Protoss-PW21

RS485 to Wi-Fi/Ethernet

User Manual

V 1.2

Overview of Characteristic

- ✧ **MIPS MCU with 4MB Flash and 8MB SRAM. Run on eCos**
- ✧ **Support TCP/UDP/MQTT/HTTP/WebSocket Protocol**
- ✧ **Support Modbus TCP to RTU, Modbus Master Function**
- ✧ **Support RS485 to Ethernet/Wi-Fi Conversion, Serial Speed Upto 230400 bps**
- ✧ **Support STA/AP/AP+STA Mode**
- ✧ **Support Router or Bridge Network Working Mode.**
- ✧ **Support 10/100M Ethernet Auto-Negotiation**
- ✧ **Support Easy Configuration Through a Web Interface or PC IOTService Tool**
- ✧ **Support Security Protocol Such As TLS/AES/DES3**

- **Support Web OTA Wirelss Upgrade**
- **Multiple Type of Different Power Input：**
  - **Protoss-PW11-H：100～240VAC@50～60Hz**
  - **Protoss-PW11-M：9～48VDC@1A**
- **Size: 102.03 x 64.95 x 27.50 mm (L x W x H)， C45 rail installation**

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Ed. V1.0	02-11-2020	First Version
Ed. V1.1	03-18-2020	Update RS485 interface
Ed. V1.2	06-23-2020	Update Link LED description

1. PRODUCT OVERVIEW

1.1. General Description

The Protoss-PW21 provides RS485 interface to Ethernet/Wi-Fi connectivity to web enable any device. The Protoss-PW21 integrate TCP/IP controller, memory, 10/100M Ethernet transceiver, high-speed serial port and integrates a fully developed TCP/IP network stack and eCos OS. The Protoss-PW21 also includes an embedded web server used to remotely configure, monitor, or troubleshoot the attached device.

The Protoss-PW21 using highly integrated hardware and software platform. It has been optimized for all kinds of applications in the industrial control, smart grid, personal medical application and remote control that have lower data rates, and transmit or receive data on an infrequent basis.

1.2. Device Paremeters

Table1. Protoss-PW21 Technical Specifications

Item	Parameters
System Information	
Processor/Frequency	MIPS/320MHz
Flash/SDRAM	4MB/8MB
Operating System	eCos
Ethernet Port	
Port Number	1 RJ45 1 WAN/LAN switchable
Interface Standard	10/100 Base-T Auto-Negotiation
Protection	8KV Isolation
Transformer	Integrated
Network Protocol	IP, TCP, UDP, DHCP, DNS, HTTP Server/Client, ARP, BOOTP, AutoIP, ICMP, Web socket, Telnet, uPNP, NTP, Modbus TCP
Security Protocol	TLS v1.2 AES 128Bit DES3
Wi-Fi Interface	
Standard	802.11 b/g/n
Frequency	2.412GHz-2.484GHz
Network Mode	STA/AP/STA+AP
Security	WEP/WPAPSK/WPA2PSK
Encryption	WEP64/WEP128/TKIP/ AES
Tx Power	802.11b: +20dBm (Max.) 802.11g: +18dBm (Max.) 802.11n: +15dBm (Max.)
Rx Sensitive	802.11b: -89dBm

	802.11g: -81dBm 802.11n: -71dBm
Antenna	SMA Antenna Interface
Serial Port	
Port Number	1 RS485
Data Bits	8
Stop Bit	1,2
Check Bit	None, Even, Odd
Baud Rate	TTL: 2400 bps~230400 bps
Flow Control	No Flow Control Software Xon/ Xoff flow control
Software	
Web Pages	Http Web Configuration Customization of HTTP Web Pages
Configuration	Web CLI XML import Telnet IOTService PC Software
Firmware Upgrade	Web, IOTService tools
Basic Parameter	
Size	102.03 x 64.95 x 27.50 mm
Operating Temp.	-40 ~ 70°C
Storage Temp.	-40 ~ 85°C, 5 ~ 95% RH（no condensation）
Input Voltage	Protoss-PW21-H：100～240VAC@50～60Hz Protoss-PW21-M：9～48VDC@1A
Working Current	~200mA
Power	<700mW

1.3. Key Application

The Protoss-PW21 device connects serial device to Ethernet networks using the TCP/IP protocol:

- Remote equipment monitoring
- Asset tracking and telemetry
- Security Application
- Industrial sensors and controls
- Medical devices
- ATM machines
- Data collection devices
- Universal Power Supply (UPS) management units
- Telecommunications equipment
- Data display devices
- Handheld instruments
- Modems
- Time/attendance clocks and terminals

2. HARDWARE INTRODUCTION

The Protoss-PW21 unit is a complete solution for serial port device connecting to network. This powerful device supports a 10/100BASE-T Ethernet connection, a reliable and proven operating system stored in flash memory, an embedded web server, a full TCP/IP protocol stack, and standards-based (AES) encryption.

Figure 1. Protoss-PW21 Appearance

2.1. Interface Definition

Figure 2. Protoss-PW21 Interface

Table2. Protoss-PW21-H Interface Definition

Pin	Description	Net Name	Signal Type	Comment
1	AC Power Input	L	Power	100～240VAC Input
2	AC Power Input	N	Power	
5		RS485_B-	IO	RS485 B-
6	Signal GND	GND	Power	Used for RS485 GND, usually leave it unconnected
7		RS485_A+	IO	RS485 A+
ANT	Antenna	ANT		Wi-Fi 2.4G SMA Antenna
RJ45	Ethernet	RJ45	I/O	10/100M Ethernet Default is WAN function in AP mode (Can be configured to LAN Function), connect to router LAN port for network access. In STA mode, it works in LAN function.
Reload	Restore to factory setting button	Reload	I	**Detailed functions see <Notes>**
Reset	Reset button	Reset	I	Hardware reset button
Net	Network status LED	Net	O	On: Include the following condition.

Pin	Description	Net Name	Signal Type	Comment
				● Ethernt 2 connection OK ● Wi-Fi STA connect to AP ● Wi-Fi AP being connected by other STA device Off: No network connection
Active	UART Data Transfer	Active	O	Off: No data transfer 0.3s Off -> 0.9s On: UART TX Output 0.3s Off -> 0.3s On: UART RX Receive On: UART bidirection.
Power	Power LED	Power	O	On: Power input OK Off: Power input NG.
Link	Server connection LED	Link	O	On(9s)->Off(1s): netp Socket connection OK. On(1s)->Off(9s): Boot OK and no netp Socket connection.

Table3. Protoss-PW21-M Interface Definition

Pin	Description	Net Name	Signal Type	Comment
1	DC Power Input	VCC+	Power	9～48VDC@1A Input
2	DC Power Input	GND-	Power	
Other pin is same as above				

<Notes>

I — Input; O — Output; I/O: Digital I/O; Power—Power Supply

Reload Pin (Button) function:

1. **After module is powered up, long press this button ("Low" > 4s) and loose to make the module recover to factory setting.**

2.2. RS485 Interface

RS485 use two wire links, A(DATA+), B(DATA-). Connect A(+) to A(+), B(-) to B(-) for communication.

The RS485 interface support maximum 32 485 device, special hardware version can support max 255 device. The cable maximum length is 1200 meters. Need to add 120Ohm terminal resistor for over 300 meters.

2.3. RJ45 Interface

Ethernet port is 10M/100M adaptive, support AUTO MDI/MDIX which means it support direct connecting to PC with Ethernet cable.

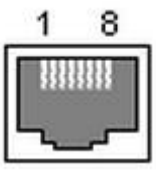


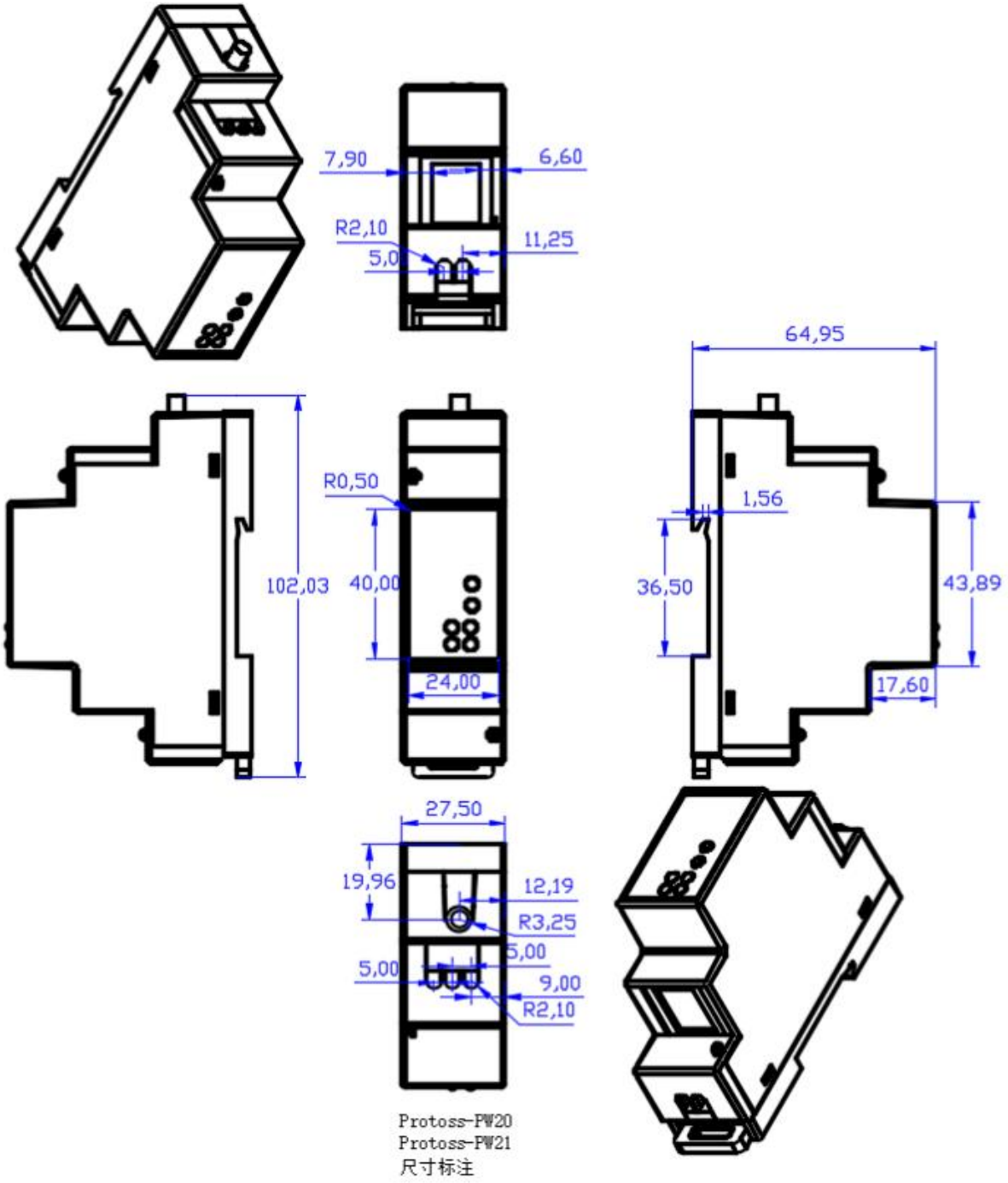
Figure 3. RJ45 Pin Defination

Table4. RJ45 Interface

Pin Number	Name	Description
1	TX+	Transfer Data+
2	TX-	Transfer Data-
3	RX+	Receive Data+
4	PHY-VCC	Transformer Tap Voltage
5	PHY-VCC	Transformer Tap Voltage
6	RX-	Receive Data-
7	N.C.	None Connect
8	N.C.	None Connect

2.4. Mechanical Size

The dimensions of Protoss-PW21 are defined as following picture (mm):



Protoss-PW20
Protoss-PW21
尺寸标注

Figure 4. Protoss-PW21 Mechanical Dimension

2.5. Product Installation

Figure 5. C45 Rail Installation

2.6. Order Information

Protoss-PW21 is defined as following:

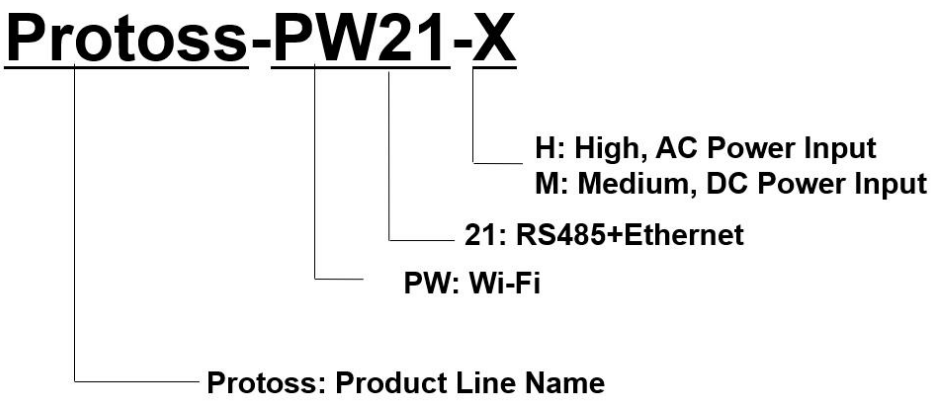


Figure 6. Protoss-PW21 Product Order Information

3. NETWORK STRUCTURE

3.1. Wireless Network

Protoss-PW21 can be set as a wireless STA and AP as well. And logically, it supports two wireless interfaces, one is used as STA and the other is AP. Other STA devices can join into the wireless network through AP interface. So the it can provide flexible networking method and network topology. Functions is as follow:

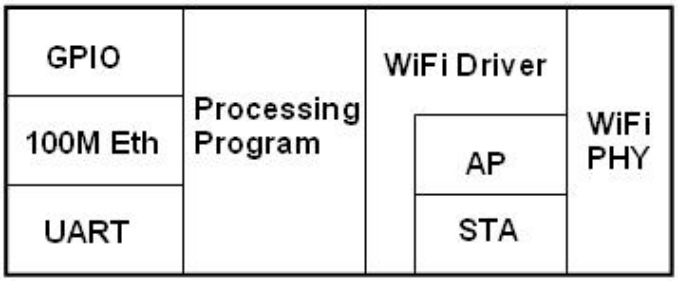


Figure 7. Protoss-PW21 Function Structure

<Introductions>

AP: Wireless access point which is the central joint. Usually, wireless router is a AP, other STA devices can connect with AP to join the network.

STA: Wireless station which is terminal of a wireless network. Such as laptop and pad etc.

3.1.1. AP Network

Protoss-PW21 can construct a wireless network as AP. All the STA devices will consider the AP as the centre of the wireless network. The mutual communication can be transponded by AP, shown as follow:

Figure 8. General AP Network

3.1.2. STA Wireless Network

Take the following picture as example. When router works in AP mode, Protoss-PW21 connects to the user’s devices by RS485 interface. In this topology, the whole wireless network can be easily stretched.

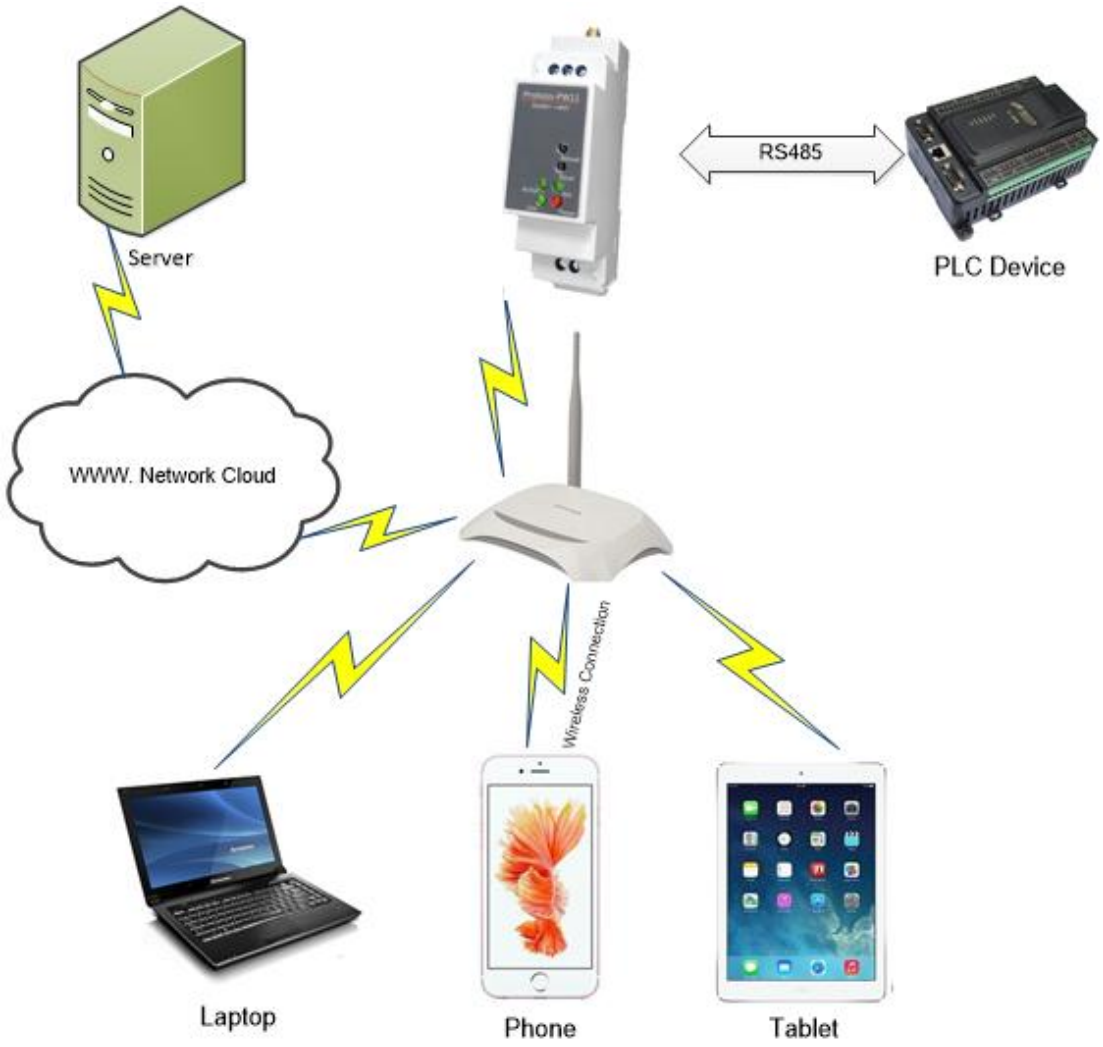


Figure 9. STA Application

3.1.3. AP+STA Wireless Network

Protoss-PW21 can support AP+STA method. It can support AP and STA interface at the same time.Shown as follow:

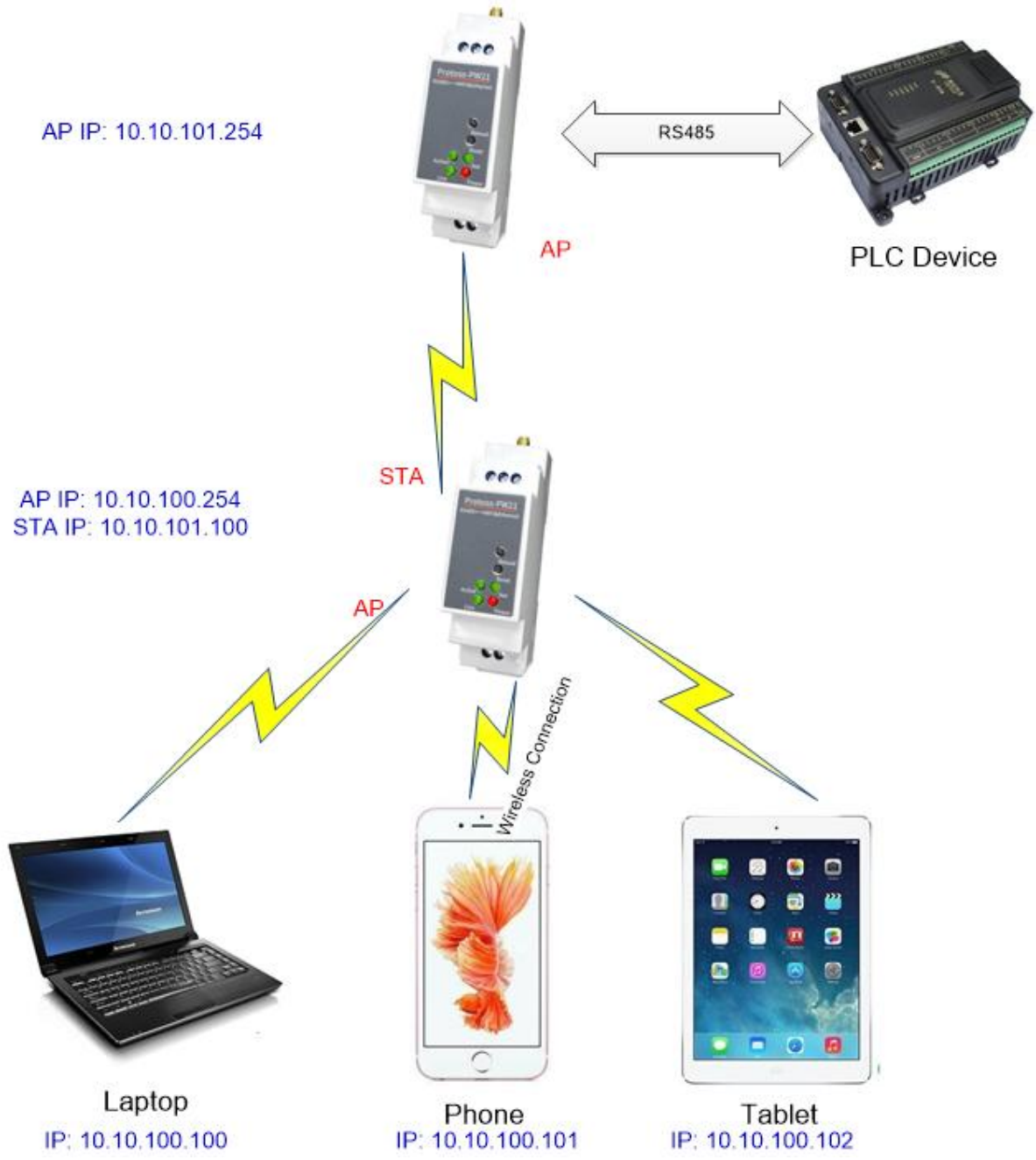


Figure 10. AP+STA Wireless Network

In this picture, Protoss-PW21 open the AP+STA function and the STA interface can be connected to the remote server by the router. Similarly, the AP interface can also be used. Phone/PAD can be connected to the AP interface and to control the serial devices or set itself.

Through AP+STA function, it is convenient to use Phone/PAD to monitor the user’s devices and not change its original settings.

Through AP+STA function, it is convenient to configure the product.And it solves the problem that the formal product can only configure by serial port.

Notes that:

When the AP+STA function is opened, the STA interface needs to connect to other router. Otherwise, STA interface will endlessly scan the router information nearby. When it is scanning, it will bring bad effects to the AP interface, like losing data etc.

AP and STA parts must set to the different sub-network for the product working as APSTA mode.

3.1.4. IOTService Software

Open the IOTService after connect to the AP hotspot generated by Protoss-PW21 or connect to Product Ethernet port to PC, then config the parameter.

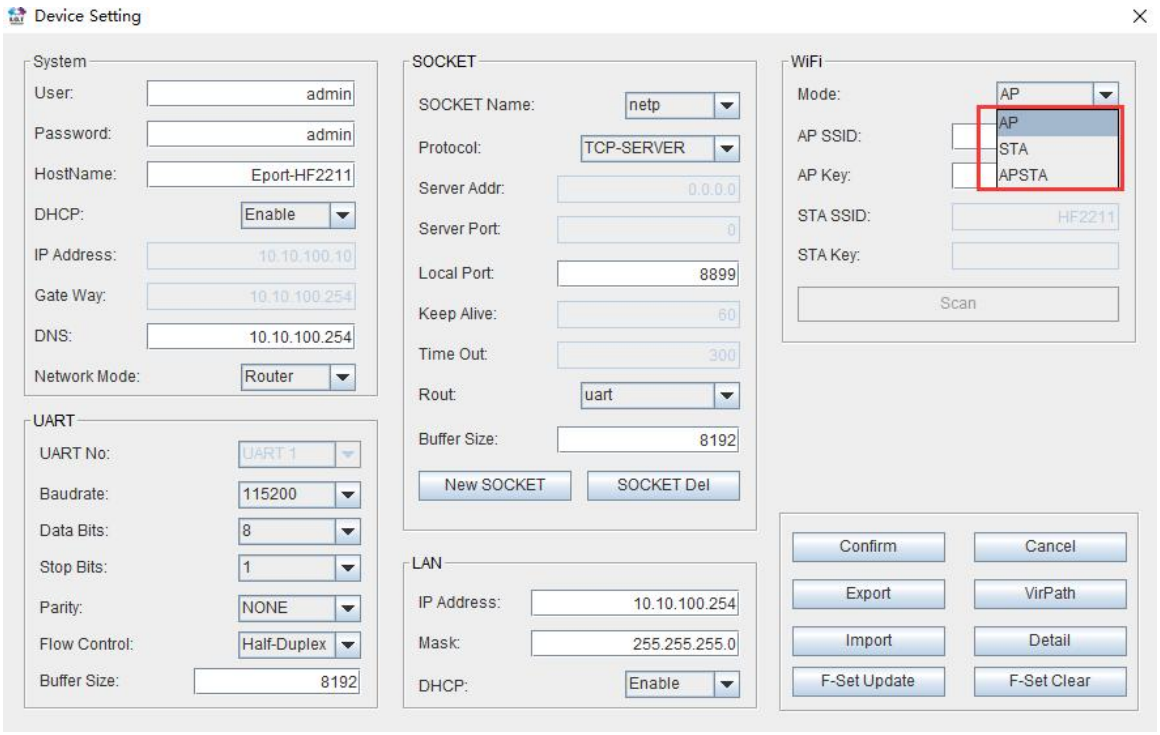


Figure 11. Configure Wi-Fi Parameter

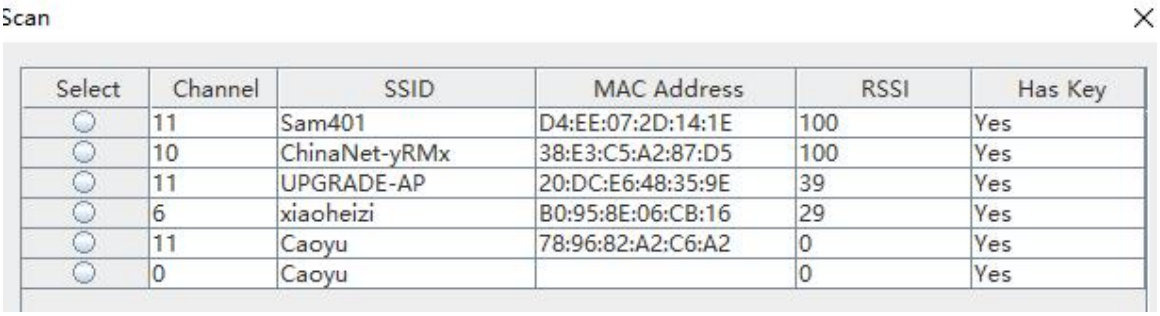


Figure 12. STA Scan Parameter

3.1.5. Webpage Configuration

Use PC to connect with Protoss-PW21 through its AP hotspot or Ethernet connection. Input the default IP(10.10.100.254, default username and password: admin/admin) to login the webpage to configure the parameter.

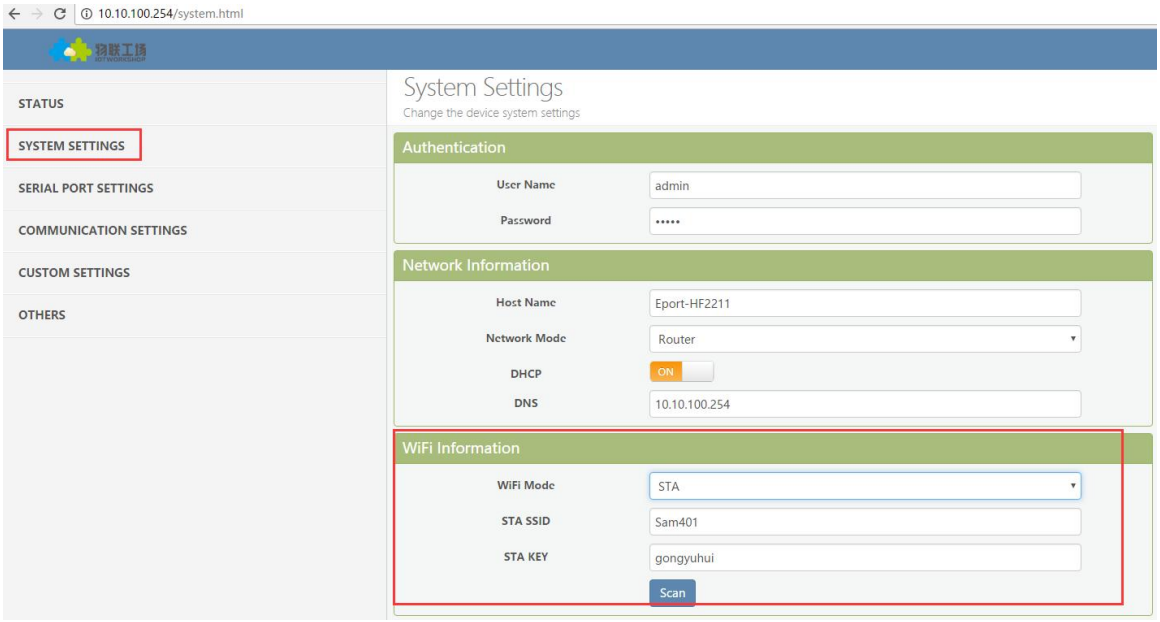
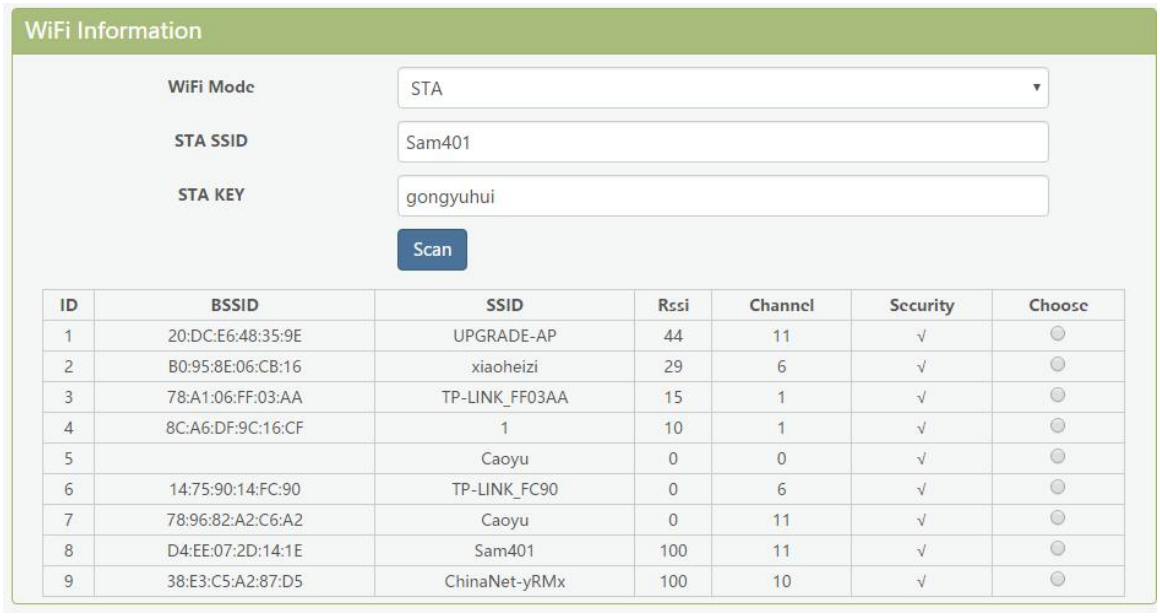


Figure 13. Configure the Wi-Fi Parameter



ID	BSSID	SSID	Rssi	Channel	Security	Choose
1	20:DC:E6:48:35:9E	UPGRADE-AP	44	11	√	
2	B0:95:8E:06:CB:16	xiaoheizi	29	6	√	
3	78:A1:06:FF:03:AA	TP-LINK_FF03AA	15	1	√	
4	8C:A6:DF:9C:16:CF	1	10	1	√	
5		Caoyu	0	0	√	
6	14:75:90:14:FC:90	TP-LINK_FC90	0	6	√	
7	78:96:82:A2:C6:A2	Caoyu	0	11	√	
8	D4:EE:07:2D:14:1E	Sam401	100	11	√	
9	38:E3:C5:A2:87:D5	ChinaNet-yRMx	100	10	√	

Figure 14. STA Scan

3.2. Ethernet Interface Function

Protoss-PW21 provides with a 100M Ethernet interface. Through the 100M Ethernet interface, user can achieve the connection among WIFI, serial port and Ethernet port. When work as AP mode, the

Ethernet works as WAN by default(can be set to LAN), connect to router LAN to get access to network. When work as STA/AP+STA, then Ethernet is LAN mode, usually for PC/PLC to connect it.

3.2.1. Ethernet Port with Wi-Fi

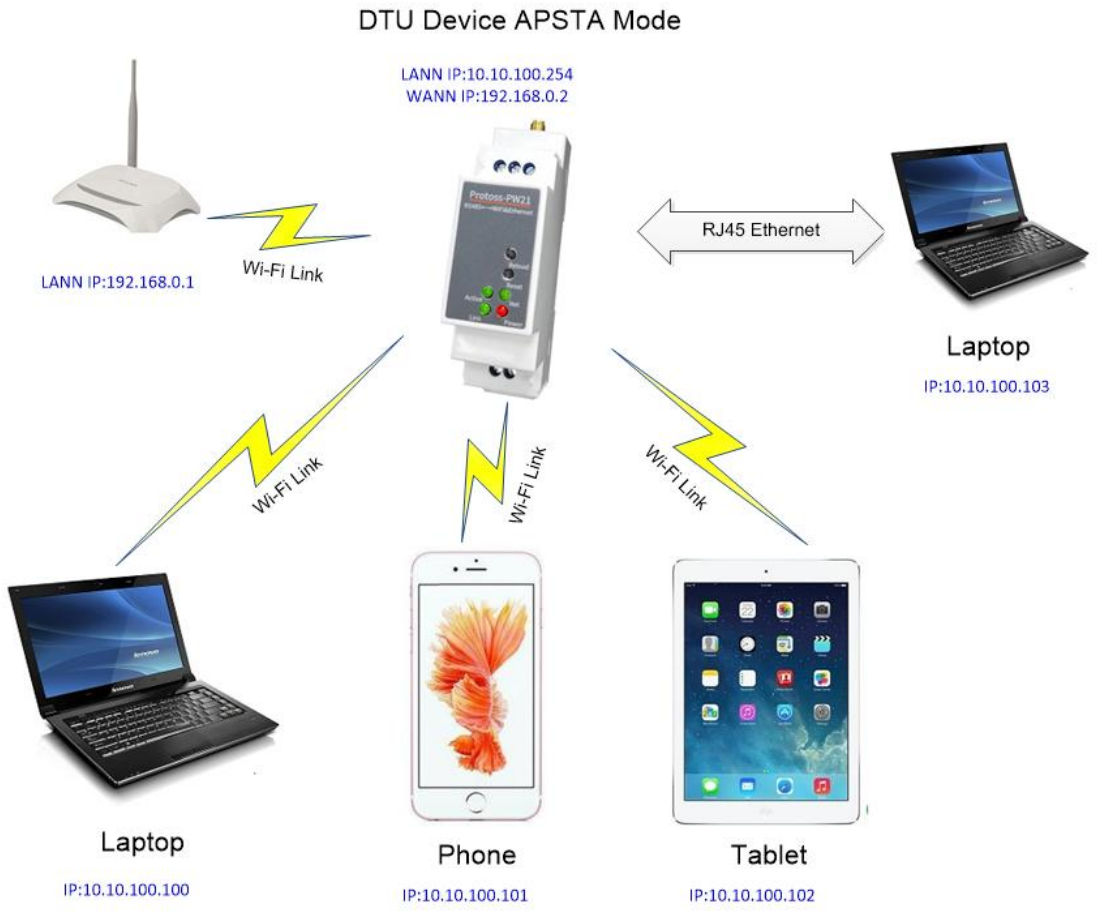
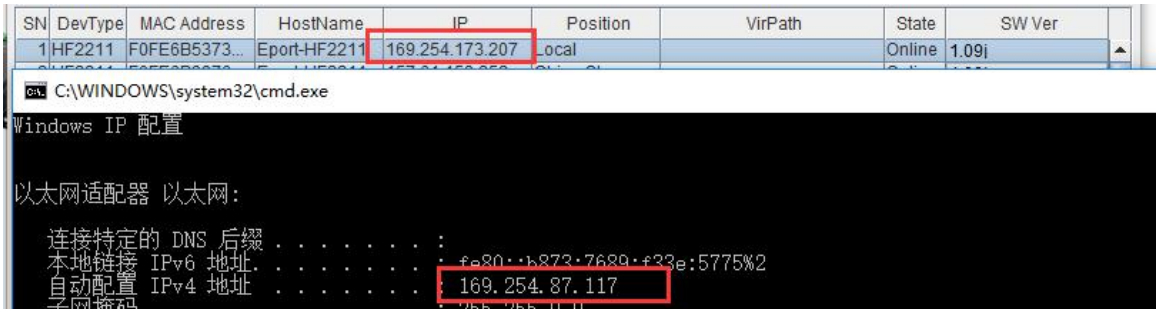


Figure 15. Ethernet Interface Function

Protoss-PW21 servers as APSTA and generate a central network. The IP addresses of all the devices and module's are in the same network segment.

Note：

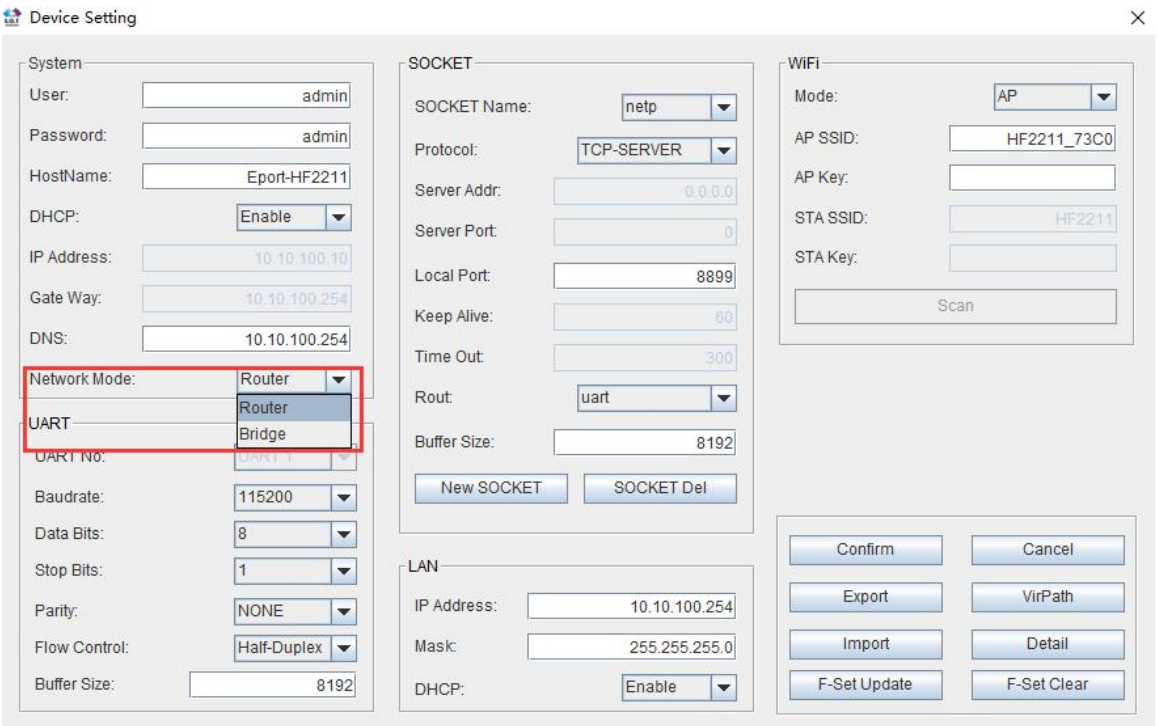
If product works in AP mode, then the Ethernet is working as WAN mode, PC will use Auto-IP to set its IP when connect via Ethernet. Better to change via Wi-Fi, then the PC and other devices are all in same subnetwork.(10.10.100.xxx)

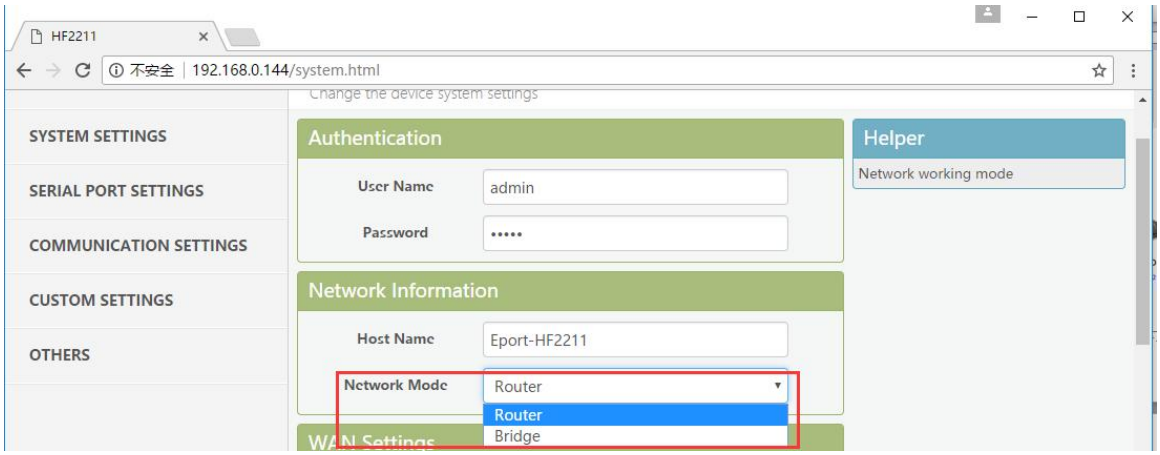


3.2.2. Ethernet Interface Function (Router Mode)

Figure 16. Ethernet Interface Function (Router Mode)

The Protoss-PW21 device Ethernet interface work in router mode. When connect to router, it will get IP address from router (as picture 192.168.1.100). The product itself generate a subnet (10.10.100.254 default). The device from the Ethernet interface is assigned with IP address by module (10.10.100.101). The device and the PC1 are in the same subnet for network communication. A connection fro PC1 to PC2, but PC2 cannot actively connect to PC1.





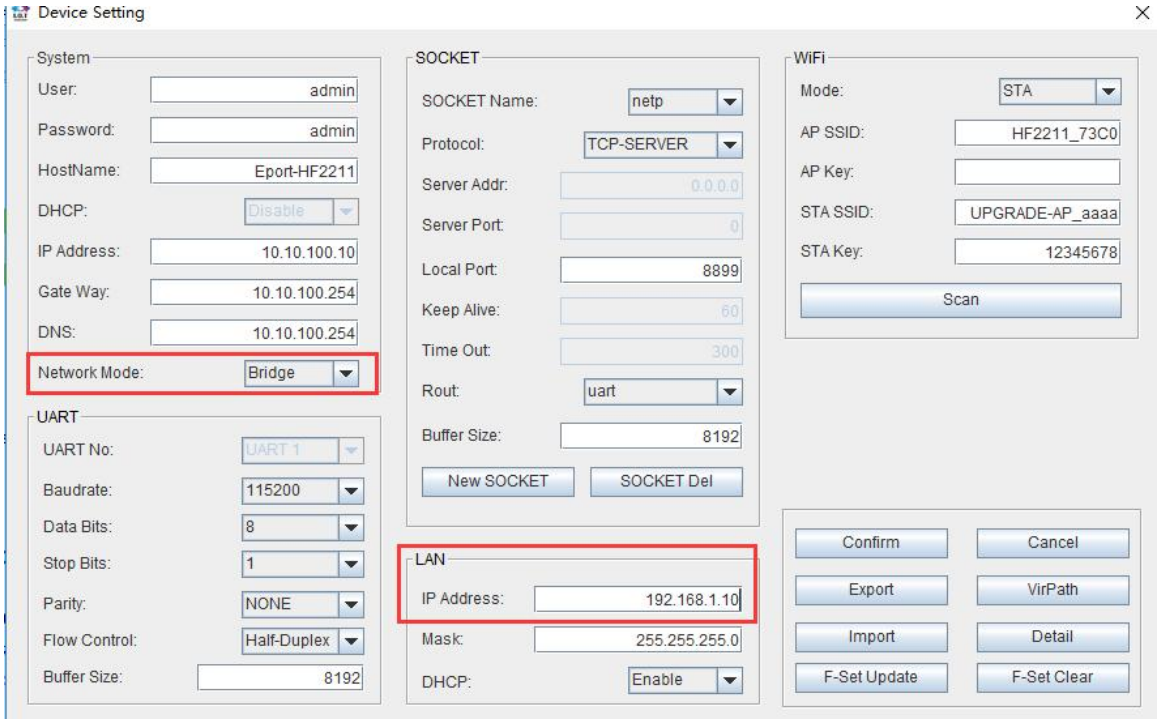
3.2.3. Ethernet Port Function (Bridge Mode)

Figure 17. Ethernet Port Function (Bridge Mode)

The Protoss-PW21 device Ethernet interface work in router mode. When connect to router, it will get IP address from router (as picture 192.168.1.101). AT the whole network, the product is like an invisible device. PC1 ad PC2 can communicated mutually without any constraint. But if product needs to connect with other devices, it needs set LAN IP address (192.168.1.10 as picture)

Notes:

Webpage, IOTService, or Cli command to set working mode, by default is router mode. **It need reboot when change its working mode.**


Device Setting
System
User: admin
Password: admin
HostName: Eport-HF2211
DHCP: Disable
IP Address: 10.10.100.10
Gate Way: 10.10.100.254
DNS: 10.10.100.254
Network Mode: Bridge
UART
UART No: UART 1
Baudrate: 115200
Data Bits: 8
Stop Bits: 1
Parity: NONE
Flow Control: Half-Duplex
Buffer Size: 8192
SOCKET
SOCKET Name: netp
Protocol: TCP-SERVER
Server Addr: 0.0.0.0
Server Port: 0
Local Port: 8899
Keep Alive: 60
Time Out: 300
Rout: uart
Buffer Size: 8192
New SOCKET
SOCKET Del
LAN
IP Address: 192.168.1.10
Mask: 255.255.255.0
DHCP: Enable
WiFi
Mode: STA
AP SSID: HF2211_73C0
AP Key:
STA SSID: UPGRADE-AP_aaaa
STA Key: 12345678
Scan
Confirm
Cancel
Export
VirPath
Import
Detail
F-Set Update
F-Set Clear

4. FUNCTION DESCRIPTION

Refer to “IOT_Device_Series_Software_Funtion” document for more detailed function.

APPENDIX A:REFERENCES

Address: Room 1002,Building 1,No.3000,Longdong Avenue,Pudong New Area,Shanghai,China,201203
Web: www.iotworkshop.com or www.hi-flying.com
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Support: support@iotworkshop.com
Service: service@iotworkshop.com
Business: business@iotworkshop.com

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