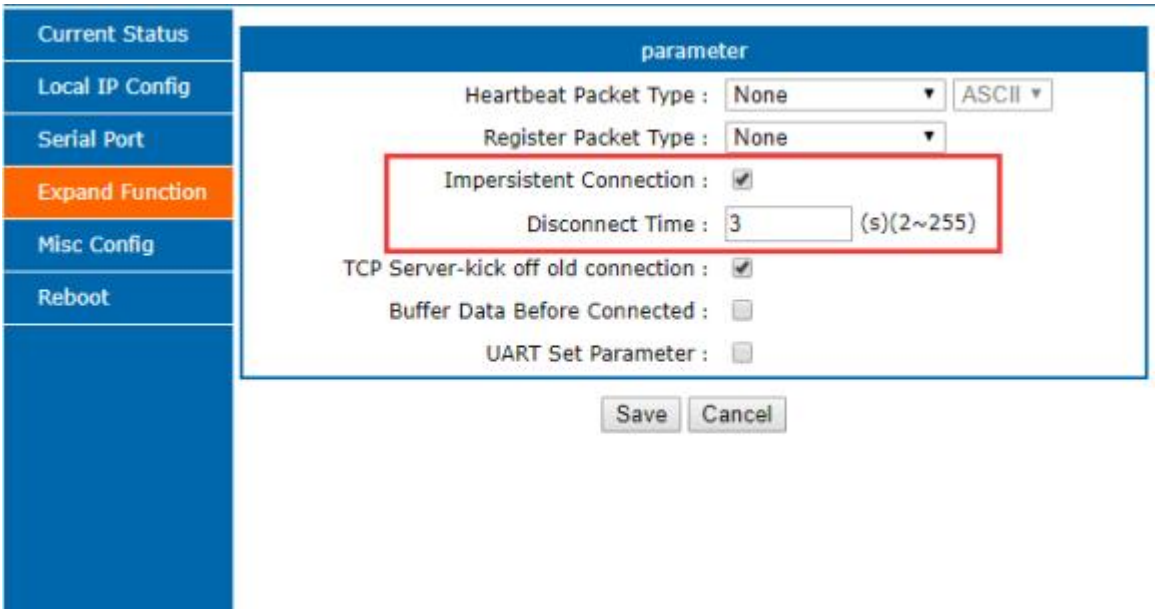


Fig. 4.3-1 Short Link

4.4. Clean the buffer data

If the TCP have not built, the data that serial received will be placed in the cache, and the PD9 serial port can receive 2Kbyte, after the TCP built, you can select whether to clear the cached data.

The default is not. Under the Httpd client mode or the TCP client mode, when enable the impersistent connection, this function has no power.

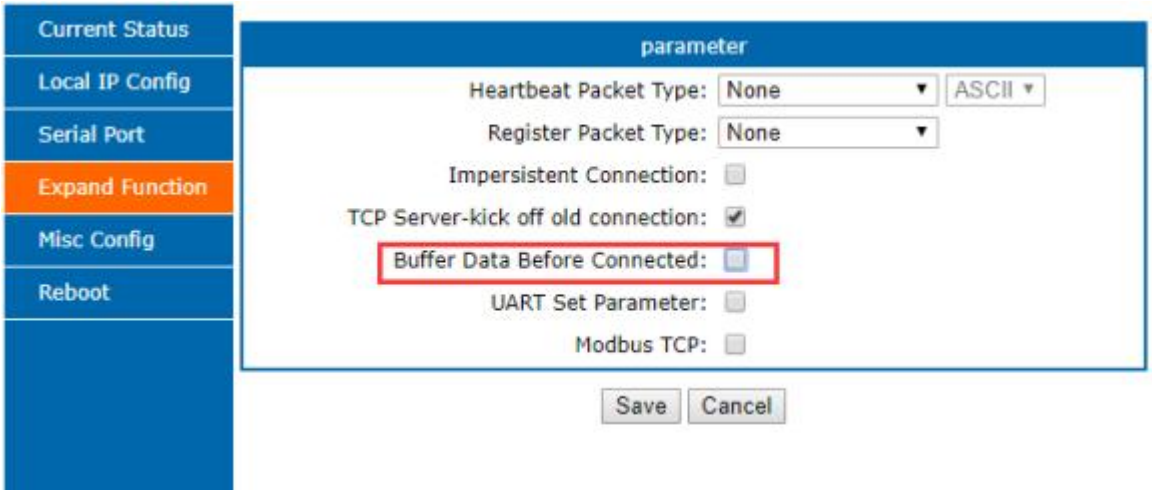


Fig. 4.4-1 clear buffer data Configuration

4.5. Modbus Gateway

Modbus gateways include: Modbus RTU and Modbus TCP protocol conversion.

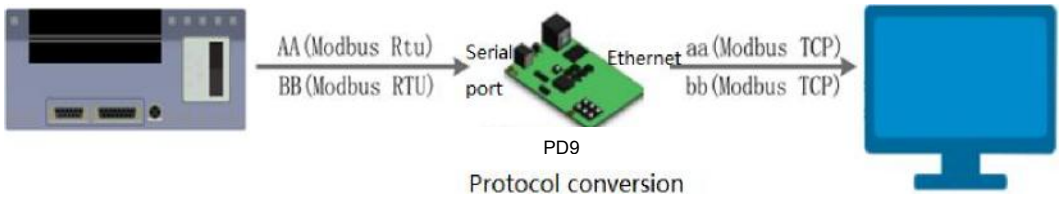


Fig. 4.5-1 MODBUS TCP

Modbus RTU and Modbus TCP: Modbus serial protocol to Modbus network protocol can be converted by Opening the Modbus TCP to Modbus RTU function in the web page.

Make the module work in the TCP server or the TCP client mode

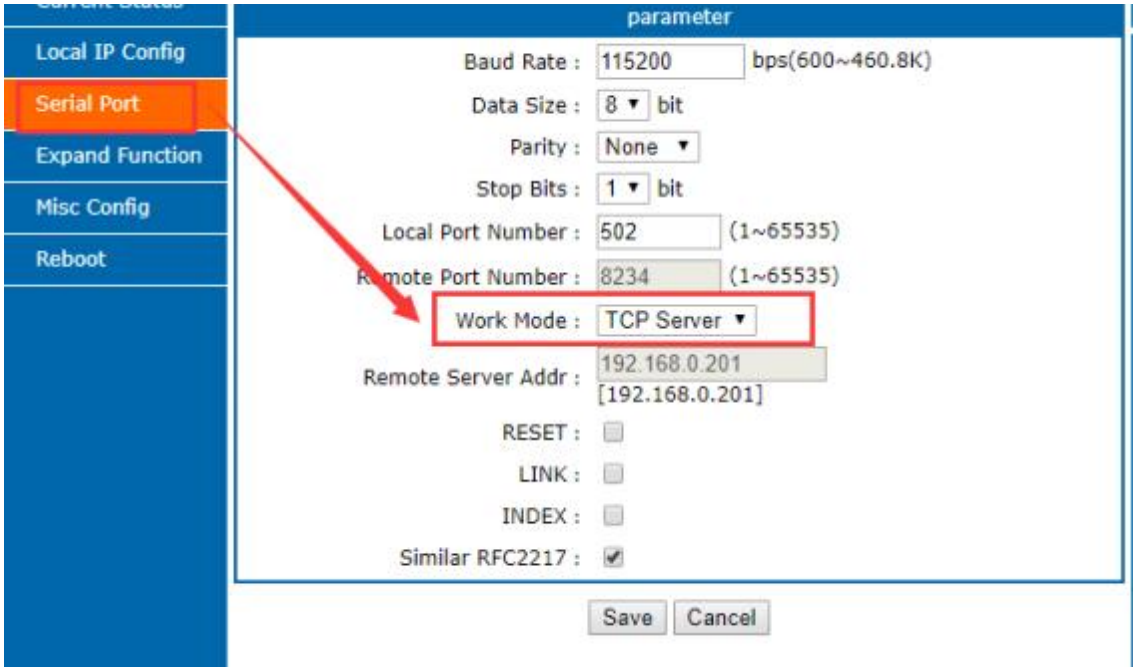


Fig. 4.5-2 Working mode

Webpage enable the modbus TCP to RTU function

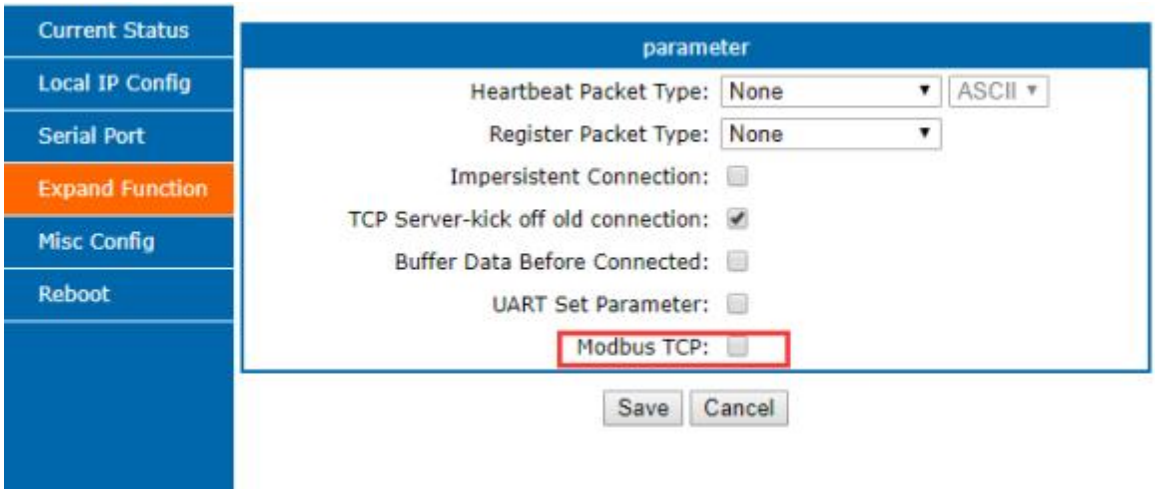


Fig. 4.5-3 MODBUS TCP mode

Modbus TCP: click to enable the function or disable the function.

4.6. Other functions

4.6.1. Heartbeat Packet Function

Heartbeat packet is divided into network heartbeat and serial port heartbeat. It can send heartbeat packet to serial port or to network, can not send together.

Serial heartbeat packet: It can be sent to the serial port as a fixed query command. To reduce the communication flow, user can choose to send heartbeat package instead of the send query command from server. When there is data send from the serial port, serial heartbeat do not stop.

Network heartbeat packet: It used for maintaining connection. Only valid at the mode of TCP client and UDP client. When there is data transmission send from network interface, the net heartbeat packet stop.

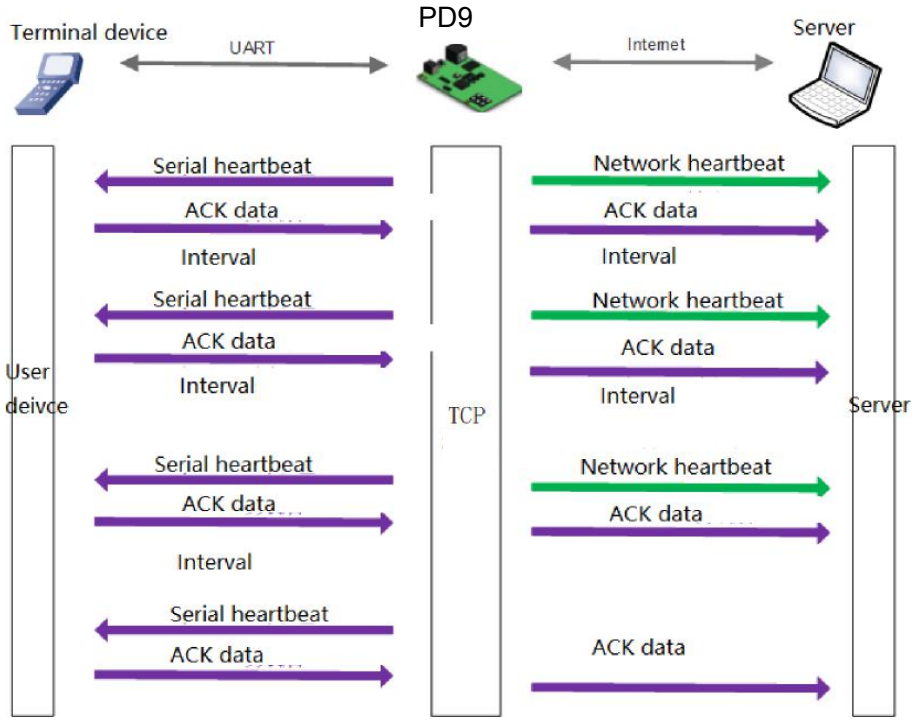


Fig. 4.6.1-1 Heartbeat packet function Fig.

The heartbeat package feature is turned off by default. Set in the web page, the settings interface is as follows:

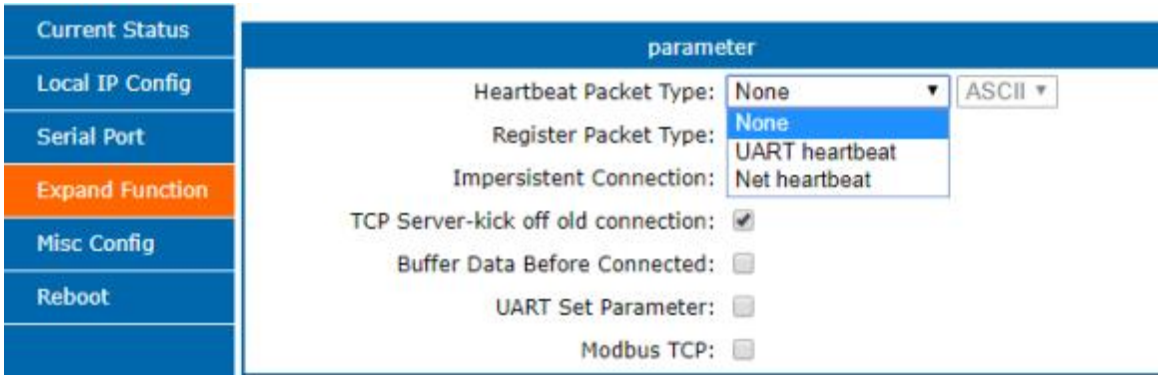


Fig. 4.6.1-2 Heartbeat Package

4.6.2. Registration Package Packet Function

PD9 supports self-defined registration package function and also supports to send self-defined registration package after connection establishment, meanwhile, it supports to send registration package when sending data There are three register package: MAC register and self defined register.Network registration packet includes: Establish a connection to send the registry packet, data carrying or both. The self-defined register content can be set according the requirement, at most for 40 bytes, supports HEX, MAC register package default is HEX, modify via change the MAC address.

Establish a connection to send the registry packet: Send the registration packet immediately after the connection is established. The main purpose is to allow the server to identify the data source device or to obtain a password for the server function authorization.

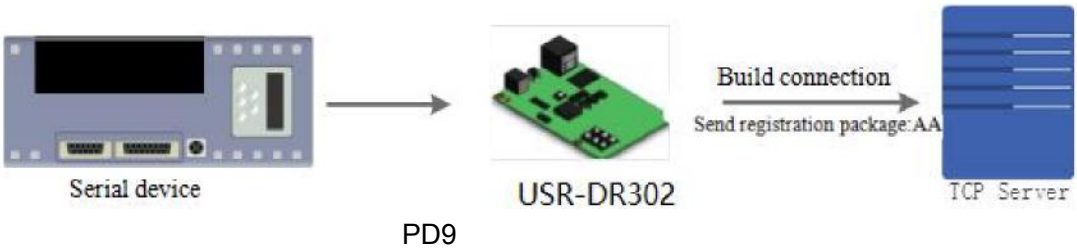


Fig. 4.6.2-1 Sending when establishing a connection

Data carrying: The packet header is carried uniformly when sending data. It used for protocol transmission.

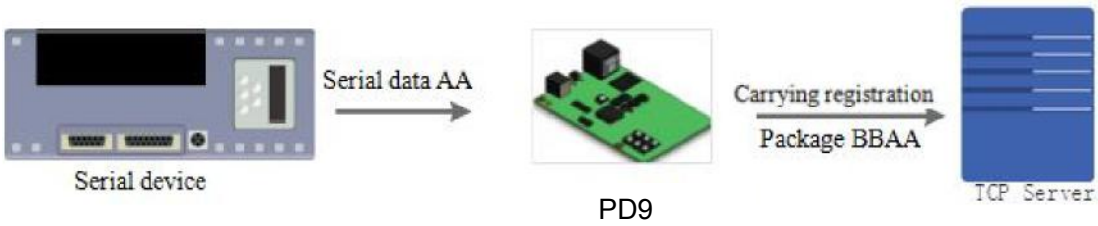


Fig. 4.6.2-2 Data carrying

Configure the relevant parameters via web page:

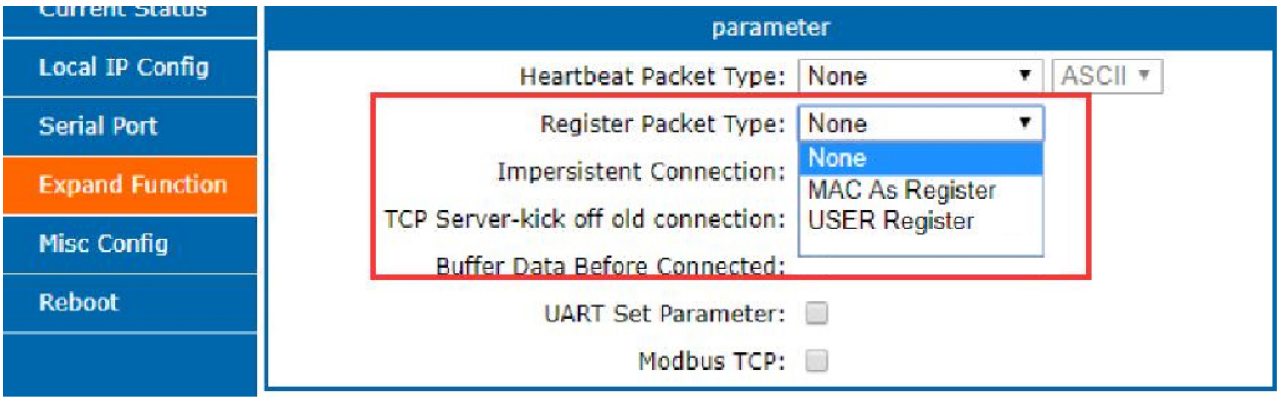
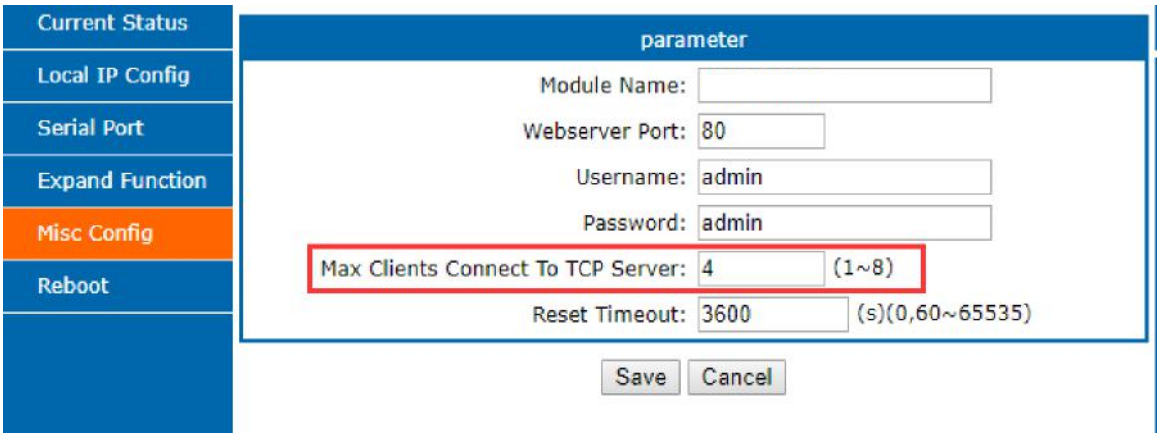


Fig. 4.6.2-3 Registration Package

4.6.3. The number of the client connected

Then the PD9 work in the TCP server mode, the max number of client to connect is 8, default is 4,the max number can be configuring as you want, which is be convenient for use. When the the number connecting clients more than 4, we should control the total data flow in 2.5KB/s if we need to send and receive meanwhile(not more than 200 bite/s).

If the number is 8 now, default use the new link instead of the oldest one, also you can set to use the older one. The webpage are as fellow.



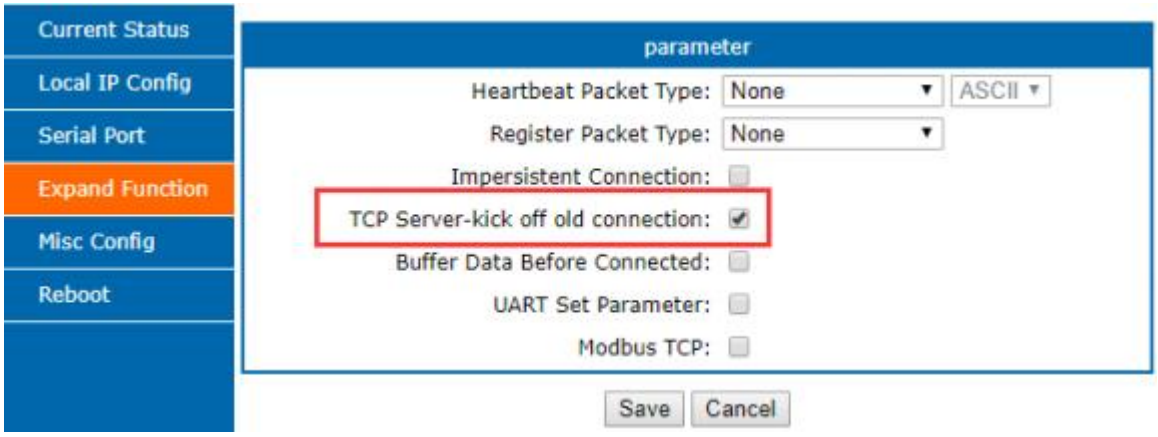


Fig. 4.6.3-1 max client connect to TCP server

4.6.4. Serial Port Packaging Mechanism

PD9 can configure serial port packaging time and serial port packaging length. PD9 will make packaging for the data of serial port according to the packaging length and packaging time in the transparent transmission mode. Default packaging time is4 byes and the length is 1024 bytes.

Example for judgment of packaging time and packaging length:

① Set packaging time as 10ms, packaing length as 512 bytes

When serial port received data, PD9 will package and send it to network if the interval time of receiving data is over than 10ms or data length is more than 512。

② If the value of packaging time or packaging length is 0, the packaging rule is effective for non-zero one.

③ Set packaging time and length as 0. PD9will conduct default packaging time when packaging time is set as 0ms. Namely, when serial port receiving data, PD9 will package and send the data to network if interval time more than packaging time of sending 4 bytes. For example, baud rate 115200, packaging time for 4 bytes is T=0.4ms, when the calculated value is smaller than 0.1ms, packaging time can be calculated as 0.1ms.

T= 1/baud rate*10*4

4.6.5. Flow Calculation

When PD9 receives data from network and then send to serial port, as the limit of serial port speed, user have to control the flow, if not the problem of data overflow on serial port side will occur. So data flow is required to calculated when sending data from network to serial port.

Example:

Network sends data in m bytes every n seconds. Method of checking if there is overflow: (Supposed network condition is good and network data transmission time is negligible)

① If there is no overflow, m bytes data must be transmitted within n seconds, then the transmitting time of M bytes data:

$$T = \frac{1}{\text{Baud Rate}} * 10 * \text{m}$$

If n >2T, then data will not overflow, PD9 can work normally. Just need keep n>T under baud rate 9600.

5. Setting Protocol

PD9 includes two protocol: network setting protocol and serial port setting protocol.

5.1. Network Setting Protocol

To configure across the net, all the communication protocol using the UDP, lower one is in front. When user are configuring, please keep the remote port is 1500, and local port can be random.

5.1.1. Set Parameter Process

1. Build SOCKET:

Build UDP SOCKET, destination IP: 255.255.255.255, destination port: 1500. Low is in front.

2. Setting command process:

① The network send searching command

② PD9 returns IP address and MAC

③ The network read PD9's parameter

④ Organize setting command according to MAC, known user name/password and parameter to be configured. ⑤ Send setting command

⑥ PD9 returns "correct setting"

⑦ Host PC send "save setting" command

⑧ PD9 returns "correct"

⑨ Restart command

⑩ USE-PD9 returns "correct setting"

5.1.2. Setting Command Content

Command Look-up List:

Function	Header	Length	command	MAC (6 bytes)	User name /password (12bytes)	Parameter	Parity (sum)
search	FF	01	01	-	-	-	02
reset	FF	xx	02	[MAC]	[usrname] [password]	-	xx
read settings	FF	xx	03	[MAC]	[usrname] [password]	-	xx
Basic settings	FF	xx	05	[MAC]	[usrname] [password]	Basic parameter	xx

Com 0 settings	FF	xx	06	[MAC]	[usrname] [password]	COM parameter	xx
Restore to factory set	FF	xx	0b	[MAC]	[usrname] [password]	-	xx
Heartbeat and register package setting			21		[usrname] [password]	Serial parameters	xx
Extend setting	-	-	-	-	-	-	-

Table 5.1.2-1 Command

Notice: Check bit is sum check, starts from length byte (including length) to adding before checking (not including checking), result is check value, only low byte is remained.

1. Command examples

① Search command example Search command is set to:

FF 01 01 02
Sum check: 02 = 01 + 01

② Reset command example

Send bytes: FF 13 02 00 71 77 7c 42 2F 61 64 6d 69 6e 00 61 64 6d 69 6e 00 Fc

Sum check: Fc= 13 + 02 + ... + 6E + 00

From 4th to 9th is the MAC of the PD9, the last 12 bytes before the sum check is the username and password User name and password both are 6 byte, bits 0 for the lack. (the last one of the username and password must be 0)

③ Read settings command example

Send (22 bytes)：FF 13 03 00 71 77 7c 42 2F 61 64 6d 69 6e 00 61 64 6d 69 6e 00 Fd

Sum check:

Fd= 13 + 03 + ... + 6E + 00

From 4th to 9th is the MAC of the PD9, the last 12 bytes before the sum check is the username and password

User name and password both are 6 byte, bits 0 for the lack. (the last one of the username and password must be 0)

2. Some commands detailed annotation

① Basic setting parameter command

On totally, there are 67 basic setting command, here we take an example for the better setting and using:

Send: FF 56 05 00 71 77 7c 42 2F 61 64 6d 69 6e 00 61 64 6d 69 6e 00 95 63 03 00 00 00 50 00 00 07 00 a8 c0 c9 00 a8 c0 00 FF FF FF 55 6c 6c 2d 66 32 00 00 00 00 00 00 00 00 00 00 61 64 6d 69 6e 00 61 64 6d 69 6e 00 00 01 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 04

Sum check: 04 = 56 + 05 + 00+ ... + 01

From 4th to 9th is the MAC of the PD9, from 10th to 22nd is username and password, later bytes is the basic parameters for fix the length, last one is sum check.

Basic Parameter:

Name	Byte	Example	Explanation
ucSequenceNum	1	00	Write the read values
ucCRC	1	00	Write the read values
ucVersion	1	00	Write the read values
ucFlags	1	C0	IP address type: 0 in 8th bit: DHCP;1 in 8th bit: Static IP
usLocationURLPort	2	00 00	Write the read values

usHTTPServerPort	2	50 00	HTTP server port
ucUserFlag	1	00	Write the read values
ulStaticIP	4	07 00 A8 C0	Static IP
ulGatewayIP	4	C9 00 A8 C0	Gateway
ulSubnetMask	4	00 FF FF FF	Subnet Mask
ucModName	16	55 53 52 2D 4B 32 00 00 00 00 00 00 00 00	PD9 name
Reserve protocol	2	00 00	Please set to be 0
username	6	61 64 6D 69 6E 00	username
password	6	61 64 6D 69 6E 00	password
ucNetSendTime	1	00	Disable and reserve protocol
uiId	2	01 00	Device ID
ucIdType	1	00	Device ID type (0~3) 0:no use 1st 1 :send id when connect; 0; disable 2 nd 1 :send id when send data; 0; disable 5th 1: reset enable; 0: disable 6th 1: link enable; 0: link disable 7th 1: index enable; 0: close 8th 1:RFC2217 enable; 0: disable
MAC_addrs	6	D8 B0 4C 11 22 33	MAC
DNSGatewayIP	4	01 00 A8 C0	DNS server address
TC_sh_time	1	03	Disconnection time for short link
ucReserved	3	00 00 00	Unused

Table 5.1.2-2 Basic Parameters

② Port settings parameter command

Port parameter:

Name	bytes	example	Explanation
ulBaudRate	4	00 C2 01 00	Baud Rate
ucDataSize	1	08	COM data bits (0X05/0x06/0x07/0x08)
ucParity	1	01	COM parity 1: no, 2: odd, 3: even, 4: mark, 5: space
ucStopBits	1	01	COM stop bit (0x01/0x02)
ucFlowControl	1	00	Disable and reserve
ulTelnetTimeout	4	00 00 00 00	Disable and reserve
usTelnetLocalPort	2	8C 4E	Local Port
usTelnetRemotePort	2	2a 20	Remote Port
uiTelnetURL	30	31 39 32 2E 31 36 38 2E 30 2E 31 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	IP address send in ASCII. Example: 192.168.0.201
ulTelnetIPAddr	4	00 00 00 00	Not adopted
ucFlags	1	00	5th 0: close cloud 1: enable 6th 0: under the TCP server, do not kick the old connection 1: kick the oldest one 7th 0:disable MAC register; 1: take MAC as register
ucWorkMode	1	01	Working mode: 0: UDP, 1: TCP Client, 2: UDP Server, 3: TCP Server, 4: HTTPD Client
HTPucFlags	1	00	0：HTTPD GET；1：HTTPD POST
tc_number	1	04	The number of the client connected to the TCP Server
Timeout_restart	2	00 00	Restart time
cos_register_flag	1	00	Self- defined register

ucTimeCount	1	91	Write the read values
uiPackLen	2	00 00	reserve
ucReserved	3	00 00 00	saved

Table 5.1.2-3 Port Parameters

Example:

FF 52 06 00 71 77 7c 42 2F 61 64 6d 69 6e 00 61 64 6d 69 6e 00 00 c2 01 00 08 01 01 01 00 00 00 00 8c 4e 2a 20 31 39 32 2e 31 36 38 2e 30 2e 32 30 31 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 c9 00 a8c0 00 01 00

00 00 00 00 00 00 04 00 00 00 00 EF

sum check:f0 = 52 + 06 + ... + 00

From 4th to 9th is the MAC of the PD9, from 10th to 22nd is username and password, later bytes is the port parameters for fix the length, last one is sum check.

③ restore to factory setting command:

Send:FF 13 0b 00 71 77 7c 42 2F 61 64 6d 69 6e 00 61 64 6d 69 6e 00 07

Sum check: 07 = 13 + 0b+ ... + 6E + 00;

From 4th to 9th is the MAC of the PD9, from 10th to 21nd is username and password, both password and username are 6 bytes, please fill 0 in the lack.

④ heartbeat package and register package

Send: FF 68 21 D8 B0 4C 44 85 13 61 64 6D 69 6E 00 61 64 6D 69 6E 00 04 1E 00 0A 0A 77 77 77 2E 75 73 72 2E 63 6E 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 77 77 77 2E 75 73 72

2E 63 6E 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 59;

Sum check: 59 = 68 + 21 + ... + 6E + 00+...+00;

From 4th to 9th is the MAC of the PD9, from 10th to 21nd is username and password, both password and username are 6 bytes, please fill 0 in the lack.

Later are the direction of the heartbeat package, register package, time of the heart beat, heart beat length and register package length. Both register package and heartbeat package are 40 bytes, fill 0 in then lack, the last one is sum check.

Heart beat package and register package

Name	Bytes	Example	content
H_R_ucFlags	1	00	Heartbeat register package: 1st 1: heart beat package send to net interface 2nd 1: send heart beat package to serial port 3rd 1: connecting and send register package 4th 1: data carry the register package 5th 1: drop the package header of the Httpd 6th 1: enable setting parameter from the serial parameters 7th 1: enter the heartbeat package in HEX

heart_times	2	00 1e	heart beat time
heart_len	1	00	Heartbeat package length
register_len	1	00	Register package length
heartbeat	40	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	Heartbeat package content
register_s	40	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	Register package

5.1.3. Commands' Return Content

1. Return results of search command

Return command:

Bytes	Name	Example	Explanation
0	TAG_STATUS	FF	Fixed number
1	Packet_length	24	Fixed number
2	CMD_DISCOVER_TARGET	01	Fixed number

3	Board_type	00	Fixed number
4	Board_ID	00	Fixed number
5~8	Client_IP_address	C0 A8 00 07	Device IP(High in front)
9~14	MAC_address	AC CF 23 20 FE 3D	Device MAC(High in front)
15~18	Firmware_version	01 00 00	device version#
19~34	Application_title	55 53 52 2D 4B 32 00 00 00 00 00 00 00 00 00 00	Device name
35	checksum	F0	checksum

Table 5.1.3-1 Return Command

Example:

Return results of search command(36 bytes)

FF 24 01 00 00 c0 a8 00 07 00 71 77 7c 42 2F 01 0c 00 00 55 53 52 2d 4b 32 00 00 00 00 00 00 00 00 00 00 F2 Parity method is reduce sum check. initial value is 0 x00, then reduce the byte one by one.

The method of the check is as follow:

F2 = 00 - FF - 24 - 01 - 00 - 4B - ... - 32 – 00-…-00

2. Return results of reset command

Response(4 bytes): FF 01 02 4B, if user name and password are right, 4B = 'K'

FF 01 02 50, if user name and password are wrong, 50 = 'P'

3. Return results of read command Description：

Return all parameter of PD9 network. 567 bytes in total, no parity, no protocol, return parameter directly. Return data divide into 4 package, 130bytes, 50 bytes,85 bytes and 302bytes.

For example:

95 63 03 00 00 00 50 00 00 07 00 A8 C0 01 00 A8 C0 00 FF FF FF 55 53 52 2D 54 43 50 32 33 32 2D 33 31 30 00 00 61 64 6D 69 6E 00 61 64 6D 69 6E 00 00 01 00 A4 AC CF 23 20 FE 10 00 00 00 00 00 00 00 00 80 25 00 00 08 01 01 01 00 00 00 00 8C 4E 2A 20 31 39 32 2E 31 36 38 2E 31 2E 31 33 33 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 85 01 A8 C0 00 01 00 00 00 00 00 00 00 00 00 00 00；

00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

00 30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00；

07 2F 31 2E 70 68 70 3F 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 2A 55 73 65 72 5F 41 67 65 6E 74 3A 20 4D 6F 7A 69 6C 6C
61 2F 34 2E 30 0D 0A 43 6F 6E 6E 65 63 74 69 6F 6E 3A 20 63 6C 6F 73 65 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Return:FF 01 03 50 if the password is wrong and no parity.

4. Return results of basic settings command FF 01 05 4B with right password:4B=" k" FF 01 05 50 with wrong password:50="P"

5. Return results of serial parameters settings command

FF 01 06 4B with right password:4B="k"

FF 01 06 50 with wrong password:50="P"

6. Return results of heartbeat package command

FF 01 06 4B with right password:4B="k"

FF 01 06 50 with wrong password:50="P"

7. Others return results

Sum check fault returns 'E' + right parity

Correct execution: FF 01 CMD 'K'

User name/password fault returns: FF 01 CMD 'P'

Others faults return: FF 01 CMD 'E'

5.1.4. Listening Report Method

Using the below wan to catch the report.

Please using the set-up software PD9Config

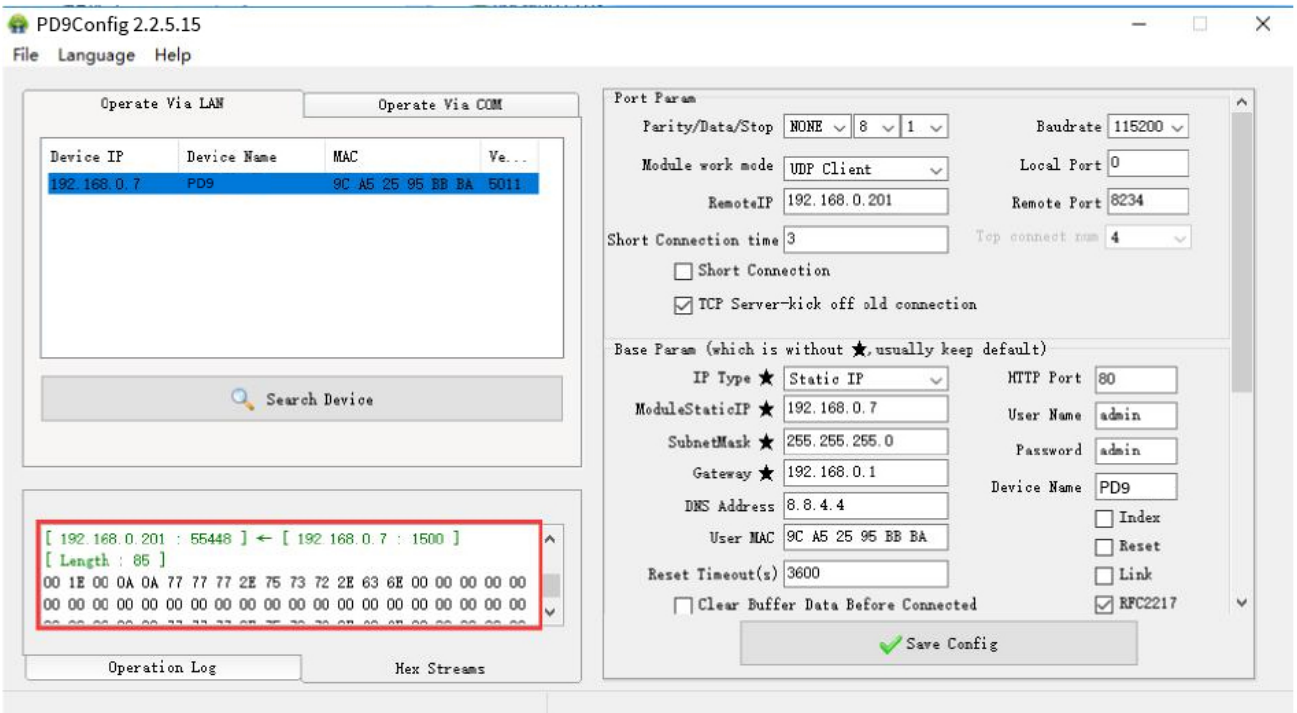


Fig. 5.1.4-1 Catch the report

6. Parameter Configuration

It is setup software configuration, webpage configuration and serial configuration.

How to configure:

Revise user name/password→set IP access method→serial parameter→ PD9 work mode→work mode related parameter

6.1. Software Configuration

To make sure setup software normal running, please check the below firstly:

1. PD9 and setup software PC are within same LAN.
2. Disable the anti-virus software and firewall on PC.
3. Disable network card nothing to do with this testing.

Download PD9Config software at www.lumel.com.pl:

Search device and all PD9 device within LAN can be found. It includes IP, name, MAC and version.

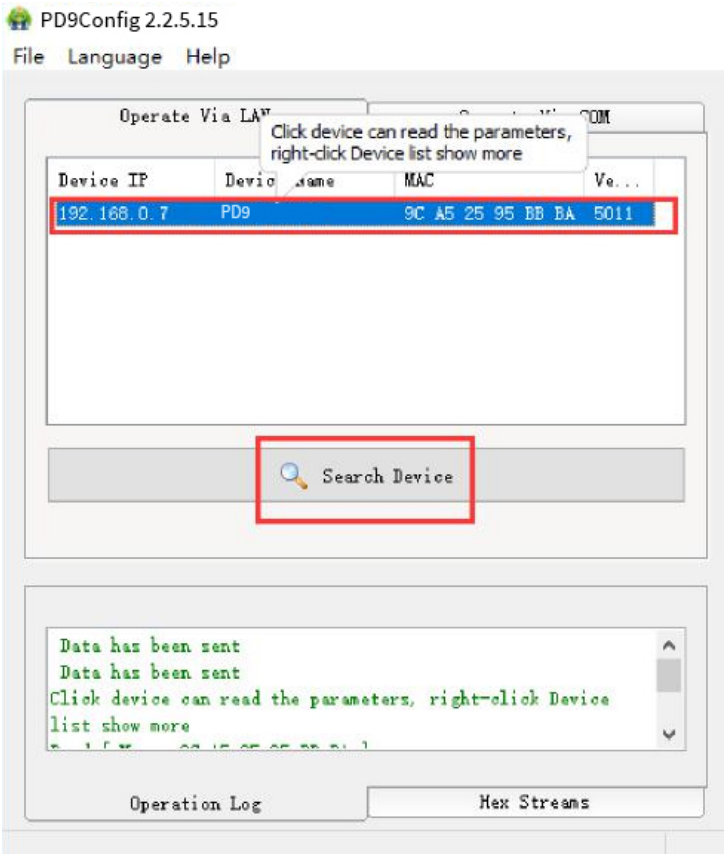


Fig. 6.1-1 Software Configuration—Search

1. Basic parameter configuration

Click “Full Show” and all basic parameter is revealed.

Set the parameter as needs and click “Base Save” then can set successfully.

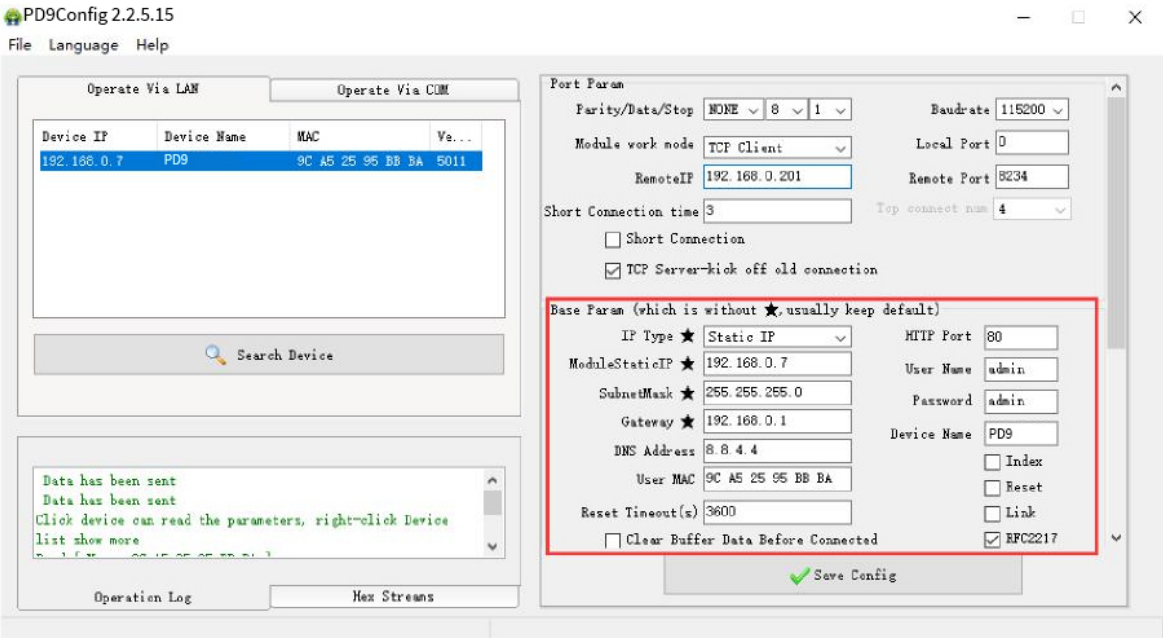


Fig. 6.1-2 Software Configuration --Full Show

- Webpage port: it is 80 by default when visit webpage.
- User name: Authentication Code for revising parameter to avoid other users within same LAN revising it.
- Password: same as user name.
- Device Name: PD9 's name an be revised.
- IP address type: Static and DHCP
- Static IP: same segment with router.
- Subnet Mask: 255.255.255.0 by default.
- Gateway: it is router IP generally, can transmit cross network segment and DNS if set correctly.

2. Port configuration

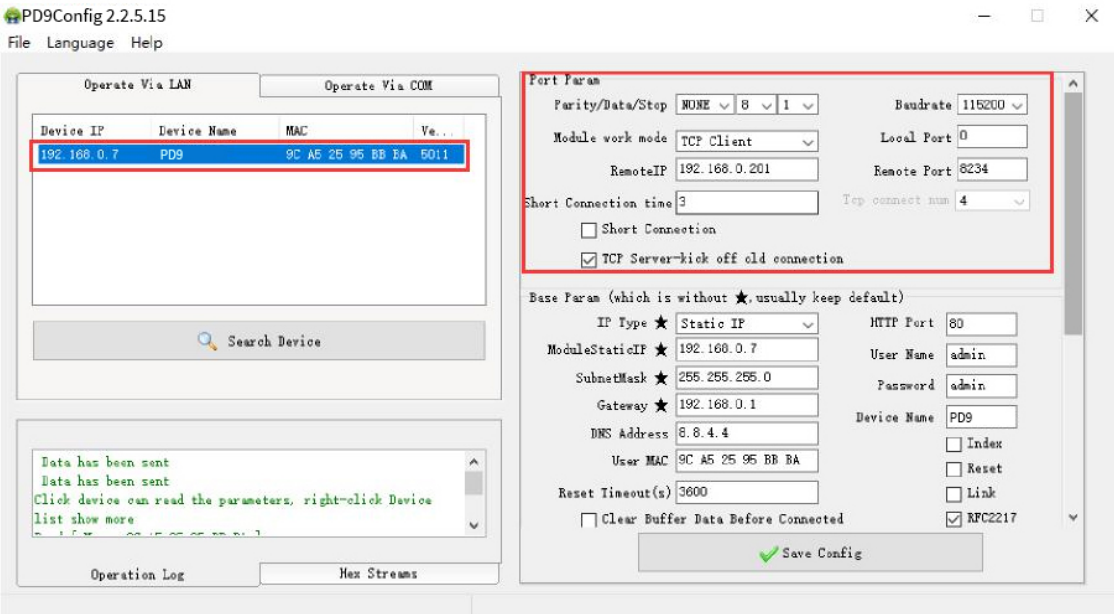


Fig. 6.1-3 Software Configuration-COM 1 Configuration

Serial Baud rate: it can be standard or customized.

- Parity/Data/Stop: serial parameter.
- Work Mode: TCP Server /TCP Client/HTTPD Client/UDP Client/UDP Server

- Destination IP/Port: IP connected when PD9 works as client (TCP Client/HTTPD Client/UDP Client)
- Local Port: The port number of PD9 be used to initiate the connection. Advice to set it to "0" when PD9 works under TCP Client for connection with Random port.
- Similar RFC2217: Please refer to Chapter 3.5.10 Similar RFC2217

3. Firmware Upgrade

If PD9 need to upgrade with new firmware, please contact the manufacturer.

During firmware upgrade, PD9 connects to PC directly. PC Upgrade via Wi-Fi is prohibited. Please refer to Chapter 4.1.5.

6.2. Webpage Configuration

Open browser and type in PD9 ' IP (192.168.0.7 by default)

Then user name: admin and password: admin

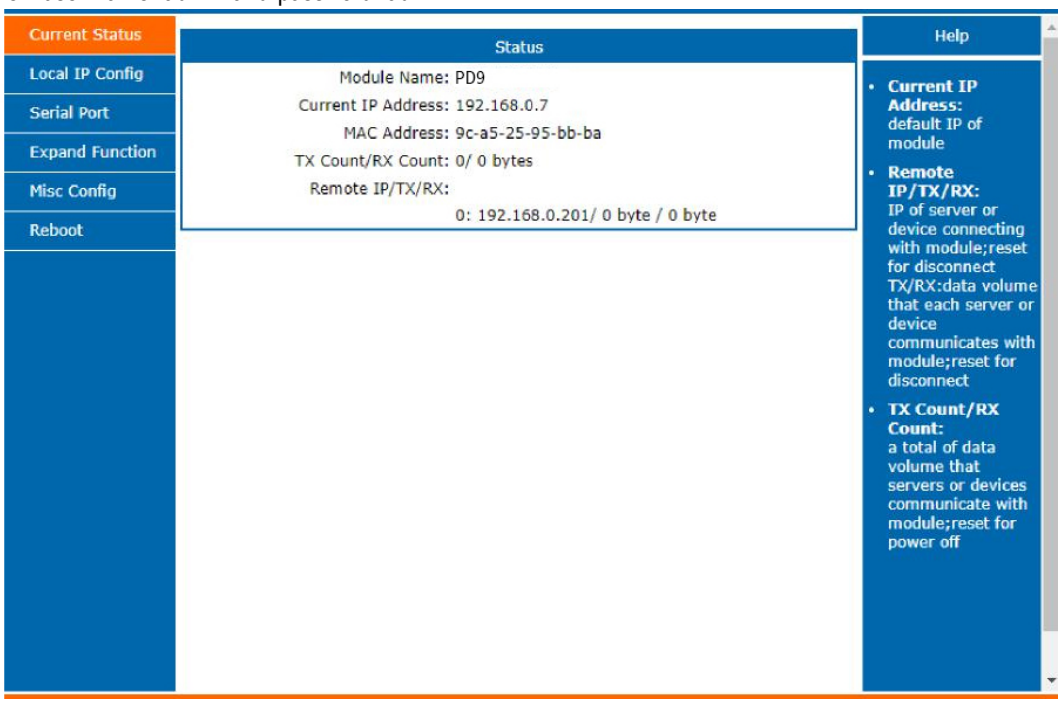


Fig. 6.2-1 Catalog

1. Current Status - reveals basic information:

- Module name
- Current IP address
- MAC address
- Total amount of data sent and received by all connections
- The IP address of the connected device and the amount of data sent and received for each connection

2. Local IP Config

Save configuration after revising the parameters. Then restart.

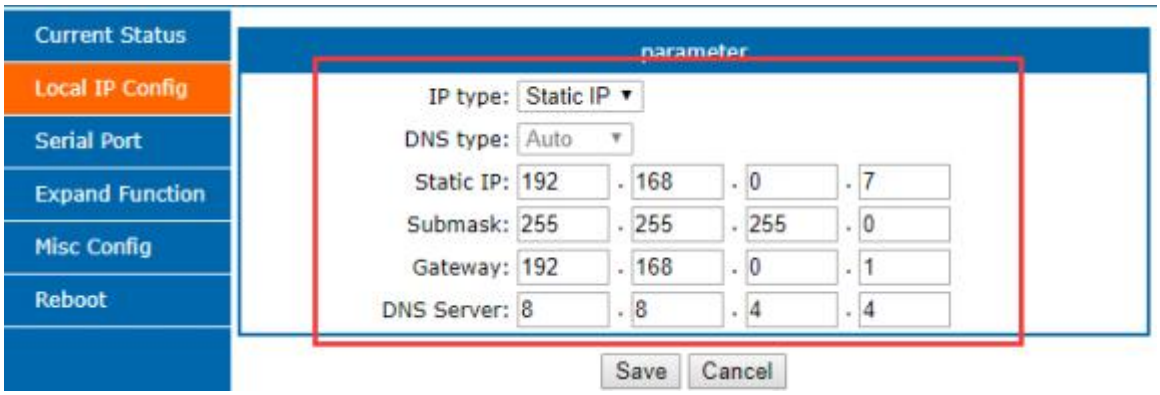


Diagram 6.2-2 Webpage Configuration-Local IP Configuration

3. Port parameters

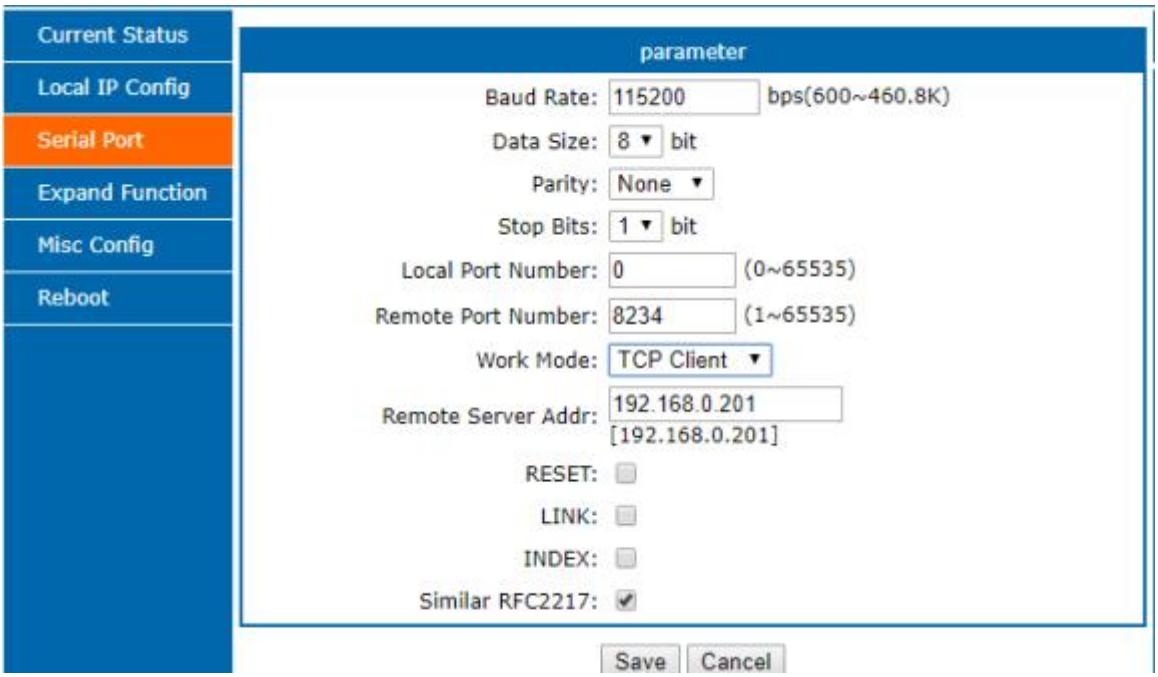


Fig. 6.2-3 Basic Parameters

4. Expand Function

- Custom heartbeat package function: can be opened by webpage, content customization, up to 40 bytes Buffer data before connected: whether serial and network data are cached if disconnection.
- Customize the registration package function: can be opened through the webpage, the content is customized, the maximum length is 40 bytes, and the registration package is customized.
- Impersistent Connection: Enable this function in TCP Client mode, short connection disconnection time customization
- Buffer Data Before Connected: You can set whether to clear the cached data before the connection.
- New connection in TCP Server mode kicks off old connection function
- UART Set Parameter: The function of setting parameters through the serial port protocol can be enabled through the webpage.
- Modbus TCP: Disable by default.

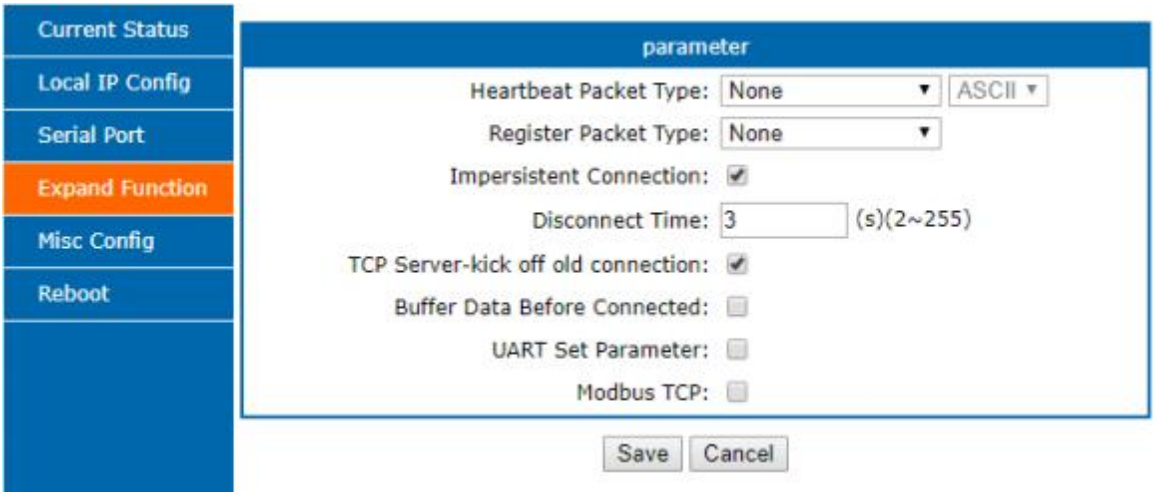


Fig. 6.2-4 Expand Function

5. Misc Config

Save all data then click restart to take effect.

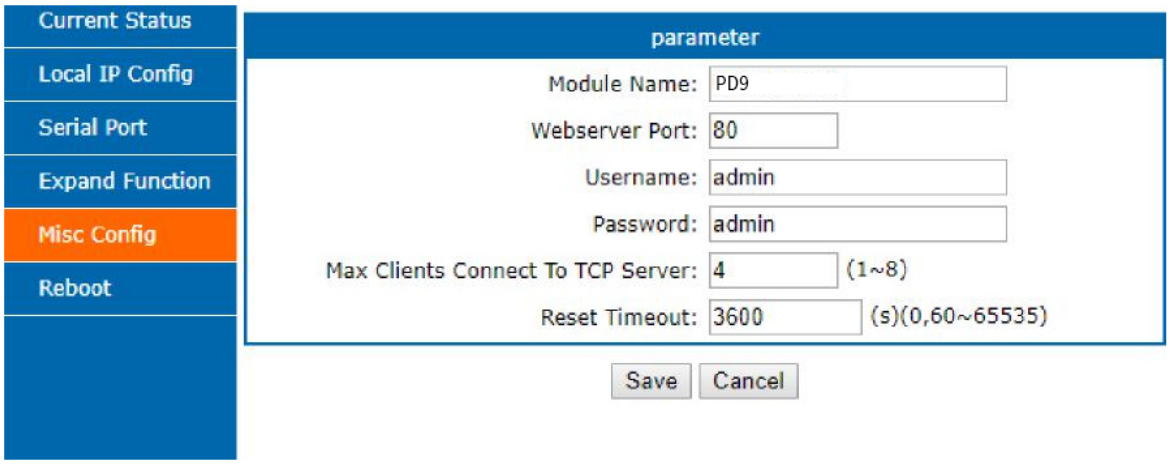


Fig. 6.2-5 Misc Config

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