



# **Dahua 5.8GHz Wireless AP/CPE User Manual**

**Version: 1.0.0**

**Zhejiang Dahua Technology CO., LTD**

 File Version Description

 Sheet 1 Version Description

Version	Release Time	Revised Chapters	Author
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 Reference Materials

 Manual Purposes

The manual mainly provides the users with some help to get familiar with PFM88X and how to use PFM88X; especially they can solve some common problems when some troubles occur to the device. The manual is mainly involved in PFM88X hardware info, various parameters of webpage, configuration mode, networking mode, malfunction analysis and some other aspects, which can effectively help users to get familiar with the usage of the device quickly and shorten the time of entry Bridge series products for users.

 Statement

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 Noun Definition and Acronym Description

 Sheet 2 Noun Definition and Acronym Description

SN	Definition or Acronym	Description
1	PFM880	Long-distance wireless transmission server AP
2	PFM881	CPE client

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# 1 Product Overview

PFM88X series device is a device with unique built-in TDMA wireless technology, which integrates industry-leading core technology and has the features of long distance transmission, high throughput rate and strong anti-interference.

TDMA, 5M/10M/20M/40MHz bandwidth flexible configuration, rate control, ACK overtime auto adjustment and etc. TDMA effectively solved the problem of hidden node which bothers large-scale point-to-multipoint WLAN. 5M/10M/20M/40MHz bandwidth flexible configuration achieved a balance between scarce wireless bandwidth resource and complex working scenario. Advanced rate control algorithm can quickly adapt to channel quality change and at the same time keep the rate stable as much as possible. ACK timeout auto adjustment technology can auto detect the distance between access point and client; adjust wireless parameter to optimize the device performance.

PFM880 max transmission distance can reach 5km, max transmission rate can reach 300Mbps, and it also has excellent long-distance transmission performance, its throughput rate can reach 40Mbps at 3km and 30Mbps at 5km respectively and transmit multichannel HD video. It can be used as wireless bridge between point-to-point and point-to-multipoint remote access, and a base station AP for WI-FI wireless coverage.

## 1.1 Product Introduction

PFM has the most advanced design technology in the industry; compact body contains base station and wireless transmission effect and an advantage of high performance.

Integrated advanced TDMA, MIMO, Multi-hop and other advanced technologies. Innovative compatibility and improvement of 802.11n protocol guaranteed long distance, throughput rate and

anti-interference ability of device wireless transmission. PFM88X series wireless device owns following advantages compared with other brand products:

### **1. Integrated Technology**

PFM88X with built-in operating system integrated TDMA, which effectively solved the problem of hidden node which bothers large-scale point-to-multipoint WLAN. Operating system adopts advanced rate control algorithm which can quickly adapt to channel quality change and at the same time keep the rate stable as much as possible. It is suitable for long-distance wireless transmission and solved the problem of long-distance point-to-point access, which makes more access number and rate distribution more average, which is fit for the application of operator and wireless monitoring field.

### **2. Long Transmission Distance, High Throughput Rate**

PFM88X max transmission distance can reach 5km, max transmission rate can reach 300Mbps, and it also has excellent long-distance transmission performance, its throughput rate can reach 40Mbps at 3km and 30Mbps at 5km respectively. Its long-distance transmission and high performance can meet the users' demand of high bandwidth and long-distance communication.

### **3. Integrated Watchdog**

PFM88X integrated hardware watchdog which monitors system operation all the time. Once the system works abnormally, watchdog will reset the system and make it restart, which effectively guarantees the stability of PFM88X.

### **4. Ping Watchdog Function Real-time Detect Link**

Ping Watchdog function can detect if the link works normally, it will help to restart the device when malfunction occurs to the link, which guarantees stability of the link.

### **5. A great number of frequencies provided to users**

Currently most wireless products are working in standard 802.115.8G frequency, but the standard

5.8G frequency band is relatively less. 5.8G device will be more susceptible to interference when the use of 5.8G device is very extensive. However, PFM88X products increased support for 5.8G nearby frequency, which will make the working frequency expand to 4920MHz-6100MHz. Because the interference of some frequencies is very little, the client working in these frequencies and performance of access point are better than other frequencies. PFM88X's support for non-standard frequency reduced the interference from outside wireless products and effectively improved the throughput rate of PFM88X, which will meet users' demand for high bandwidth.

**Attention:** Please confirm if it conforms to local laws and regulations and radio management regulations before using these non-standard frequency bands.

## 6. Adapt to complex working environment

PFM88X can work in complex environment, working temperature is between -30°C and 70°C, working humidity is between 5% and 95%. PFM88X can still maintain high throughput rate if it works in thunderstorm, high temperature high humidity, low temperature low humidity and other severe weather conditions for a long time.

## 1.2 Electrical Specifications

See sheet 3 for the electrical specifications of PFM88X.

Type	Item	DH-PFM880	DH-PFM881
Wireless Technology	Standard	IEEE802.11 a/n	
	Working Frequency	USA(FCC): 5.725~5.825 GHz ISM band	
		ETSI: 5.15~5.35 GHz; 5470~5725 MHz ISM band	
	Modulation Mode	802.11 a/n: OFDM	
	Antenna	External antenna: gain 16dBi	Built-in antenna: gain 15dBi
	Equivalent Output Power	+27dBm(@MCS0,11n)	+23dBm(@MCS0,11n)
	Receiving Sensitivity	-74dBm @ 65Mbps, -96dBm@1Mbps	
Optimal Transmission Distance	0-3KM	0-5KM	

	Working Frequency Band	5470-5825 MHz	
	Wireless Authentication	SRRC	
	Wireless Direction Angle	Horizontal 90° , vertical 12°	Horizontal 40° , vertical 15°
	Transmission Rate	11n: 300/270/216/162/108/54Mbps	
		150/135/108/81/54/27Mbps	
		135/121.5/108/81/54/40.5/27/13.5Mbps	
130/117/104/78/52/39/26/13Mbps			
65/58.5/52/39/26/19.5/13/6.5Mbps			
	11a : 54/48/36/24/18/12/9/6Mbps(self-adaption)		
Hardware	Power Module Port	1*POE RJ45(IN: 220V, OUT: 24V/0.5A)、1*LAN RJ45	
	Power Consumption	MAX 10W	MAX 8W
	Port	1*POE RJ45	1*POE RJ45、1*LAN RJ45
	Indicator Light	N/A	Wi-Fi status indicator light / LAN port indicator light / Power indicator light / Signal intensity indicator light
	Working Temperature	-30℃~+70℃	
	Storage Temperature	-30℃~+80℃	
	Working Humidity	5%~95%RH( no condensation)	
	Equipment Dimension(mm)	233x233x45mm	280x30x80mm
	Antenna Dimension(mm)	450x140x35 mm	N/A
	Equipment Weight	2.4Kg	0.45Kg
	Antenna Weight	1.26Kg	N/A
	Protection Level	IP66	N/A
Mast Diameter	40mm~60mm		
Software	Encryption Way	WEP/WPA-PSK/WPA2/CCMP(AES)/TKIP	
	Network Mode	Route/Network Bridge	
	Working Mode	Access Point/Client/WDS AP/WDS client/WDS Repeater	
	Security Mechanism	IP/MAC address filtering, hide network name and etc	
	Network Protocol	TCP/UDP/ARP/ICMP/DHCP/HTTP/NTP	
	TDMA Enhancement	Support (TDMA eliminate hidden nodes influence and greatly improve one-to-many performance)	

Auto ACK timing Adjustment	Support (Auto optimize parameter within long-distance communication and make the performance optimal)	
Management and Log	NTP, SNMP, Syslog, Telnet	
Webpage Configuration Management	Support webpage configuration	
Firmware Update	Support Firmware webpage update	
Long-Distance Communication Throughput Rate	≤40Mbps@3km	≤30Mbps@5km
Bandwidth Flexible Configuration	5M/10M/20M/40MHz	

Sheet 3

### 1.3 Product Packaging List

#### DH-PFM880

- Host \*1;
- Antenna \*1
- Feeder line \*2
- POE power supplier (24V/0.5A)\*1;
- Quick configuration manual;
- Compact disc;
- Accessory

#### DH-PFM881

- Host \*1;
- POE power supplier (24V/0.5A)\*1;

- Quick configuration manual;
- Compact disc;
- Ribbon \*2;

## 1.4 Product Features

- Adopt high performance 802.11n 2X2 MIMO chip, max rate 300Mbps, outdoor max transmission distance 5km
- Excellent far field rate performance: throughput rate  $\leq 40\text{Mbps}@3\text{km}$ ,  $\leq 30\text{Mbps}/5\text{km}$  (under the condition of hollowness)
- Support four working modes: AP, Station, AP-WDS, Station-WDS
- Use unique TDMA technology, intelligent rate control, auto ACK overtime adjustment and some other technologies.
- TDMA protocol overcame 802.11 inherent problem of inherent node, which makes the product have better long-distance and point-to-point performance.
- Support point-to-point and point-to-multipoint transmission modes.
- Exclusive antenna, radio-frequency amplifier, low noise receiver design, ensure long-distance video, audio and data transmission.
- Customize common scenario and working mode for users, make it convenient for non-wireless professionals to use and install.
- Exclusive TDMA technology can maximize the use of bandwidth resource and better support point-to-multipoint data transmission.
- POE power supply, support international universal 802.3af standard, power supply mode is more convenient and reliable.

- Remote control and management through webpage, easy for configuration.
- Water-proof and ultraviolet-proof cover ensures outdoor stable operation for the device.

## 1.5 Application Range

1. Safe towns, safe construction sites, safe scenic area
2. Playground, ranch, uptown crossroad and other no blocking scenarios.

## 1.6 Hardware Description

See sheet 4 for the simple hardware information of PFM88X:

Hardware Index	
CPU/Baseband Radio	Atheros AR7240/AR9280
Memory	32MB DRAM, 8MB Flash
Physical Port	2 × 10/100M Base-TX (Cat. 5/5E, RJ-45)Internet access
LED Indicator Light	Power, LAN, WLAN, 3×Link Quality
Power Supply	POE, Power Adapter 24V/0.5A

Sheet 4

## 1.7 Hardware Description

In order to make users not have to login webpage, and let them have a rough idea of current working situation of PFM88X intuitively with naked eyes, PFM88X adopts LED to show current working condition and connection quality. LED is mainly divided into two parts, one is device status, and the other is connection quality. See Figure 1 for more details, the first LED from left is power indicator, the second is network indicator, the third is connection indicator; the first to the third from

right are signal intensity indicator, see sheet 5 for more details.



Figure 1

LED	Color	Status
POWER	Green	Light on means PFM88X connected power
LAN	Green	Light on means PFM88X LAN port is connected to external device
WLAN	Green	Light on means wireless of PFM88X is enabled. Flashing light means the device wireless is enabled and transmitting data by wireless.
Signal Intensity	Red	Indicator shows the signal intensity
	Yellow	Green light on means high signal intensity
	Green	Yellow light on means medium signal intensity Red light on means weak signal or no signal

Sheet 5

## 2 Product Installation

The line connection mode is different under different network mode, because the device default setting is bridge mode. This chapter mainly describes the line connection mode of bridge mode, please refer to chapter 7 network setting for the connection mode of route mode.

### 2.1 Line Connection

See Figure 2 for the installation of PFM88X.

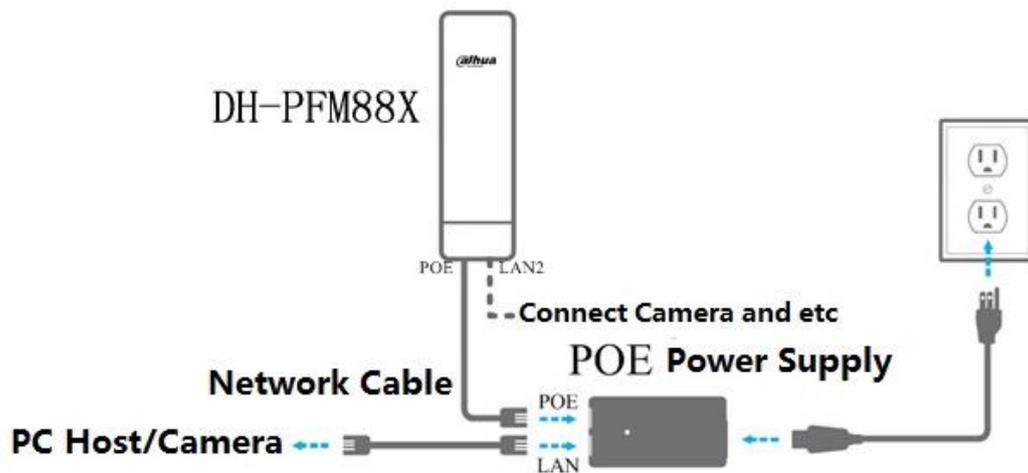


Figure 2

PFM881 device has two internet accesses (RJ45 ports), which are marked as “POE” and “LAN2” respectively. The device default setting is bridge mode, so “POE” port is connected to POE power port by network cable and provides PFM881 device with 24V power and data connection. “LAN2” port can be linked to IP Camera (such as video surveillance application) and other devices.

## 2.2 Restore Default Factory Setting

We can choose manual operation when users forget the IP of PFM88X and can't open the webpage.

See Figure 3 for more details; press Reset button for 5-10 seconds, let go when all the LED lights are on, and the device has been restored default factory setting. Meanwhile, the port with direct connection with PFM88X host will show twice connection and disconnection in a row.



Figure 3

See sheet 6 for main parameters of PFM881 default factory setting

Item	Default Factory Setting
IP Address	192.168.1.36
User Name	admin
Password	admin
Wireless Mode	Client
Way of Encryption	WPA->WPA2->CCMP->Secret Key: 1234567890abc
Network Mode	Bridge Mode

Sheet 6

## 3 Quick Configuration

This chapter mainly describes how to make quick configuration to Bridge device and make it work normally.

### 3.1 Log In

Login PFM88X configuration work is made up of setting the host which connects PFM88X directly and log in, operation steps are as follows:

1. Network connection->local connection, select local connection and single click right button, click properties by mouse left button.
2. Select Internet protocol (TCP/IP), double click with mouse left button, you will see the window shown in Figure 4.

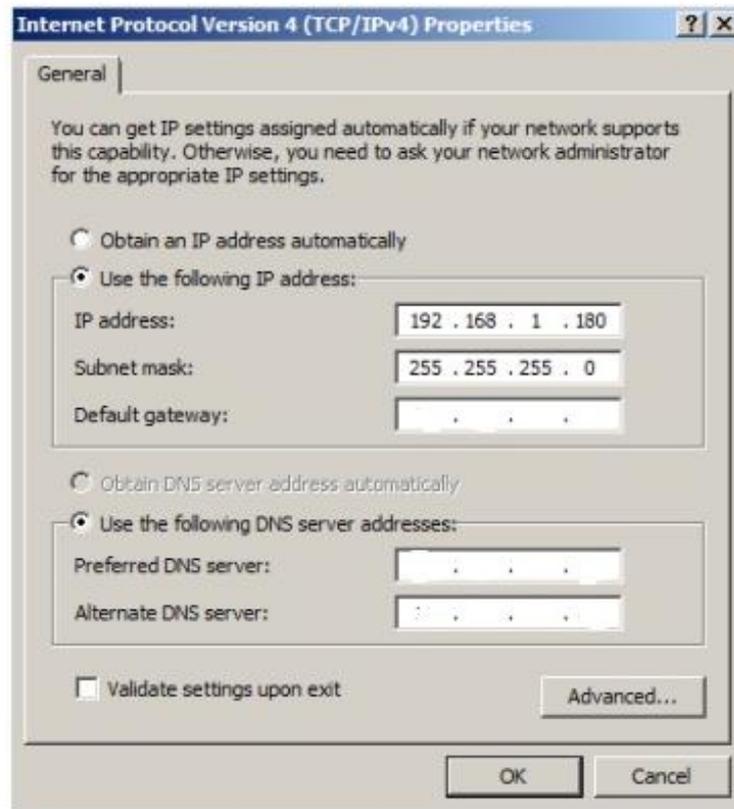


Figure 4

3. IP address is set the same network segment IP of PFM88X, which is shown in Figure 4, and the IP can't be the same as PFM88X. For example: the IP of PFM88X is 192.168.1.36, then the host IP can be set as 192.168.1.180; meanwhile, different PFM88X devices need to be allocated with different addresses so as not to cause address conflict.

4. Input PFM88X IP in the browser and press enter key, enter the login interface, default user name and password are admin\admin;

### 3.2 Device Quick Configuration through Setting Wizard

Users can make quick configuration to Bridge device by setting wizard in this chapter.

1. The first page is "Status Display" After login (see Figure 5); it shows the current working status, current setting and software version of PFM88X. Other pages can be displayed by clicking the menu on the left, as shown in Figure 6.

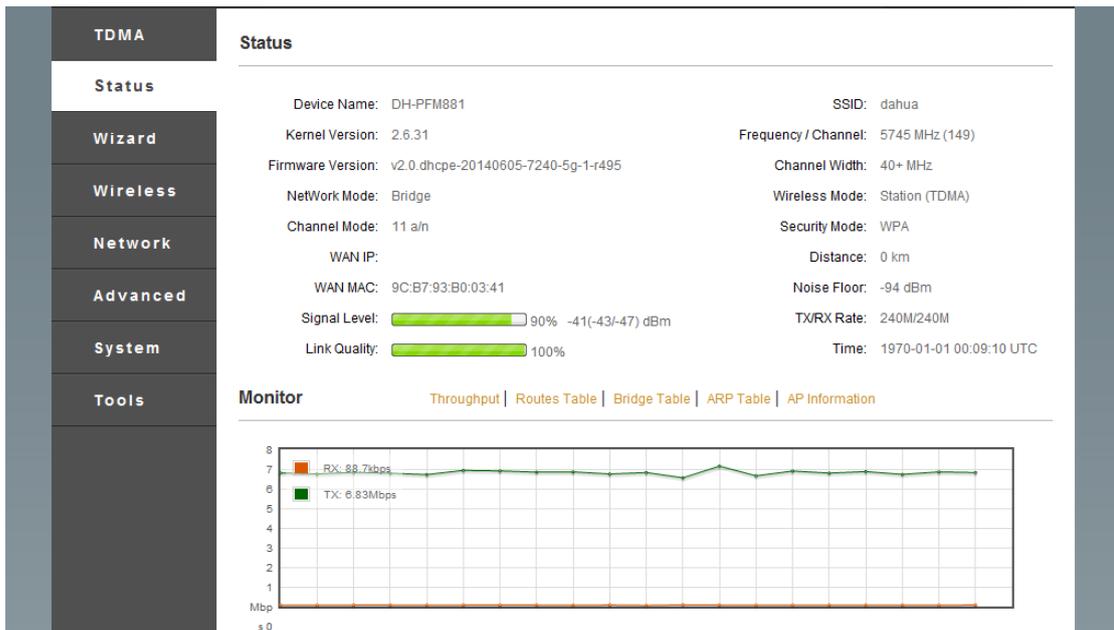


Figure 5

2. Click “Setting Wizard” on the left, as shown in Figure 6. The wizard can help users to make quick configuration to the device, such as network configuration, wireless mode and etc.

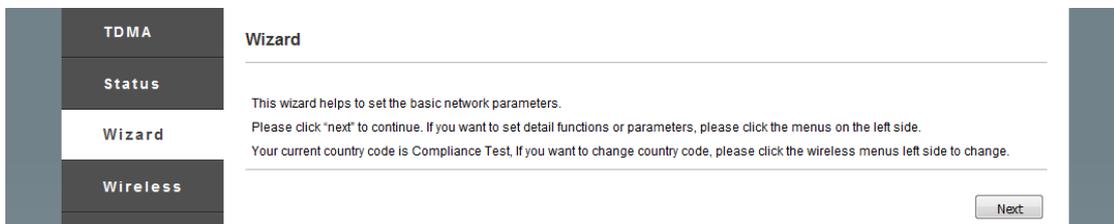


Figure 6

3. Click “Next”, it will display basic network parameter configuration. Device default configuration is “Bridge Mode”, LAN port IP address is “192.168.1.36”, as shown in Figure 7. If users need to configure the device as “Bridge Mode” and other detailed network setting, please click the “Network Setting” menu on the left after completing setting wizard.

**Attention:** If several PFM88X devices realize interconnection of point-to-point or point-to-multipoint, different devices need to be configured with different IP address.

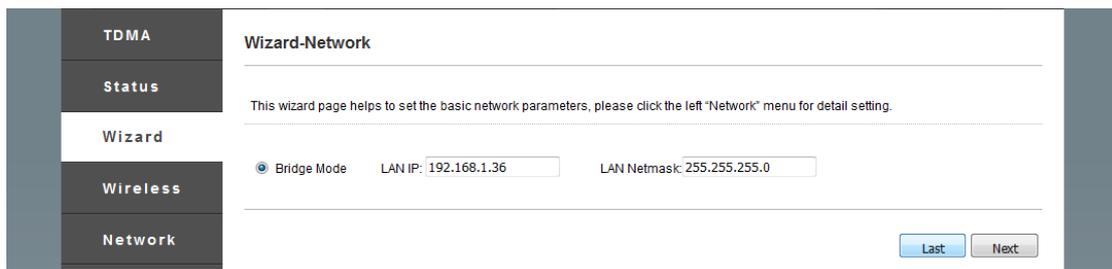


Figure 7

4. Click “Next” and it will display basic wireless mode and wireless security options, as shown in Figure 8. Two of most commonly used wireless mode of PFM88X device are “client” and “access point”.

**Configured as “client” (Station) mode:** It means PFM88X device can be connected to PFM88X device of “access point” mode.

**Configured as “Access Point” (AP) mode:** It means PFM88X device can be connected to PFM88X device of “client” mode.

The precondition is that configuration between wireless encryption option of wireless connection for both sides and network name should be in accordance with each other. Please click “wireless Setting” menu on the left if you need other detailed wireless configuration.

Attention: If you need one-to-one (one-to-many) device interconnection and transmit audio or data, the center device needs to be configured as “Access Point” while other devices configured as “client”, and configured with same way of encryption, then let “Access Point” device connect to “Client” device, in this way audio or data transmission can be done.

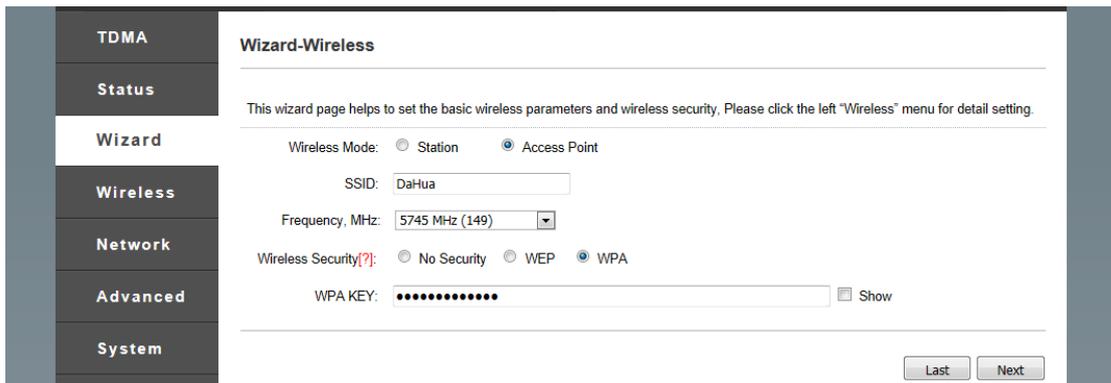


Figure 8

5. Click “Next” and it will display working scenario option, as shown in Figure 9. Please enable “custom scenario” if the users need to customize working scenario, then click “Next” to display custom scenario configuration. If users enable other options and click “Next”, the completion page of setting wizard will occur.

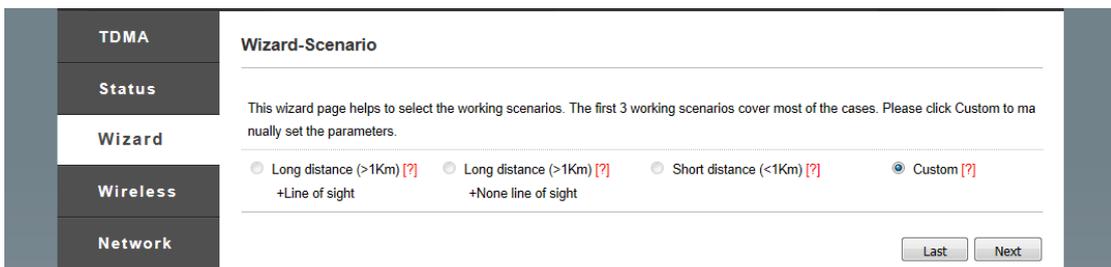


Figure 9

6. In the page “setting wizard-custom scenario”, as shown in Figure 10. The following several option setting will affect the device performance:

**Output Power:** Users need to configure the device output power according to the actual working situation and local laws and regulations, the bigger output power is, and the longer wireless transmission distance will be (The system supports max output power 27dBm).

**Channel Width:** default is 20MHz, to reach optimal wireless transmission rate. It is recommended to use channel width 10MHz under the environment of serious block and long-distance communication (>1km) to improve the quality of wireless transmission.

**ACK-Timeout Auto Adjustment:** Users are recommended to open “ACK-Timeout Auto Adjustment”, this option can auto test the distance between two devices and set parameters according to this distance to optimize wireless connection quality.

Distance: If “ACK-Timeout Auto Adjustment” option is open, then the distance setting will become invalid, system will auto test device distance and optimize connection quality. Users need to close “ACK-Timeout Auto Adjustment” option if they want to make the distance which is set by themselves take effect.

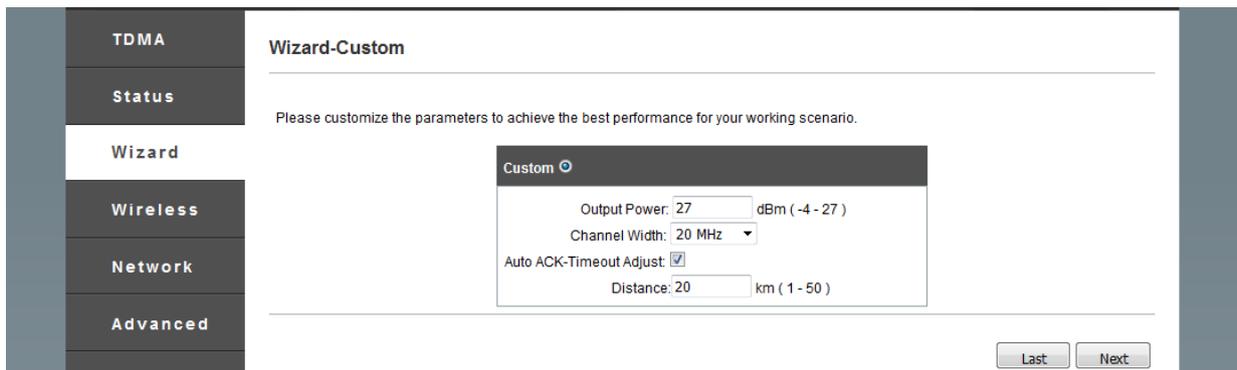


Figure 10

7. The last page is “Setting Wizard-Finish”, as shown in Figure 11. Users can click “change” button to save all the settings, then click “Apply” button to make your settings valid; or click “apply” to modify previous configuration.

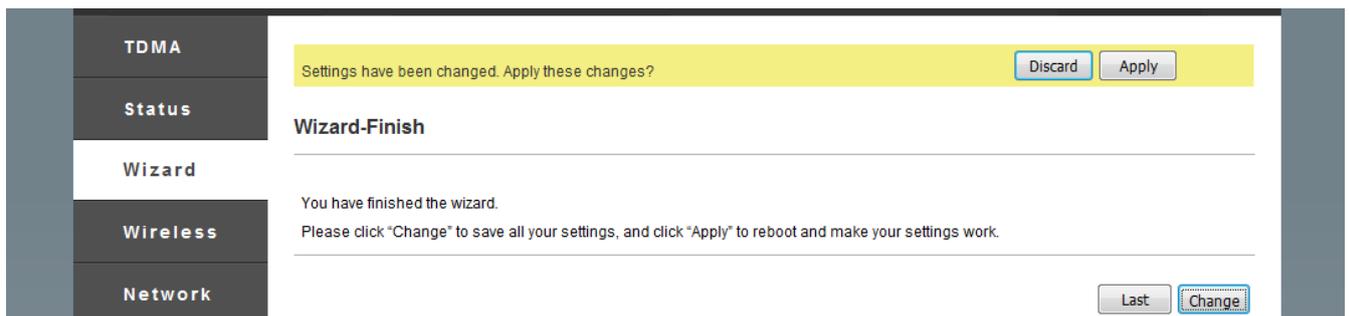


Figure 11

## 4. TDMA

Currently, most long-distance wireless broadband network bridge products developed from 802.11 WLAN technologies. The built-in operation system integrated TDMA, 5M/10M/20M/40MHz bandwidth flexible configuration, rate control, ACK timeout auto adjustment and several other industry-leading technology, which is an ideal product of long-distance wireless broadband access. Among those, TDMA effectively solved the problem of hidden node which bothers large-scale point-to-multipoint WLAN. 5M/10M/20M/40MHz bandwidth flexible configuration achieved a balance between scarce wireless bandwidth resource and complex working scenario: narrower wireless bandwidth configuration is used in the situation where there are less free wireless channels and a single user wireless access rate requirement is not high; wider wireless bandwidth configuration is used under the situation where there are more free wireless channels and single user wireless access rate requirement is high. Besides the narrower wireless bandwidth configuration is more effective in the environment with block. Operation system adopts advanced rate control algorithm which can quickly adapt to channel quality change and at the same time keep the rate stable as much as possible, which is very suitable for long-distance wireless transmission. ACK timeout auto adjustment technology can auto detect the distance between access point and client; adjust wireless parameter to optimize the device performance. See Figure 12 for client TDMA.

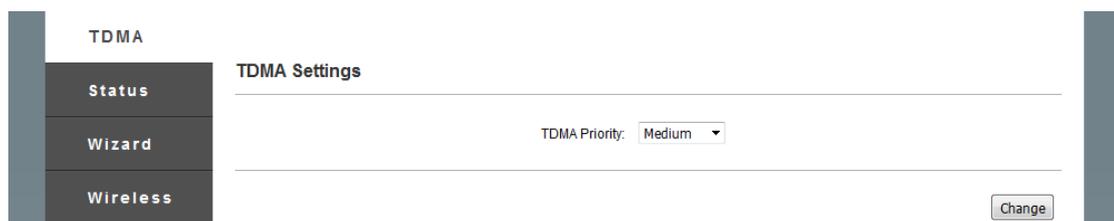


Figure 12

When you enable TDMA function, AP end needs to enable TDMA, client needs to set a priority. Different clients ask for different demand for bandwidth when one AP links to several clients, but the setting of priority is done according to clients' demand of bandwidth for current device. We recommend users to set priority as high if the demand for bandwidth is high, otherwise, priority should be set as low priority. Anyway, all the clients' priority can be set same if they have the same demand for bandwidth.

**Attention:** The TDMA of AP and client should both be open when you want to enable TDMA function. The TDMA from other factories can't communicate with our TDMA. If both our device and device from other factories enable TDMA, then both sides can't be connected.

## 5. Status Display

Status Display is the first page after the users log in, the page displays current configuration of the current device and current working condition of real time monitoring. It is located in the second item of the menu bar; see Figure 13 for more information.

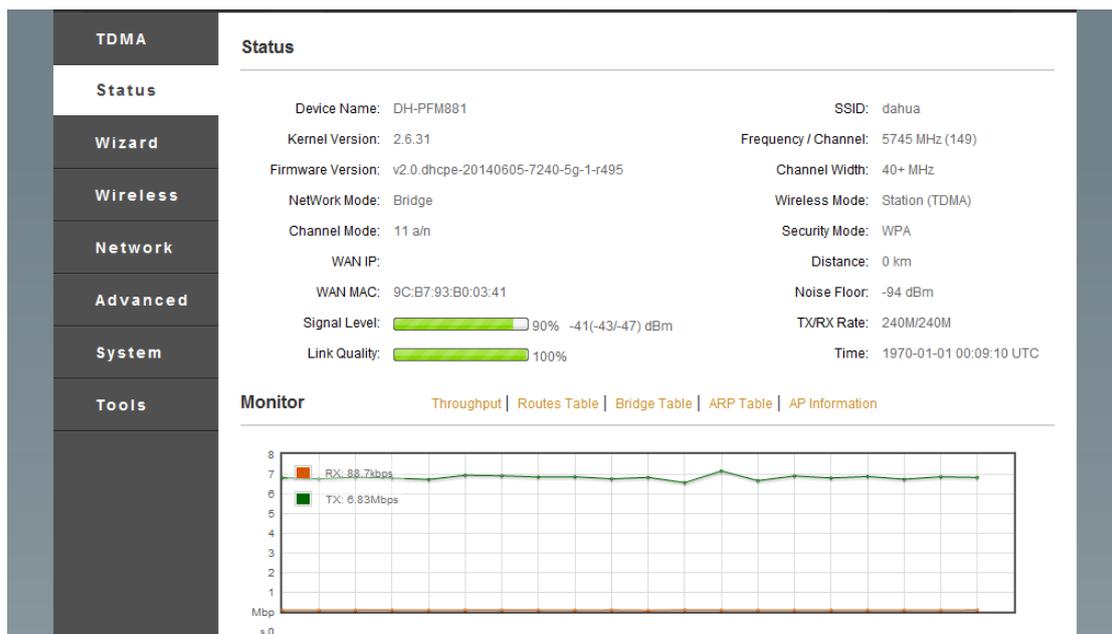


Figure 13

### 5.1 Status Display

It shows current configuration information on the status display page, which shown in sheet 7

Item	Function	Item	Function
Device Name	PFM88X	Kernel Version	2.6.31
Firmware Version	Software Version	802.11 Mode	The current 802.11 protocol
WAN IP	WAN port IP address	WAN	WAN port MAC address with

	with route mode	MAC	route mode
Network Mode	Operation mode, route mode or bridge mode	Network Name	Name of wireless network
Frequency/Channel	Communication channel	Channel width	Four types: 5M、10M、20M、20/40M AUTO
Wireless Mode	Client, access point, WDS client, WDS access point, WDS repeater	Way of encryption	Several ways of encryption for wireless
Distance	The distance between client and access point which are interconnected	Low Noise	Interference from external environment
Signal Intensity	Parameter for Client, WDS client, WDS repeater, which indicates the total signal intensity of client and the signal intensity of up and down two way for client	Link Quality	The quality of link connection
Send/receive connection rate	Parameter for client, WDS client, WDS repeater, which indicates the momentary rate of sending/receiving data for current device	Time	Time display. Time will auto update to calibration time from NTP service when NTP client is enabled and NTP service is set right. There will be a default if you can't log on the Internet.

Sheet 7

## 5.2 Real-Time Monitoring

**Throughput Rate:** Throughput rate is also called throughput capacity, which means the data volume passing through each section in unit time while the throughput rate on status display page means the data volume transmitting through network in unit time, which is the main index to measure network performance. Users can also real time monitor the rate of device transmitting data volume by it. See figure 14 for more information.

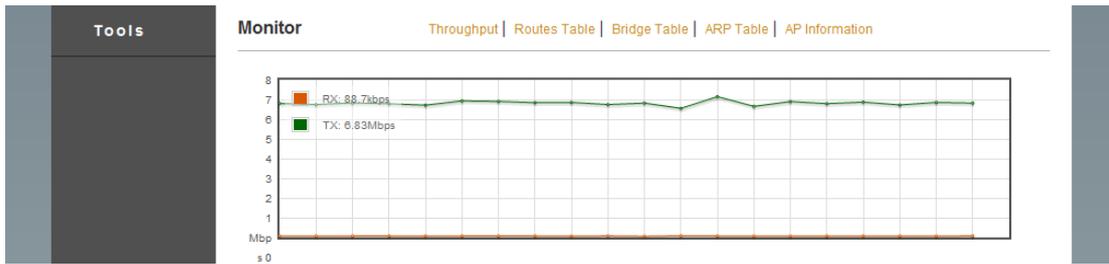


Figure 14

**Routes Table:** The routing list stores the paths which point to the network for PFM88X device. See Figure 15 for more information.



Figure 15

**Bridging Device Table:** PFM 88X acquired the corresponding relation between device MAC address which communicate though it recently and aging time.

**ARP Table:** The device acquired the corresponding relation between used IP address which communicate through LAN port recently and MAC address.

**Access Point/Client information sheet:** When the device is used as AP mode and it connected a client, then you can see the client information shown in Figure 16.



Figure 16

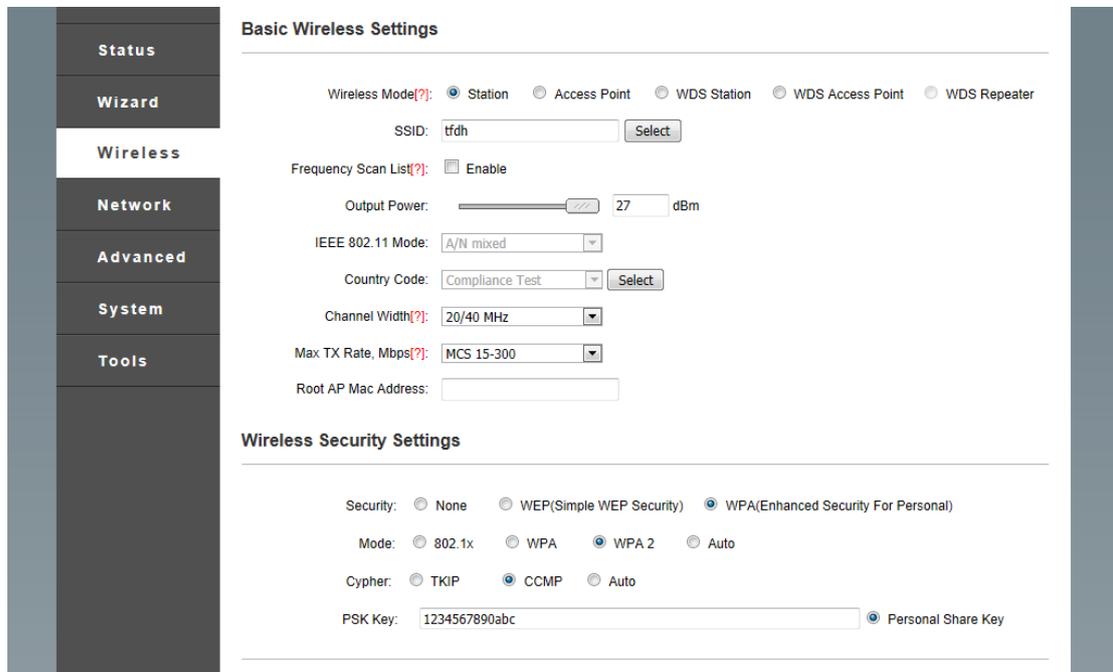
When the device is used as client mode, and it connected an AP, then it will display AP information shown in Figure 17.



Figure 17

## 6. Wireless Setting

See Figure 18 for more information about wireless setting.



The screenshot shows the 'Basic Wireless Settings' and 'Wireless Security Settings' sections of a web interface. On the left is a navigation menu with options: Status, Wizard, Wireless, Network, Advanced, System, and Tools. The 'Basic Wireless Settings' section includes:
 

- Wireless Mode: Station (selected), Access Point, WDS Station, WDS Access Point, WDS Repeater
- SSID: tfdh (with a Select button)
- Frequency Scan List: Enable (checkbox)
- Output Power: 27 dBm (with a slider)
- IEEE 802.11 Mode: A/N mixed (dropdown)
- Country Code: Compliance Test (with a Select button)
- Channel Width: 20/40 MHz (dropdown)
- Max TX Rate: MCS 15-300 (dropdown)
- Root AP Mac Address: (empty text field)

 The 'Wireless Security Settings' section includes:
 

- Security: WPA(Enhanced Security For Personal) (selected), None, WEP(Simple WEP Security)
- Mode: WPA 2 (selected), 802.1x, WPA, Auto
- Cypher: CCMP (selected), TKIP, Auto
- PSK Key: 1234567890abc (with a Personal Share Key checkbox)

Figure 18

There are five types of wireless mode of the device: AP mode, client mode, WDS client mode, WDS Repeater

**AP Mode:** Client device like computer, cell phone, wireless bridge and etc can connect to wireless access node. One AP can connect several clients.

**CPE/Client:** It needs to be used cooperatively with AP, it connects to AP. One client can only connect to one AP.

**WDS Client:** Same as client can only connect to WDS access point or WDS repeater, and one WDS client can only be connected to one WDS access point or WDS repeater.

**WDS Access Point:** Can only connected to WDS repeater or WDS client, meanwhile one WDS access point can connect to several WDS client or WDS repeater.

**WDS Repeater:** Can connect to WDS client or WDS repeater at the same time.

**Network Name (SSID):** Used to control the value of access to wireless network. When other devices try to connect to this device, only with same setting of SSID can they realize intercommunication and build LAN.

As shown in Figure 20, users can search the names of surrounding wireless network by click “select” on the right of network name, and then connect to corresponding wireless network according to his own demand.

**Frequency:** Center frequency of carries wave, bandwidth is the left-right offset of the center frequency. It needs to be set parameter when it is used as AP mode. Users can select several frequencies when it is client mode. Client can't connect to AP when the frequency of AP is not the frequency selected by client. Only when the frequency of AP is one of the frequencies selected by client can they be interconnected.

**Output Power:** Users can adjust the output power of device transmitting wireless signal according to the distance between devices. The transmitted signal distance and intensity will improve when output power goes up.

**Country Code:** Country code can be used to distinguish different standard channel between different countries or regions.

**Channel Width:** It means max data transmission rate of the channel.

**Max Send/Receive Rate:** Limit the device max send/receive rate by setting it and keep the stability of device performance by doing so.

**Root Access Point MAC Address:** Client, WDS Repeater or WDS client can limit the object that the device is to connect by setting it.

**Wireless Encryption:** Make encryption to wireless connection, users can select corresponding encryption way according to their own demand for safety. The devices which are to be interconnected need to be set the same wireless encryption, otherwise, they won't be interconnected.

**WEP:** Wired equivalent encryption technology, a data encryption technology.

**WPA:** A kind of specification based on standard to enhance the interoperable safety, which has greatly increased the control level of data protection and access in the existing and future WLAN system. It is designed into the form of software upgrading and run on the existing hardware, Wi-Fi Protected Access is from and will be compatible with the future IEEE 802.11i standard. After it is installed correctly, it will provide users of wireless network with high-level protection, which will always make their data protected and it is only open to those authorized network users. WPA made up all the defects of WEP.

## 7. Network Setting

### 7.1 Route Mode

PFM88X is used as a router when it is under route mode; it has WAN port and LAN port. At this moment, the LAN2 of PFM88X is equivalent to the LAN port of router while the LAN port on POE power supplier is equivalent to the WAN port of router. See Figure 19 for its line connection when it is under route mode.

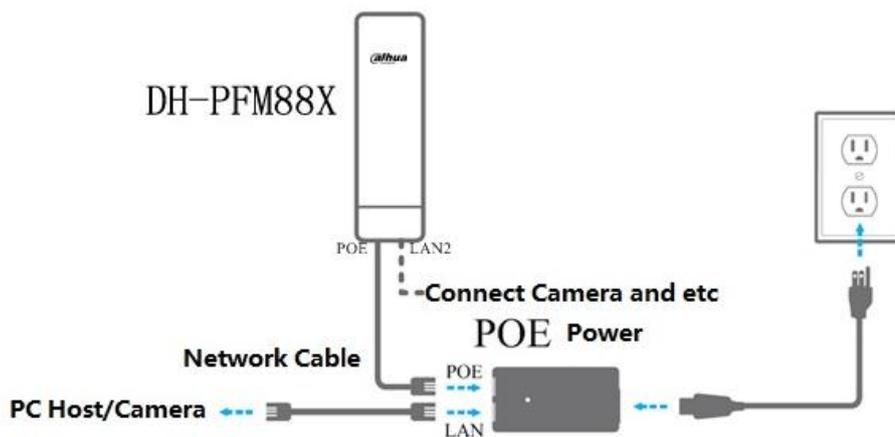


Figure 19

See Figure 20 for more information about router mode.

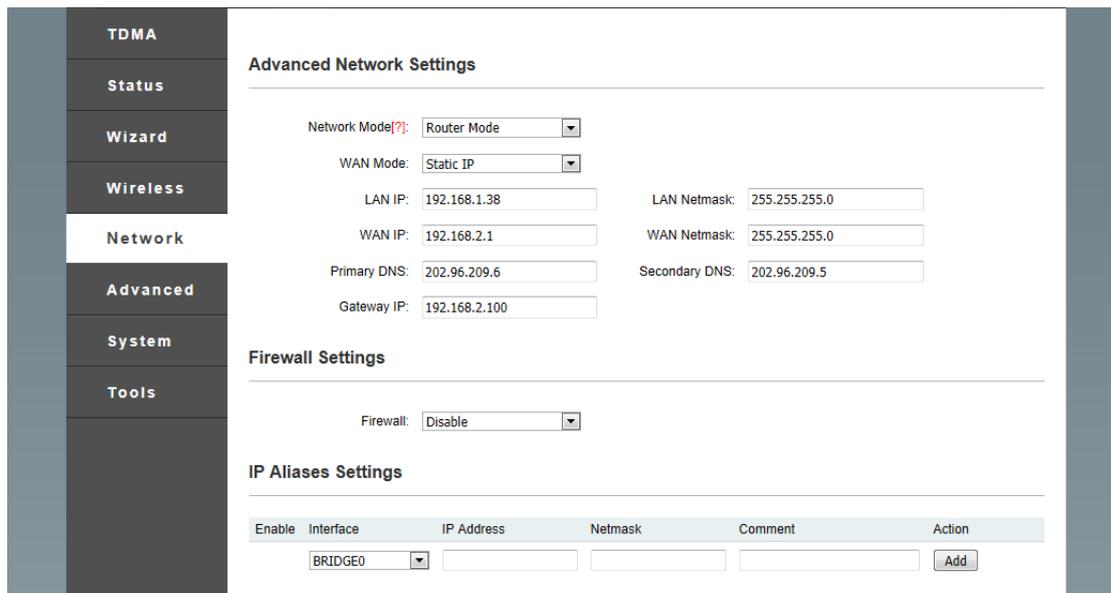


Figure 20

**WAN Mode:** Wan mode is about WAN port being set static IP address and DHCP. Users need to manually set IP, subnet mask and etc when it is set as static IP. The device will auto get IP address from DHCP server when it is set as DHCP.

**WAN IP:** IP address of WAN port, can be set the same IP address of the same segment which is to connect to network.

**WAN Subnet Mask:** Subnet Mask of WAN port can be set the same address of the same segment which is to connect network.

**Attention:** IP address of WAN port can't be set the same as the existing IP on the network in order to avoid IP address conflict.

**LAN IP:** IP address of LAN port, users can set it according to his own demand. Make sure the IP address is not the same as other device IP address in the same network, so as not to cause IP address conflict.

**LAN Subnet Mask:** Subnet mask of LAN port, users can set the IP of LAN port according to his own demand.

**Main DNS and auxiliary DNS:** DNS server set the value of local DNS server.

**Gateway:** Generally it is ok to set gateway address as IP address of LAN port.

## 7.2 Bridge Mode

There is no WAN port for bridge mode. Both the LAN port on POE power supplier and the LAN2 port on PFM88X are LAN ports, users can select one network port to connect according to his own demand. Refer to Figure 3 for more details. The setting of IP address of LAN port and subnet mask is same as route mode.

## 7.3 Firewall

When users want to use PFM88X to shield some devices, they can use firewall to realize this function, see Figure 21 for more details; there are four situations of firewall filtering:

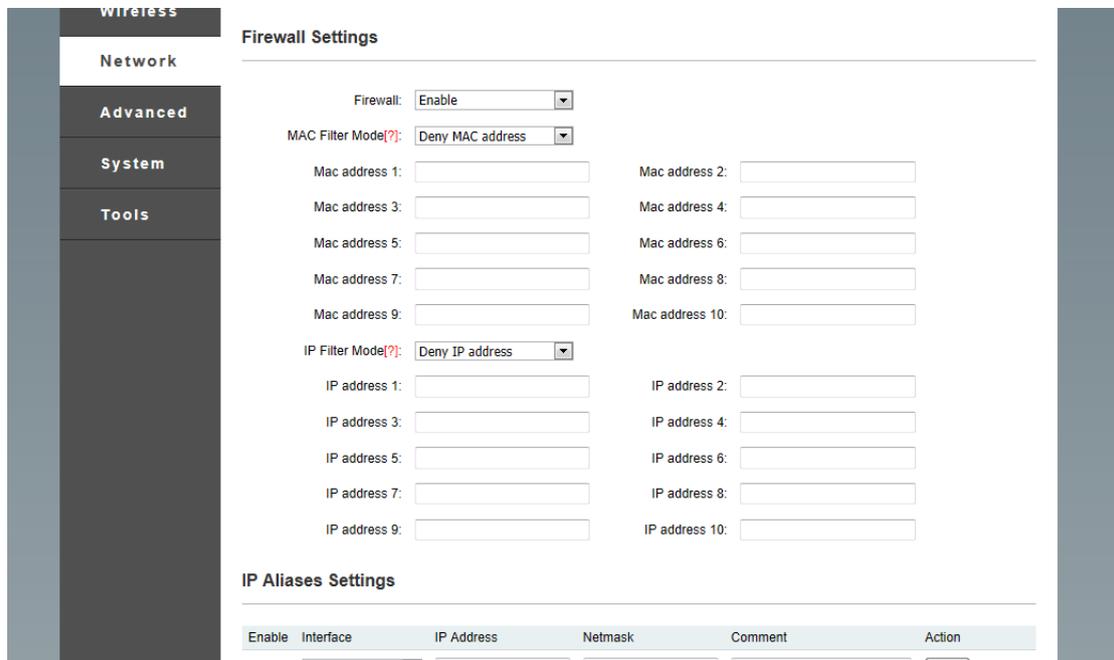


Figure 21

1. Filter a device with IP address xxx.xxx.xxx.xxx

After firewall is enabled, IP filtering mode is set as reject, and set any item among IP1~IP10 as the IP to be filtered.

2. Filter some device

After firewall is enabled, select MAC filtering mode as reject, set any item among Mac1~Mac10 as the MAC address of the device to be filtered.

3. Filter all other devices except the device with IP xxx.xxx.xxx.xxx

Select IP filter as accept, and set any item among IP1~IP10 as the IP to be accepted.

4. Only accept some device

After firewall is enabled, select MAC filtering mode as accept, set any item among Mac1~Mac10 as the MAC address of the device to be accepted.

## 8. Advanced Settings

See Figure 22 for more information about advanced settings page.

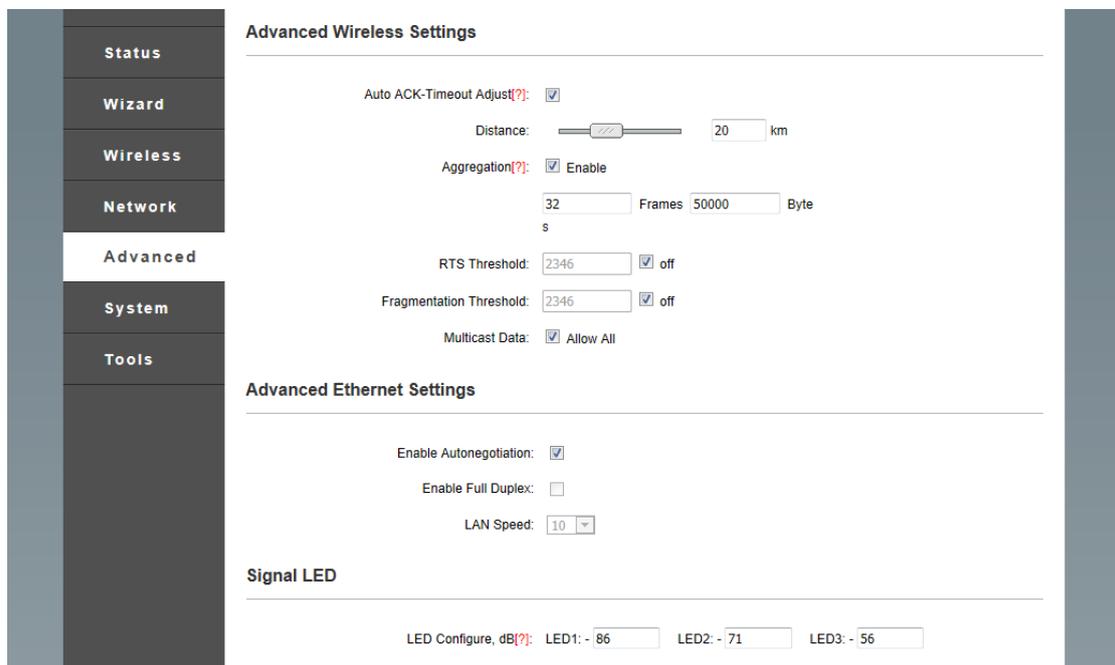


Figure 22

**ACK-Timeout Auto Adjustment:** Users are recommended to open “ACK-Timeout auto adjustment”, which can auto test the distance between two devices; can set parameter according to this distance to optimize wireless connection quality.

**Distance:** The distance setting will be invalid if the “ACK-Timeout auto adjustment” is open. The system will auto test the device distance and optimize connection quality. Users need to close “ACK-Timeout Auto Adjustment” if they want to make the self-set distance valid.

**Aggregation:** Make different frames combine together and send out, enable this function to improve throughput rate and the device is enabled by default.

**RTS Threshold Value:** RTS/CTS mechanism will enable if the packet length is equal to or more than the set value. At this moment, the station will send a RTS to access point to inform it that data will be sent when the station tries to send data. After receiving the application, the access point will inform all the other stations in its covered area by CTS, asking them to delay sending. Meanwhile, the access point will inform the station which sent request to send data.

**Segmentation Threshold Value:** If the packet length surpasses the set value, it has to be divided into several data segment to send, and the number can only be even.

**Multicast Support:** When this function is enabled, PFM88X will allow the multicast packet to pass it.

**Antenna Switch:** Set the value as external antenna when the device is using external antenna. Otherwise, it is built-in antenna.

**Client Isolation:** To enable this function can make the devices which connect to the same access point, WDS AP and WDS Repeater not be intercommunicated. It won't cause any influence to communication even if the client IP is repeated.

**Max Client Limit:** Limit the quantity of client which connect to access point, WDS AP and WDS Repeater and WDS client by setting it.

**Enable Auto-Negotiation:** When it is enabled, the LAN port will auto adjust its speed to max public level according to the connection speed and duplex mode of the device on the other end.

**Enable Full Duplex:** If the LAN port of PFM88X allows the data transmission in two directions at the same time.

**LAN Port Speed:** For the LAN port speed of PFM88X, there are only two kinds which are 10Mbps and

100Mbps.

**Signal Intensity LED Setting:** The setting of LED1, LED2 and LED3 here is the signal intensity value which is needed to light three LED lights. The signal intensity value of LED3 is the biggest (LED3>LED2>LED1), default settings are LED1:-86dB, LED2:-71dB and LED3:-56dB respectively. The LED1 will be on if the signal intensity is higher than LED1 but lower than LED2; both the LED1 and LED2 will be on when signal intensity is higher than LED2 but lower than LED3; All of the LED1, LED2 and LED3 will be on when the signal intensity is higher than LED3.

## 9. System Settings

There are four parts on the system setting interface which are configuration management, firmware configuration, device configuration and account information, see Figure 23 and 24 for more details.

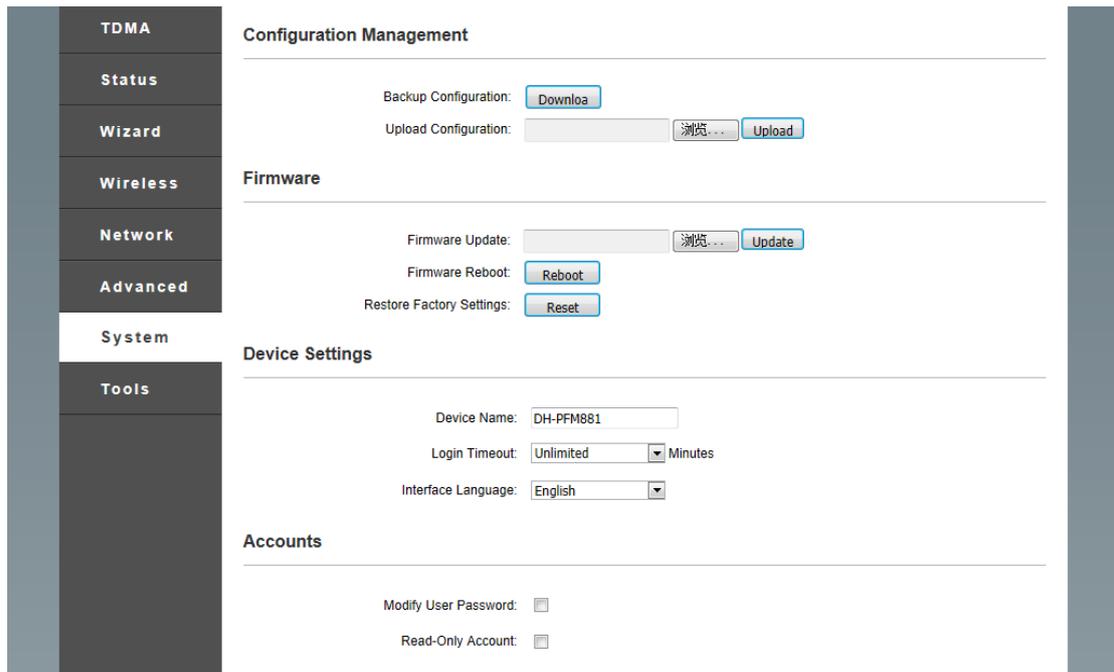


Figure 23

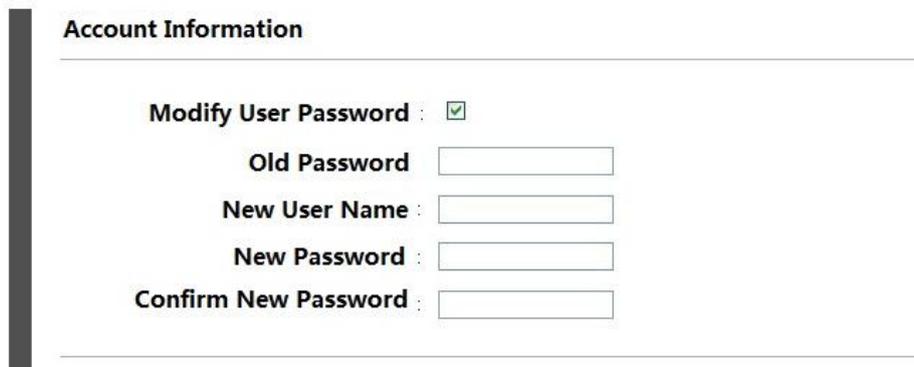


Figure 24

**Back-up Configuration File:** Click to download; backup the configuration on the current webpage, pay attention that you can't modify the configuration file content manually.

**Uploading Configuration File:** Click to browse, select the previously-downloaded configuration file, click to upload, then you can restore the device configuration to it is when backuping configuration file.

**Firmware Upgrade:** Click to browse, select the version which is to be upgraded; click to upgrade, then the upgrade of device is on the way.

**Firmware Restart:** Click restart and the device begins to restart.

**Restore Factory Settings:** Click the factory setting on the webpage, then the device configuration will restore to factory settings after a period of time.

**Device Name:** User can set the device name according to his own demand.

**Login Timeout Setting:** When the user login timeout is set to a value and there is no response after the webpage surpasses the time, it will auto jump to the login interface.

**Interface Language:** Users can set the language of the webpage according to his own demand.

**Account Information:** When user enables “modify user password”, he can modify the account information according to his own demand.

## 10. Tools Application

There are two parts on the page of tools application which are testing tool and Telnet/DHCPD, as shown in Figure 25.

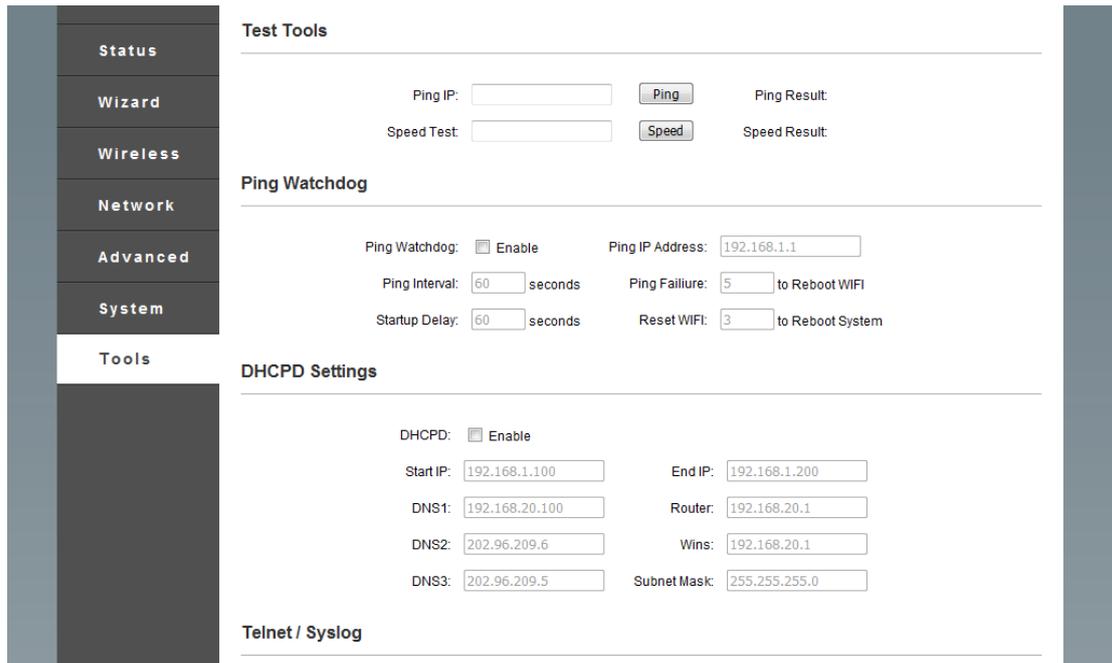


Figure 25

**Ping IP:** When user set a device IP in the ping IP bar, click ping, then ping's result is Alive if the device is connected to PFM88X. Otherwise, it will be Not Alive.

**Network Speed Detection:** When the access point is connected to client, set the IP address of access point (client) in the network speed detection of client (access point), then click speed detection, the result will display on the webpage after a while.

**Ping Watchdog:** It is used to continuously monitor the running condition of Wireless Bridge, especially use Ping tool when connecting to remote host. Wireless Bridge can ping target host for a long time, so if Wireless Bridge didn't receive the defined a certain number of replies, it means the tool will make the Wireless Bridge restart.

**Ping IP Address:** IP address of target host. **Ping interval:** time interval between two Pings.

**Ping Failure:** The device will restart WIFI when the times of continuous Ping failure reach the set value.

**Start Delay:** After the Wireless Bridge system started, the time set by delay will start to Ping target host.

**WIFI Restart:** The device will restart the system when the times of continuously restarting WIFI reaches the set value.

**Telnet:** When telnet is enabled, the command prompt window under Windows XP or Windows 7 adopts Telnet xxx.xxx.xxx.xxx (PFM88X's IP) which can log in PFM88X. It is unable to log in the device if Telnet is forbidden.

**DHCPD:** PFM88X can be used a DHCP server when enabling DHCPD function, the DHCP client which is connected to it can obtain relevant address from it.

**Start IP and End IP:** The IP address obtained by address pool and DHCP client can be only set between start IP and end IP, which are usually set the same segment with PFM88X.

**Subnet Mask:** Set subnet mask according to the IP of set address pool.

**Route:** It is the gateway address; user can set corresponding parameter according to what function he wants to realize.

**WIN:** Generally it is ok for user to set the same as route if there is no special requirement.

**DNS1,DNS2,DNS3:** User can set according to his demand; generally it is ok to set the address of local DNS server.

**Syslog:** Enable Syslog function, and at the same time set the IP of the PC where Syslog server is located, server port is set as 514, then you can see the relevant log information on the Syslog server.

**NTP Client:** PFM 88X can log on the Internet when NTP client function is enabled, and set the network address where NTP server is located, PFM88X will auto calibrate the set time from NTP server and display it on the status display page.

**SNMP Agency:** SNMP agency allows network administrator to monitor network performance, search and solve network problems. Such as SNMP agency option enabled, fill in the name of a user in SNMP community, such as creatcomm, then fill in user's corresponding mailbox: [jerry@creatcomm.com](mailto:jerry@creatcomm.com), fill in creatcomm for location information, then save and apply. Install mrtg on the host, open mrtg webpage, then information like the flow which passes PFM88X can be observed.

## 11. Common Networking Mode

### 11.1 Wireless Point-to-Point

We generally set one DH-PFM881 as access point, and the other as client during point-to-point communication, see Figure 26 for more information.

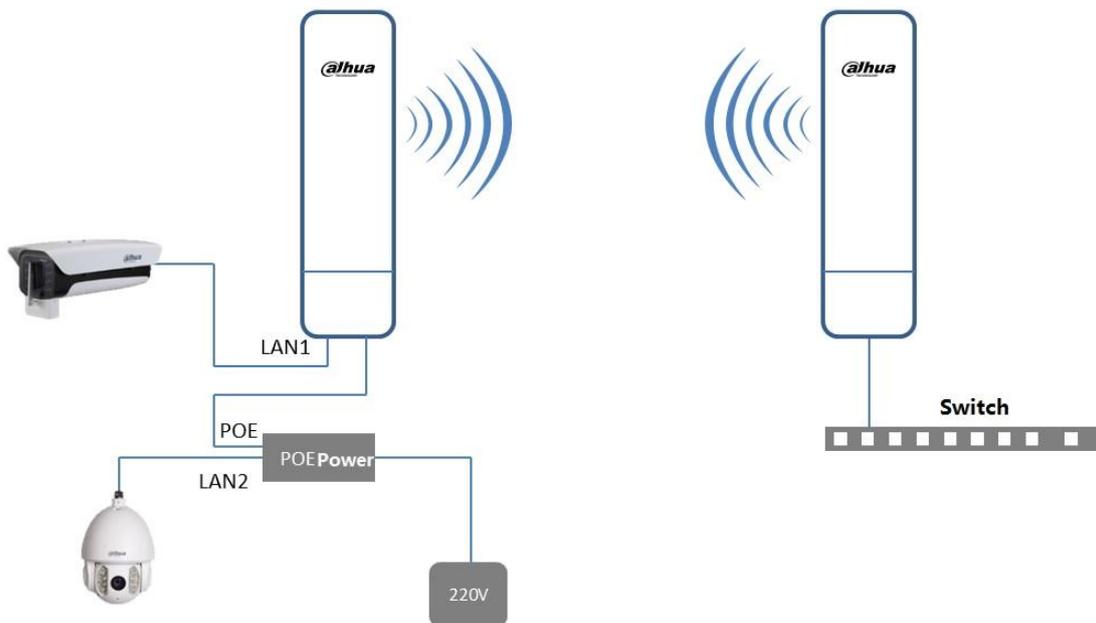


Figure 26

1. Two PFM88X network setting page -> network mode are both set as bridge mode; firewall is forbidden for both PFM88X and set different LAN IP;
2. Wireless page -> set wireless mode as access point and client respectively, both AP and client are set as the same SSID, set the same way of encryption and password for wireless encryption, like WPA->WPA2->CCMP->1234567890, output power is set as 13dBm, AP frequency can be set as 5.785GHz, channel width of AP and client can be set as 20MHZ;
3. Attention: Relative direction needs to be adjusted for access point and client.

4. Use one computer to ping another one, which means inputting ping xxx.xxx.xxx.xxx (IP of another computer) in one computer;

Expected Result: After the connection between access point and client, the computer which connected access point and client can be interpinged, meanwhile, you can see the number of connections is one on the page of status display for access point.

## 11.2 Wireless Point-to-Multipoint

Generally we set DH-PFM880 as access point (single AP covers  $90^\circ$ , combination of four pieces cover  $360^\circ$ ), and other DH-PFM881 are set client when it is during point-to-multipoint communication, see Figure 27 for more details.

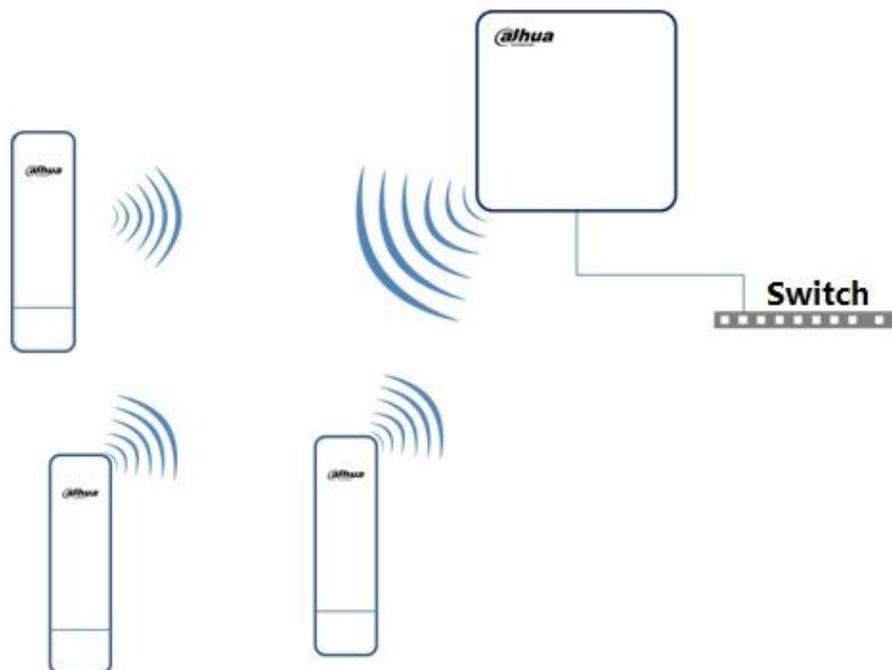


Figure 27

1. Network setting page of all the PFM88X-> network mode are all set as bridge mode, and firewall is forbidden for all (default is closed), set different LAN IP:

2. Wireless page -> set wireless mode as access point and client respectively, both AP and client are set as the same SSID, set the same way of encryption and password for wireless encryption, like WPA->WPA2->CCMP->1234567890, it is recommended to finish configuration according to device wizard;
3. Attention: Relative direction needs to be adjusted for access point and client.
4. Use one computer to ping another one, which means inputting ping xxx.xxx.xxx.xxx (IP of another computer) in one computer;

Expected Result: After the connection between access point and client, the computer which connected access point and client can be interpinged, meanwhile, you can see the number of connections is N on the page of status display for access point. (N means the number of connected client)

### **11.3 Wireless Coverage Blind Angle Adjustment Mode**

When the monitoring point is blocked seriously, we generally adopt two CPE back-to-back connection to adjust angle during the direct communication between client wireless and central AP, see Figure 28 for more information.

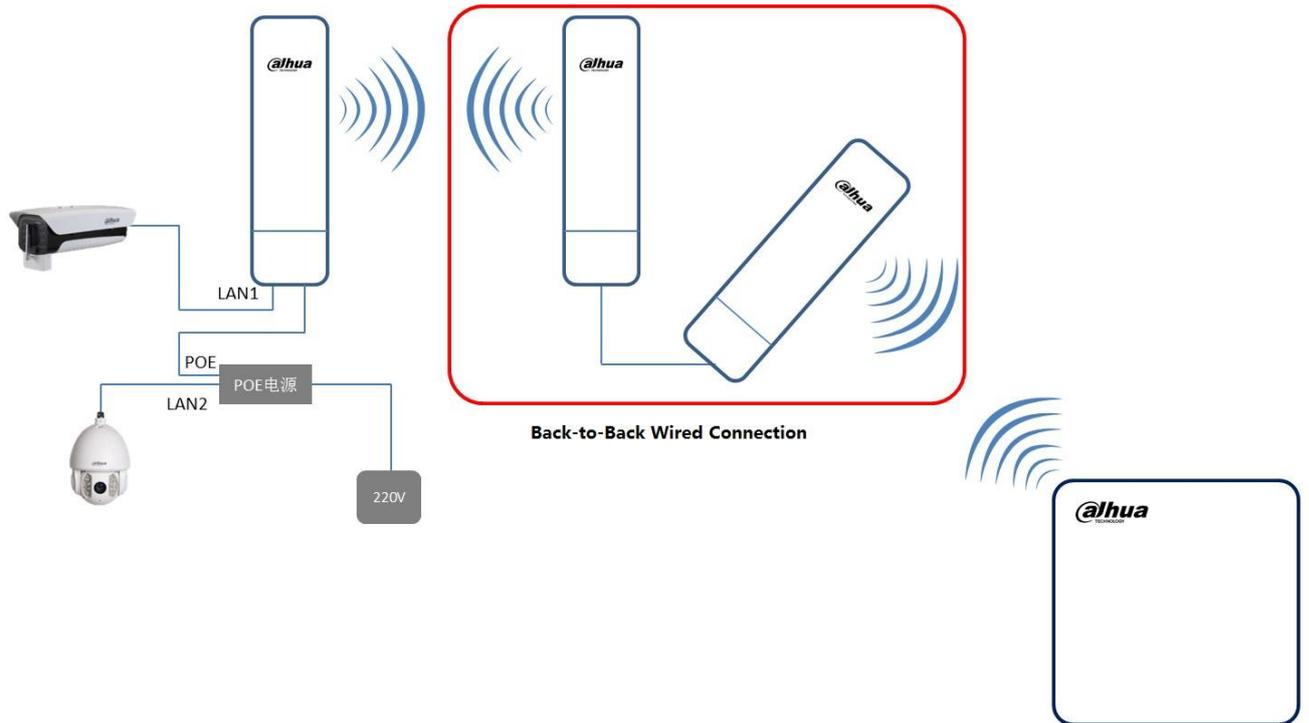


Figure 28

1. Wired connection for two back-to-back devices
2. Downlinked client device is set as access point, uplinked central AP device is set as client
3. Refer to 11.1 and 11.2 for detailed configuration
4. Expected Result: After the connection between access point and client, the computer which connected access point and client can be interpinged, meanwhile, you can see the number of connections is N on the page of status display for access point. (N means the number of connected client)

## 11.4 Route Mode Networking

When TurboBridg5A is working under route mode, it is used as a router, see Figure 29 for more information, the POE port of POE power supplier connects PFM88X, the LAN port of POE power supplier connects external network, the LAN port of PFM88X connects computer, the exact configuration is shown as follows:



10 to set the parameters of DHCPD.

4. The network name of wireless connection is the WiFi network you set in advance, after the computer is connected to PFM88X, the WAN port address of ping PFM88X, for example, the WAN port IP of ping PFM88X is 192.168.2.50, then you just input ping 192.168.2.50;

Expected result: The computer which is connected to the LAN port of TurboBridg2 can ping through the WAN port IP of PFM88X.

Expected result: the computer which is connected to LAN port of TurboBridg2 can ping through WAN port IP of PFM88x.

## 12. FAQ

### 1. The device can't boot up normally:

- (1). The network cable between CPE device and POE module is over 40m.
- (2). The quality of network cable didn't meet the standard of UTP-5 categories.
- (3) The crystal head of network cable is insecure or cable sequence error (remake the crystal head)

### 2. Forgot IP address and unable to restore factory default

Please press Reset button for 5-10 seconds, try to input 192.168.1.36 IP to log in the device after all the LED lights are on.

### 3. Why can't fine wireless access point in my computer?

Solution: wireless system is connected with max working rate, the exact rate depends on distance and

environment. Users can detect the following steps to make sure the max possible connection rate is obtained.

- (1) The location of wireless access point

Try to adjust the location and direction of wireless access point.

- (2) Wireless channel

The interference could be obviously improved if you use other communication channel;

- (3) Wireless interference

Other devices may also cause interference, so try to shut off other devices and check if the situation is improved. Users also can shield the devices which cause interference or adjust the position.

#### **4. The signal intensity is too low.**

- (1) It is not visible between CPE and AP due to bigger blocks.
- (2) The surface plate of CPE doesn't face AP directly; the vertical angle between AP and CPE is not suitable.
- (3) CPE is installed on the window, which may cause interference.
- (4) The distance between AP and CPE is too far.

#### **5. Why is the signal intensity high but the throughput capacity low?**

Reasons:

- (1) Too much interference or multipath interference.
- (2) Something is wrong with the device Ethernet port.

#### **6. Frequent packet loss, serious packet loss with several devices in the same area, it will be better when communication channel is changed.**

Same frequency interference will be caused if several PFM88X are used in the same area without separate the channels of two devices. Users are recommended to separate the frequencies of them so as not to make the communication channels overlapped. It is recommended to make the frequency

difference between two devices over 20M if the width of communication channel is 20M.

### **7. Packet loss and big time delay for ping device address of the computer**

- (1) Port isolation for AP which connects the same POE switch.
- (2) Bad pressing and connection for cable crystal head (remake crystal head)

### **8. Users often lose connection and the speed is low.**

- (1) Too many users of AP access.
- (2) Weak AP signal.
- (3) Too many serious interference signals in the surrounding, client and AP are not binded.
- (4) Check user number and if the upper level network bandwidth is already full.

## **13. Construction attention for wireless bridge and monitoring.**

### **13.1 Construction attention**

#### **1. The horizontal direction and vertical angle of antenna**

Try to make the AP antenna on the base station slope down a certain angle because the antenna between base station and wireless bridge is directional. Meanwhile, try to make AP and client antenna aim each other horizontally.

#### **2. Height for setting antenna**

There are some certain requirements for the distance between two points and height for setting antenna during the actual wireless communication between two points due to the fact that the earth is a sphere. Please refer to the following sheet for more details.

Frequency	3Km	5Km	10Km	15Km
5.8GHz	5m	7m	11m	16m

### **3. Geographical environment**

Place for the farthest distance of communication is sea level and clear flat land, which is the generally-used geographical condition to evaluate the communication distance of wireless communication devices. The second farthest are places like rural area, hill, riverbed and other half obstacle, half open environment. The shortest communication distance is place like city building complex or among mountains. In a word, the more intensive the obstacles are, the more influence it will cause to wireless communication distance, especially to metal objects. Therefore, make sure the client and access point are directly visible during the actual construction;

### **4. Electromagnetic environment**

Direct current dynamo, grid system, switching power, electric welding machine, high frequency electronics, computer, single chip and other devices all can cause different levels of influence to communication distance of communication devices.

### **5. Climatic condition**

The communication distance will be longer if the air is dry; the communication distance will be shorter if the air is wet (especially rainy, snowy weather)

### **6. Try to avoid same frequency and adjacent frequency interference**

Users need to search what frequencies that other devices are using first when setting the frequency of access point, which has to avoid these frequencies as far as possible. Meanwhile, the access point frequency has to be separated a certain distance from the surrounding frequencies which are being used in order to prevent adjacent frequency interference. For example, when communication channel width is 20M, so it has to be separated over 20M from the frequency being used. Meanwhile, the frequency between each AP should be set like this.

## **13.2 Test Situation**

### **Testing distance: 3.5 km**

Test environment: The test place is located between Beicai Town and Zhangjiang Town in Pudong New

District City of Shanghai, and one site is located on the 12th floor in a community while the other site is located on the 5th floor in an office building, which can basically be directly visible without any obvious blocks.

Test result:

Frequency	Signal Intensity	Channel Width	Throughput Rate
5500MHz	-70dBm approx	20M	35-40Mbps
5825MHz	-72dBm approx	20M	30-35Mbps

### 13.3 Reference Setting:

Set the network name according to your demand;

Country code: test mode or America;

Frequency: 5200MHz~5600MHz;

Set max output power, which can only be 14dBm in Chinese national code; and max output power can be 27dBm when country code is American and test mode;

Enable TDMA, which can effectively improve overall performance during point-to-multipoint transmission;

Set channel width according to actual bandwidth demand, generally it is higher than 20M when is it 40M;

The IP address between access point and client is different; make sure there are no devices with same IP address in the LAN;

Keep other configuration as default;



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