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5.8GHz Wireless Bridge/CPE/AP

Model: DH-PFM881

User Manual

Version： V1.0.1563

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📖Versions

Table 1 Versions

Version	Date	History	Author
1.1	2015-07-24	Created	Gao Feng
1.2	2015-11-04	Update pictures and partial functions description. Based on r1563.	Liu Meng
1.0.1563	2016-01-04	Update some functions parameters	Liu Meng

📖References

📖Purpose

This document is proposed for the users of DH-PFM881 devices, helping them to configure the device and list the troubleshooting, so that the devices can be used successfully quickly.

This document mainly contains the following parts: hardware information, web configuration menu descriptions, network configuration examples, and troubleshooting. It can help the customers quickly be familiar with the devices and use them correctly.

📖Notes

This document is to characterize the DH-PFM881 series of devices. Please read the document carefully before setting up device. Any damage which is caused by inappropriate use will not be covered under the warranty.

📖Definitions

Table 2 Definitions

No.	Items	Description
1	DH-PFM881	Outdoor, long distance AP/CPE/Bridge devices
2	XTrans	XTrans is a series of wireless technologies, including TDMA, 5M/10M/20M/40MHz bandwidth support, intelligent rate control, Auto ACK Time-out adjust, having the advantage of long

No.	Items	Description
		transmission range, high date rate and robust transmission.
3	AP	Access Point
4	Station(Client)	WIFI station that can be associated to an access point.
5	CPE	Customer-premises equipment: it is any terminal and associated equipment located at a subscriber's premises and connected with a carrier's telecommunication channel at the demarcation point.

1 Product Overview

DH-PFM881 is a powerful WIFI Bridge/AP/CPE device, which allows WIFI access and video/audio/data transmission device, enables long-range, fast speed and robust wireless connections. Integrated with the XTrans technology, DH-PFM881 has the advantages of long-distance, high-throughput, and Strong anti-interference.

XTrans technologies include TDMA, 5M/10M/20M/40MHz bandwidth, intelligent rate control, Auto ACK Time-Out Adjust and so on. TDMA technology solves the problems of hidden-node problem in the 802.11 network. 5M/10M/20M/40MHz bandwidth can be flexibly configured by the uses in different working scenario to achieve the best link quality. Intelligent rate control algorithm can be adapted to quick channel quality variations automatically, thus stabilizing the wireless throughput. ACK Time-Out Auto Adjust can automatically detect the distances of the DH-PFM881 devices, and thus adjust the wireless parameters to achieve the best wireless link quality.

The best transmission range and max speed of DH-PFM881 can be as high as 15Km and 300Mbps, making it suitable for many applications of WIFI Bridge/CPE, especially have advantages for point-to-multi-point communication.

1.1 Product Advantages

The DH-PFM881 has the industrial leading technology, owing the performance capability of a wireless base station with only a small form factor, furthermore, it has very attractive low cost.

DH-PFM881 has the following advantages compared to the competitors:

1. Embedded TDMA technology

DH-PFM881 devices is embedded with TDMA technology, including TDMA, 5/10/20/40MHz bandwidth, intelligent rate control, Auto ACK Time-out adjust. They make the device have longer transmission distance, higher throughput and better point-to-multi-point performance.

2. Longer transmission distance, higher throughput

The longest transmission distance of DH-PFM881 can be as far as 15 km, and the max throughput can be 300Mbps. It can satisfy the needs of most of the applications.

3. Embedded hardware watchdog

DH-PFM881 is embedded with hardware watchdog, which is used to monitor the working status of the device. Once the system is not working properly, the DH-PFM881 device can be rebooted to guarantee the stability of the system.

4. Software Ping watchdog function

DH-PFM881 software ping watchdog function enable the device periodically ping another device associated to, so that it can detect if the system is working well. If the wireless link is lost or there is any problem, the device is rebooted. This is important because the devices can be restored to work automatically if there is any problem, and avoid the extra human labour to maintain the outdoor devices.

5. More Non-standard channels availability

Currently most of the WIFI devices are working at standard 802.11 5.8GHz frequency. However, standard 802.11 5.8GHz only provide limited channels, and there is serious interference if there are a lot of 5.8G WIFI devices nearby.

DH-PFM881 support more channels near 5.8GHz band, and spread the band to non-standard frequency part: 4920MHz-6100MHz。The advantage of working at the non-standard band is to avoid the interference in the standard channels, and the wireless throughput can be improved.

Note: Please confirm whether those non-standard channels are permitted locally before using them.

6. Outdoor industrial product

DH-PFM881 device can work at all kinds of outdoor severe environments, including -30 to 70 degree temperature, 5% to 95% humidity, while maintain good performance.

1.2 Electrical Specifications

The electrical specifications are shown are the following table:

Table 3 Electrical Specifications

	Items	Specifications

WIRELESS	Standard	IEEE802.11 a/n（2T2R 300Mbps）
	Operation Frequency	5.745～5.825 GHz(More Non-standard channels is availability,4920MHz-6100MHz)
	Modulation Mode	802.11 a/n: OFDM
	Antenna	15dBi Gain
	Output power	＋24dBm(@6.5Mbps,11a)，＋23dBm(@300Mbps,11n)
	Receive Sensitivity	-72dBm @ 65Mbps, -94dBm@6Mbps
	Date rate	11n：13.5/15/27/30/40.5/45/54/60/81/90/108/120/121.5/135/150/162/180/216/240/270/300Mbps(40MHz Channel Width)
		11n:130/117/104/78/65/58.5/52/39/26/13/6.5Mbps(20MHz Channel Width)
		11a ： 54/48/36/24/18/12/9/6Mbps(adaptive)
	Distance	Outdoor open area: <15 km
HARDWARE	Power supply	24V POE
	Interface	POE
	LED	WIFI Status/LAN/Power/Signal strength
	Operation Temperature	-30℃～+70℃
	Storage Temperature	-40℃～+85℃
	Operation Humidity	5%～95%RH
	Device Size	280*80*30(mm)
SOFTWARE	Encryption	802.1x/WPA-PSK/WPA2-PSK
	Network	Router/Bridge
	Operation Mode	Access Point/Station/WDS Access Point /WDS Station/WDS Repeater
	Security	MAC filter, SSID hidden
	Network protocol	TCP/UDP/ARP/ICMP/DHCP/HTTP/NTP
	TDMA	Supported (Avoid 802.11 hidden-node problems, and improve the point-to-multi-point performance)
	Auto ACK timing Adjust	Supported
	Management	NTP, SNMP, Syslog, Telnet

	and Logs	
	Web based Configuration	Supported
	Firmware Update	Supported
	Bandwidth supported	5M/10M/20M/40MHz

1.3 Package Contents

Open the package carefully, and make sure that none of the following items listed are missing：

- One DH-PFM881 device
- One 24V/0.5A POE power adapter
- DH-PFM881 Mast-Mount Strap Special Screw Set

1.4 Features

- High performance 802.11n 2×2 MIMO chip
- Best transmission range: 15Km, and max transmission throughput: 300Mbps
- Integrated XTrans technology, including TDMA, intelligent rate control, Auto ACK Time-out adjust
- TDMA solves the problems of hidden-node problem in the 802.11 network, thus having better long-distance and PTMP performance
- Support 5 operation mode: Access Point, Station, WDS Access Point, WDS Station, WDS Repeater
- Support point-to-point, point-to-multipoint connection
- Unique RF and antenna design enables long-range transmission

- Wireless multimedia optimization technology guarantees video/audio transmission QoS
- Web based working scenario selection makes the installation and setting much easier
- Reliable POE power supply, support 802.3af standard
- Web-based configuration, easy to use
- Waterproof housing and accessory kit protects

1.5 Using Example

The DH-PFM881 usage example are shown in Figure 1, it can be used as WIFI AP, CPE, or outdoor PTP, PTMP topology. Therefore, DH-PFM881 is suitable for various applications like wireless video transmission, and wireless signal coverage.

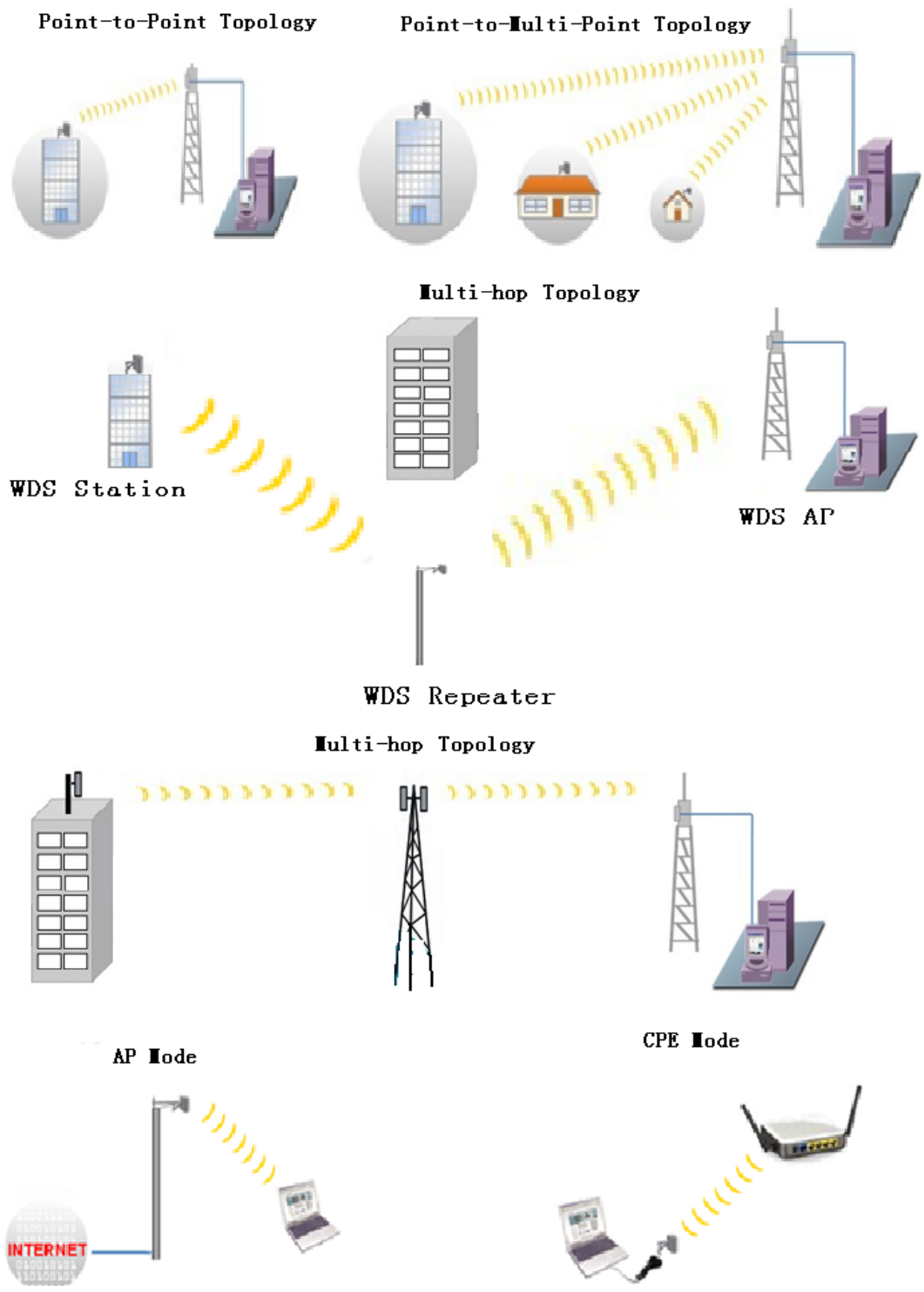

Figure 1 DH-PFM881 using examples

1.6 Applications

DH-PFM881 can be used widely in the following applications:

- Wireless video surveillance (free-way, city, police, oil pipeline, forest and etc.)
- Carrier wireless backhaul and rural area internet last-mile wireless solution
- Enterprise local area network inter-connection
- WIFI signal coverage and rural wireless coverage

1.7 Hardware Overview

DH-PFM881's hardware information is described in the following Table 4:

Table 4 Hardware information

Hardware Specifications	
CPU/Baseband Radio	Atheros AR9344
Memory	64MB DRAM, 8MB Flash
Physical Interface	2×10/100M Base-TX (Cat. 5/5E, RJ-45) Ports
LED Status	Power, LAN, WLAN, 3×Link Quality
Power supply	POE, Power Adapter 24V/0.5A

1.8 Understand the DH-PFM881 LEDs

The LEDs of DH-PFM881 can be divided to 2 groups. One group of LEDs are **Indicators**, including the left 3 LEDs of Figure 2, and they are Power, LAN and WAN indicators. The other group of LEDs are **Link Quality**, including the right 3 LEDs of Figure 2, shown the signal strength.

Figure 2 DH-PFM881 LEDs

Table 5 LED Information

LED	Color	Status
POWER	Green	ON = Device Power on
LAN	Green	ON = Device connected to the network
WLAN	Green	OFF = Device radio is OFF ON = Device radio is ON, but not sending or receiving date through the wireless LAN. BLINK= Device radio is ON, and sending or receiving date through the wireless LAN.
Link Quality	Red	Showing the signal strength between the device and the network. Green is ON = good quality Yellow is ON = medium quality Red = poor quality or no link
	Yellow	
	Green	

2 Installation

This chapter describes how to install DH-PFM881 device in the bridge mode, and the installation method of router mode can be seen in Chapter 7.

2.1 Connections and installation

The connection of DH-PFM881 device to POE and power supply is shown in Figure 3.

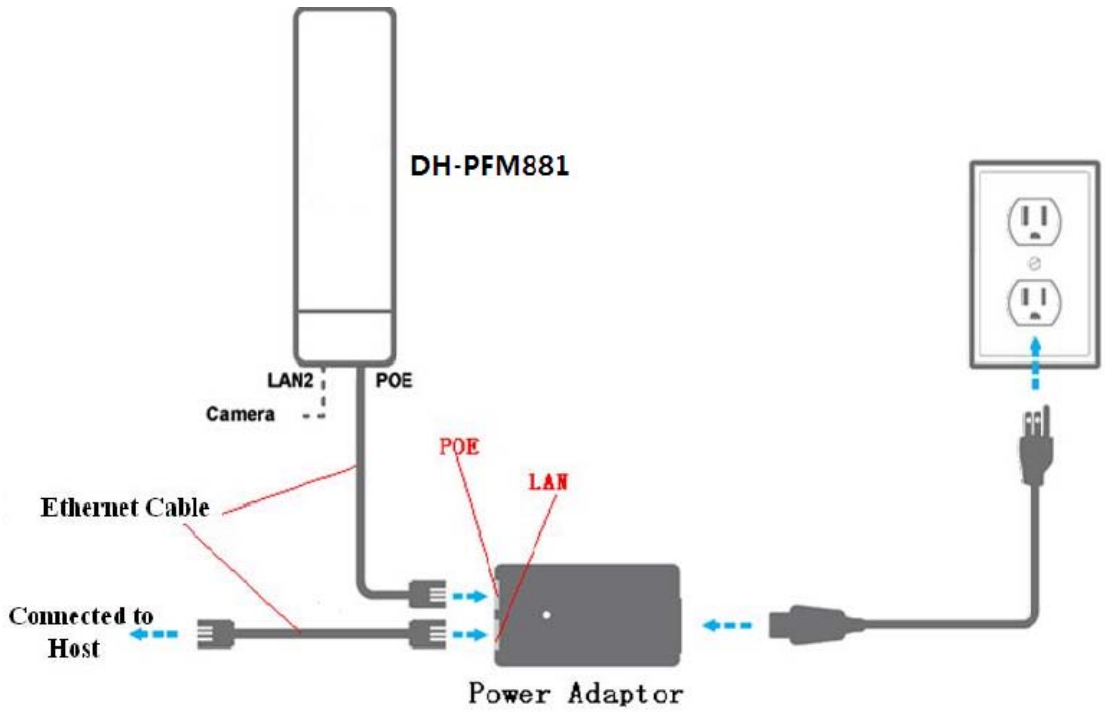

Figure 3 Connections at Bridge mode

DH-PFM881 has 2 RJ45 ports, and they are marked with "POE" and "LAN2" separately. In the bridge mode, please connect the device with the POE power adaptor in the following way:

1) Remove the bottom cover from the DH-PFM881 device, and you will see there are 2 RJ45 ports marked with "POE" and "LAN2".

2) Using an Ethernet cable to connect the POE power adaptor and the "POE" port of the DH-PFM881 device.

3) Connect the POE adaptor to the normal power supply board.

4) Normally, "LAN2" port of the DH-PFM881 can be connected to IP Camera and other devices, or leave it unconnected

5) Mount the DH-PFM881 securely to the pole by locking the strap tightly.

2.2 Restore to the Factory Settings

In some cases, uses can restore the device to the factory settings by the following way in the Figure 4. Push the reset button for 5~10 seconds until all LED is on. This will restore to the factory setting. During this process, the DH-PFM881's RJ45 ports will be connected and disconnected twice.

Figure 4 Restore to the factory settings

For default, all the factory settings are shown in the following Table 6.

Table 6 Main parameters at the factory settings

Items	Default Settings
IP address	192.168.1.36
User name	admin
Password	admin
Wireless mode	Station
SSID	DaHua
Output power	High(24dBm)
Encryption	WPA->WPA2->CCMP->Password：1234567890abc
Network mode	Bridge

3 Quick Configuration

This chapter describe how to configure the device quickly.

3.1 Log in

To log in the DH-PFM881 device, user needs to configure the TCP/IP of your computer first as the following steps:

1、Right click Local Area Connection icon of your computer and click properties, then click Continue, the Local Area Connection Properties dialog box appears as Figure 5.

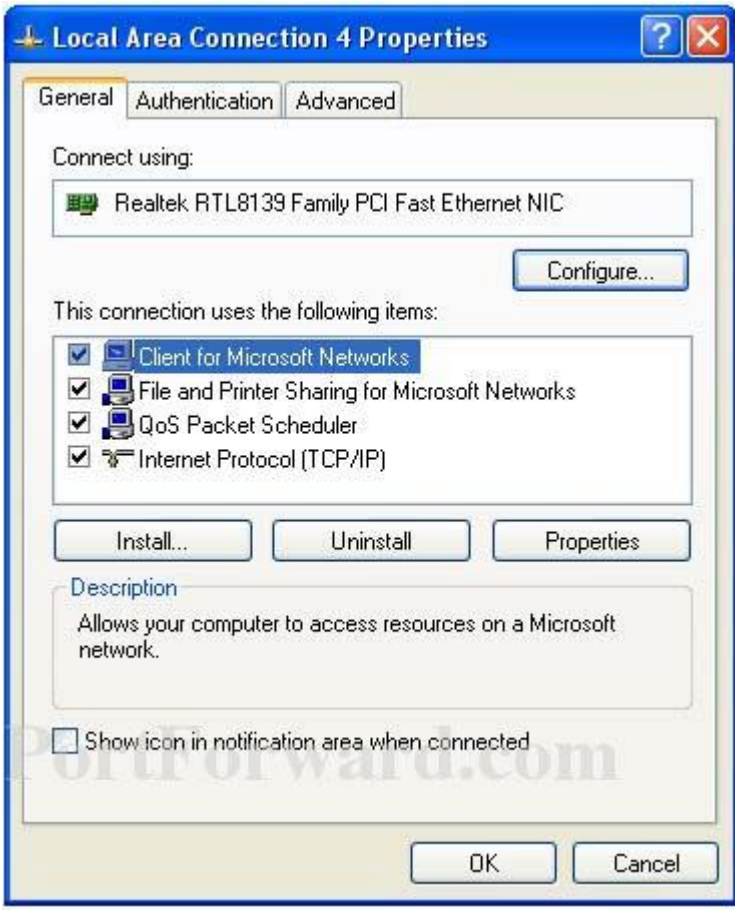

Figure 5 Local Area Connection Properties

2、Select Internet Protocol (TCP/IP) and click Properties button, and the following dialog box appears：

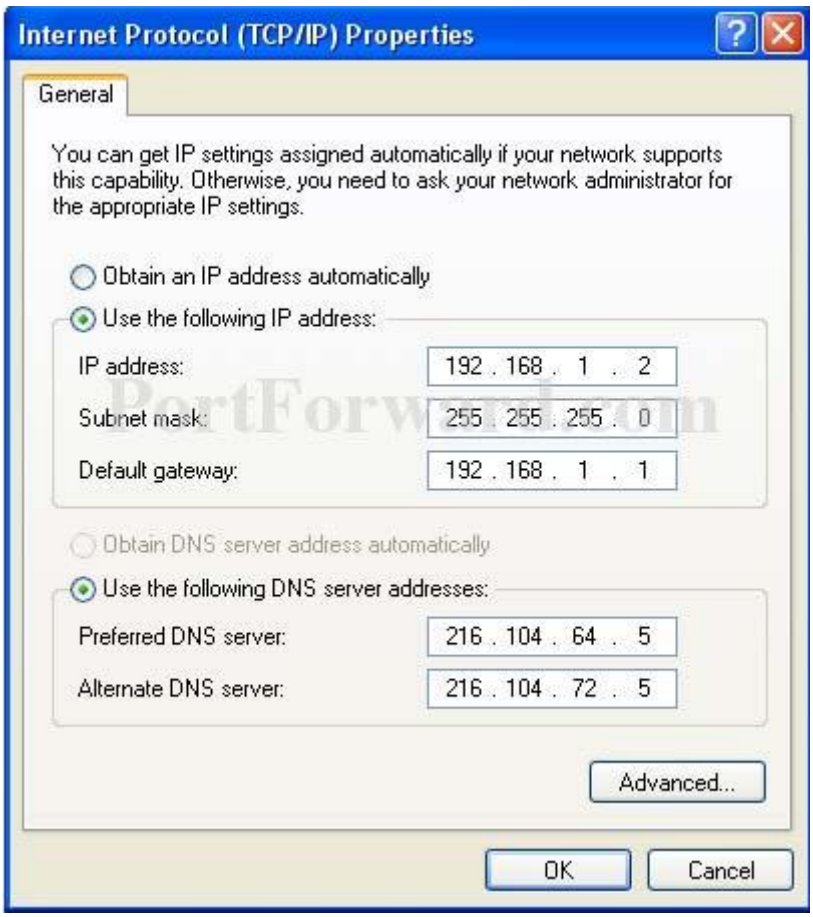

Figure 6 IP settings

3、In the above Figure 6, IP address should be set to 192.168.1.*, here * can be a number between 1-255 (but not 36) since the DH-PFM881 default IP address is 192.168.1.36.

4、When the above IP setting is done, input the default IP 192.168.1.36 into the address bar of your web browser, and the following log in interface appears as shown in Figure 7.

5、In Figure 7, input the user name and password (default is admin/admin) and click the Confirm button, then you can log in to the web configuration menu of the DH-PFM881 device.

Figure 7 DH-PFM881 Log in interface

3.2 Quick Configuration of the Device

The users will see how to configure the DH-PFM881 device quickly in this chapter.

1、 The first page shown after log in is the **Status** page, which indicates the working status, current setting, software version and other information of the DH-PFM881 device. User can switch to other pages by clicking the left main menus in Figure 8.

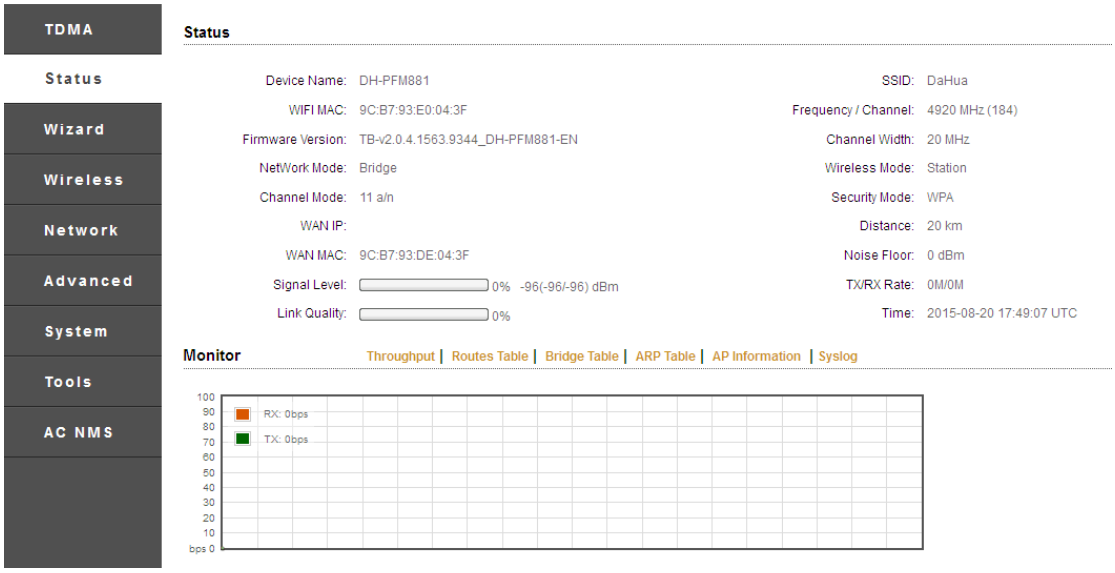

Figure 8 Status Page

2、Click **Wizard** main menu, the users can configure the device quickly, including **Network** and **Wireless** settings and so on. It is **Wizard-Network** page as shown in Figure 9, and this page helps to set the basic network parameters. The default mode is Bridge mode, and the default LAN IP address is 192.168.1.36. If the user wants to configure the device to Router mode, please click **Network** in the main menu.

Note: If several DH-PFM881 devices are connected in the Point-to-Point or Point-to-Multi-Point topologies, they must be configured to different IP address to avoid collisions.

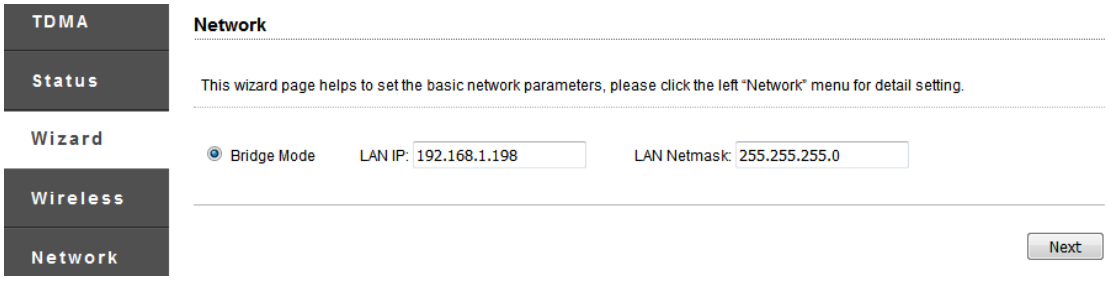

Figure 9 Wizard-Network

3、After finishing the **Wizard-Network** settings, click next and it goes to **Wizard-Wireless** page shown in Figure 10. The most used wireless mode is the **Access Point** and the **Station**.

Station mode：The device acts as a WIFI station, and it can be connected to a normal home access point or DH-PFM881 access point.

Access Point mode：The DH-PFM881 device acts as an access point, which allows normal WIFI stations access. For detail settings of wireless mode, please click **Wireless** in the main menu.

Note: If two DH-PFM881 devices need to be connected in point-to-point topology, one of the device need to be configured as Access Point, and the other one need to be configured as Station, and both of them should have the same Encryption method.

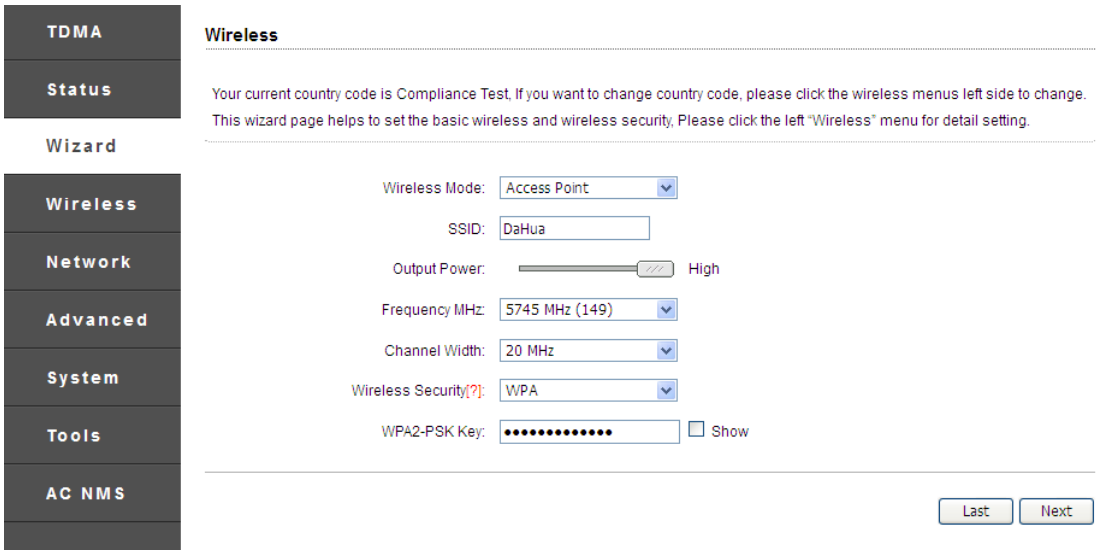

Figure 10 Wizard-Wireless

4、The last page of Wizard is shown in Figure 11. User can click **Change** to save all the settings, and then click **Apply** the make the setting effective, or click **Last** to modify the previous settings.

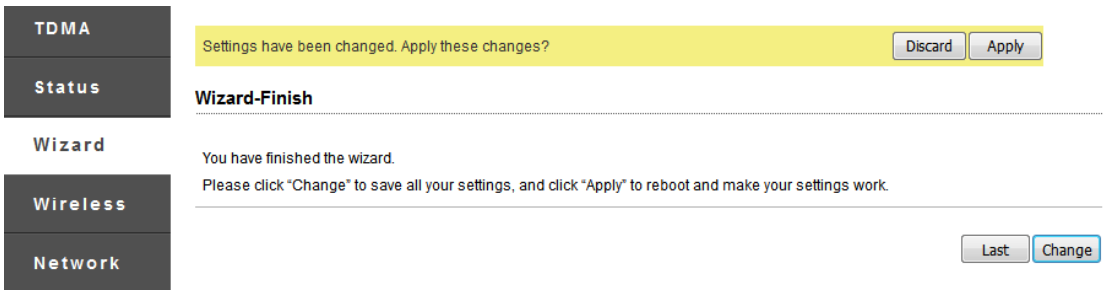

Figure 11 Last Page of Wizard

4 TDMA

Currently, most of the outdoor bridge products are developed based on 802.11 protocols, however, it has the limitations of short-distance, hidden node problems, and poor point-to-multi-point performance.

TDMA technologies, developed and patented by , utilizing a series of advanced technologies such as TDMA, 5M/10M/20M/40MHz bandwidth support, intelligent rate control, Auto ACK Time-out Adjust, having the advantage of long transmission range, high date rate and robust transmission.

TDMA technology solves the problems of hidden-node problem in the 802.11 network infra-structure. 5M/10M/20M/40MHz bandwidth can be flexibly configured by the uses in different working scenario to achieve the best link quality. Intelligent rate control algorithm can be adapted to quick channel quality variations, while stabilize the wireless throughput, thus suitable for long-distance transmission. ACK Time-out Auto Adjust can automatically detect the distances of the DH-PFM881 devices, and adjust the wireless parameters to achieve the best link quality.

The TDMA setting is shown in the following Figure 12.

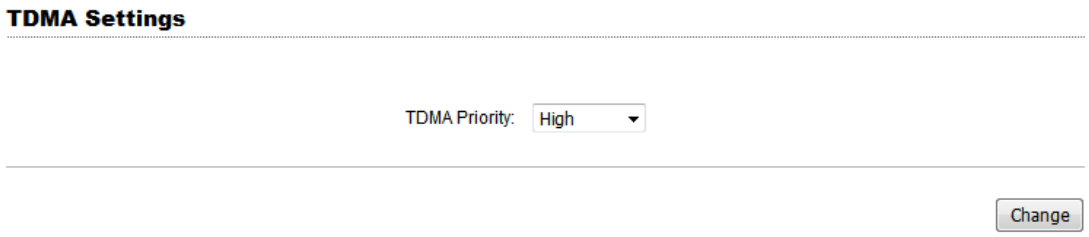

Figure 12 TDMA setting

To use the TDMA, the user needs to enable TDMA mode in the AP device, and set a priority level in the station device. When several stations are connected to one AP, different stations demand different throughput. If the station demands higher throughput, its priority level can be set to High, otherwise set to Low. When the stations demand the same throughput, their priority level can be set to the same level.

Note: When using TDMA mode, the TDMA button need to be enabled at both AP and station devices in the web-based configuration menu. The devices from other vendors cannot be connected to DH-PFM881 in the TDMA mode.

5 Status

Status is the first page shown after logging in. It shows the current configuration and real-time monitoring of the device, seen in the following Figure 13. This page is divided into 2 parts: **Status** and **Monitor**.

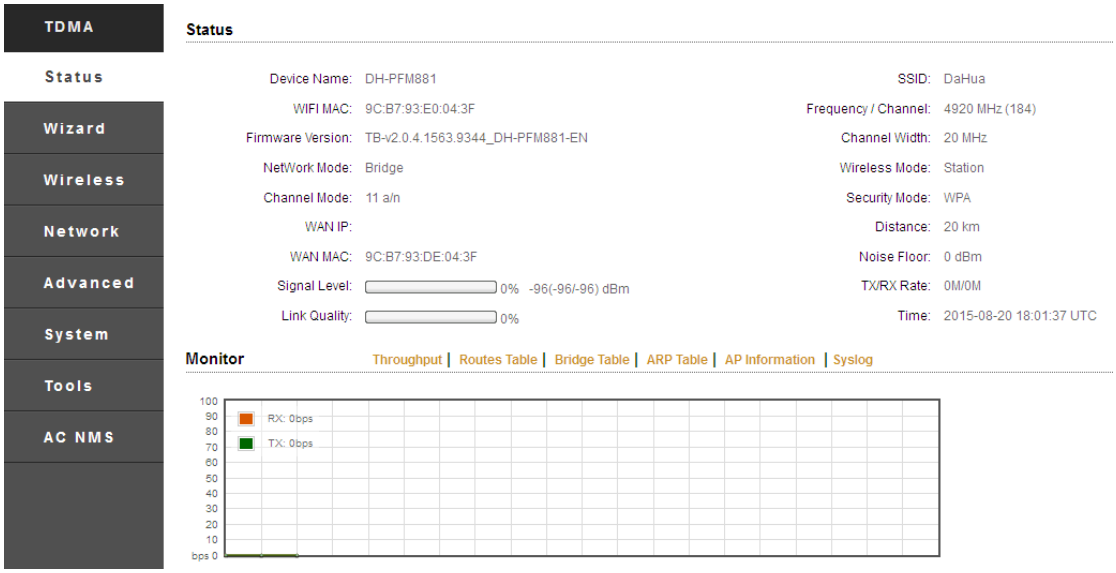

Figure 13 Status

5.1 Status

All the configurations in Status page is shown in Table 7.

Table 7 Configurations shown in Status

Items	Description	Items	Description
Device	Name of the device , for example: DH-PFM881	SSID	The name of the wireless network
WIFI MAC	MAC of the wireless port	Frequency/ Channel	Wireless channel chosen
Firmware Version	Software version number	Channel Width	5MHz, 10MHz, 20MHz, 40- MHz, 40+ MHz
Network Mode	Network mode: Router or Bridge	Wireless Mode	Access Point, Station WDS Access Point, WDS Station, WDS repeater
Channel Mode	11 a/n	Security Mode	Wireless encryption method
WAN IP	WAN IP address	Distance	The distance between two associated devices
WAN MAC	MAC of the WAN port	Noise Floor	Noise Floor value
Signal Level	It indicates the signal strength of	TX/RX Rate	The date rate of current device during sending

	the device		and receiving data.
Link Quality	Quality of the connection link	Time	The real-time

5.2 Monitor

Throughput: The figure here monitors the real-time throughput of the wireless link, shown in the following Figure 14.

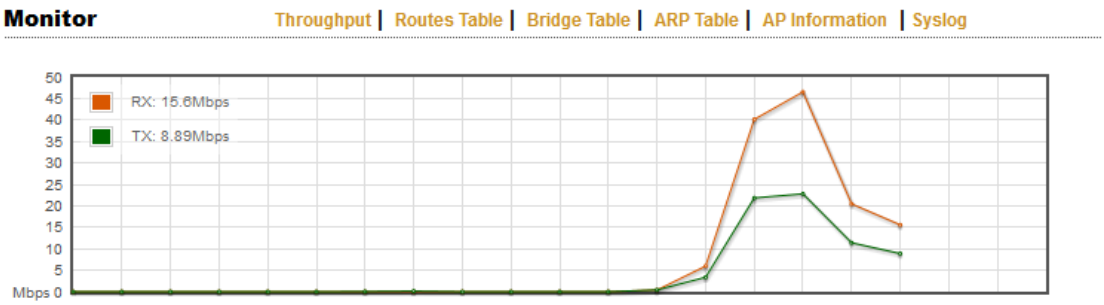

Figure 14 Throughput monitor

Route Table: It is stored in a router that lists the routes to particular network destinations, and in some cases, metrics (distances) associated with those routes. The route table contains information about the topology of the network immediately around it.

Figure 15 Router Table

Bridge Table: It lists all the devices that communicate through the DH-PFM881 device.

Monitor Throughput | Routes Table | Bridge Table | ARP Table | AP Information | Syslog

MAC Address	Ageing Timer
9c:b7:93:e0:03:e0	0.65
9c:b7:93:e0:03:c5	0.00
9c:b7:93:de:03:c5	0.00
00:1d:ba:02:df:16	0.00
9c:b7:93:df:03:c5	0.00
00:1d:ba:71:92:64	0.79
9c:b7:93:de:03:e1	269.27

Figure 16 Bridge Table

ARP Table： It lists the IP address and MAC address of the devices that communicate through the LAN port of the DH-PFM881 device.

Monitor Throughput | Routes Table | Bridge Table | ARP Table | AP Information | Syslog

IP Address	MAC Address	Interface
192.168.1.191	00:1d:ba:02:df:16	br0

Figure 17 ARP Table

AP/Station Information: Showing the status information of the associated devices.

For example, if the DH-PFM881 device is an AP, and the associated device is a Station, and this Station Information shows the related information of the Station device in the Figure 18.

Monitor Throughput | Routes Table | Bridge Table | ARP Table | Station Information | Syslog

MAC Address	TX/RX Rate	RSSI
00:21:6a:2b:95:bc	144M/104M	38

Figure 18 STA Information of an AP

If the DH-PFM881 is a Station, and AP Information shows the associated AP device's information, seen in Figure 19.

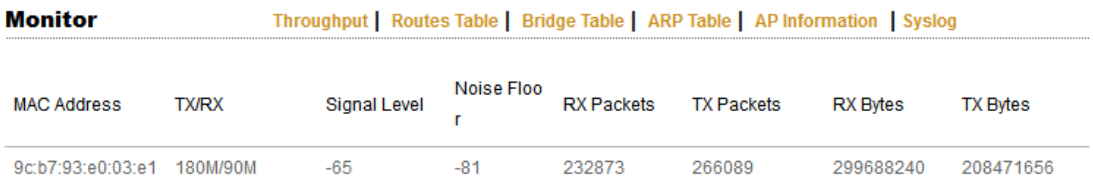

Figure 19 AP Information of a Station

Syslog：Display the log information of DH-PFM881.

6 Wireless

Wireless is shown in Figure 20.

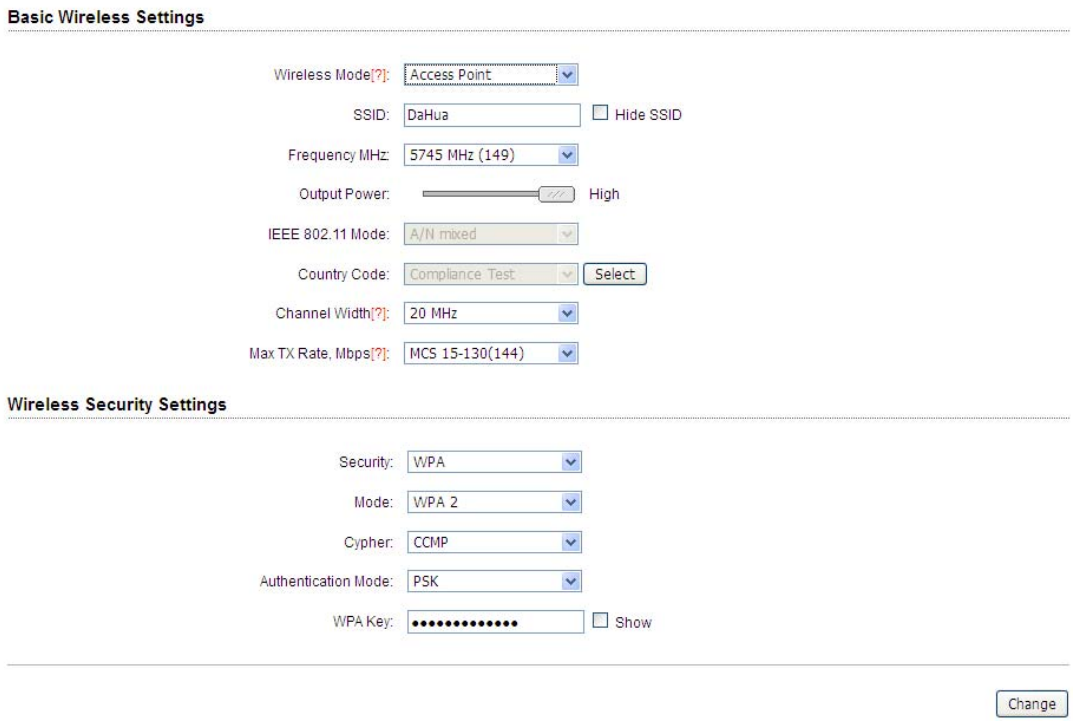

Figure 20 Wireless

Wireless Mode: There are totally 5 wireless modes, including: Station, Access Point, WDS Station, WDS Access Point, and WDS Repeater.

Access Point: Access point.

Station: A client device that can be connected to an AP.

WDS Station: Use WDS feature to link multiple APs in a network, all associated stations from any AP can communicate with each other like in ad-hoc mode. WDS station means this device is a station in WDS mode.

WDS Access Point： Use WDS feature to link multiple APs in a network, all associated stations from any AP can communicate with each other like in ad-hoc mode. WDS AP means this device is an AP in WDS mode.

WDS Repeater： A DH-PFM881 device can be configured to WDS Repeater mode, so that it can connected to another WDS Station or WDS Repeater.

SSID: Name of a wireless.

Shown in Figure 21, the user can click the **Select** button to list all the SSIDs that can be associated, and then choose the one need to be associated.

Frequency： This only appears when the device is configured to Access Point mode or WDS Access Point mode. The device can only work on one channel at the same time.

Frequency scan list： This only appears when the device is configured to Station mode or WDS Station mode. If it's not enabled, the station will scan all the channels which both the device and the country code allowed and then choose the same channel as the associated AP. If it's enabled, click select, another window will pop up and let the user to choose the working channels, and the channels should include the associated AP's channel, which can fasten the association process between the AP and the Station.

Output Power： Output power of the DH-PFM881 device.

Country Code： Different countries allows different channels, use can choose the country code to only allow the device works at the channels permitted in the particular country.

Channel Width： Channel width selection, and DH-PFM881 device supports 5MHz/10MHz/20MHz/40MHz bandwidth.

Max TX Rate： Max transmission rate, and it can be used to limit the max transmission rate of a device.

Root AP MAC Address： In Station, WDS Station, and WDS Repeater modes, users can use this to limit the APs associated to.

Security： User can set the security based on needs to guarantee the wireless security.

WPA： Encryption method supported by 802.11 Protocol.

7 Network

7.1 Router mode

DH-PFM881 acts as a router when configured to Router mode. In router mode, the connection is shown in Figure 21. User needs to connect the POE port of POE adaptor to the POE port of the DH-PFM881.

After the above connection, the DH-PFM881 can work as a router. The LAN2 port of DH-PFM881 device acts as the LAN port of the router, and LAN port of POE adaptor acts as the WAN port of the router.

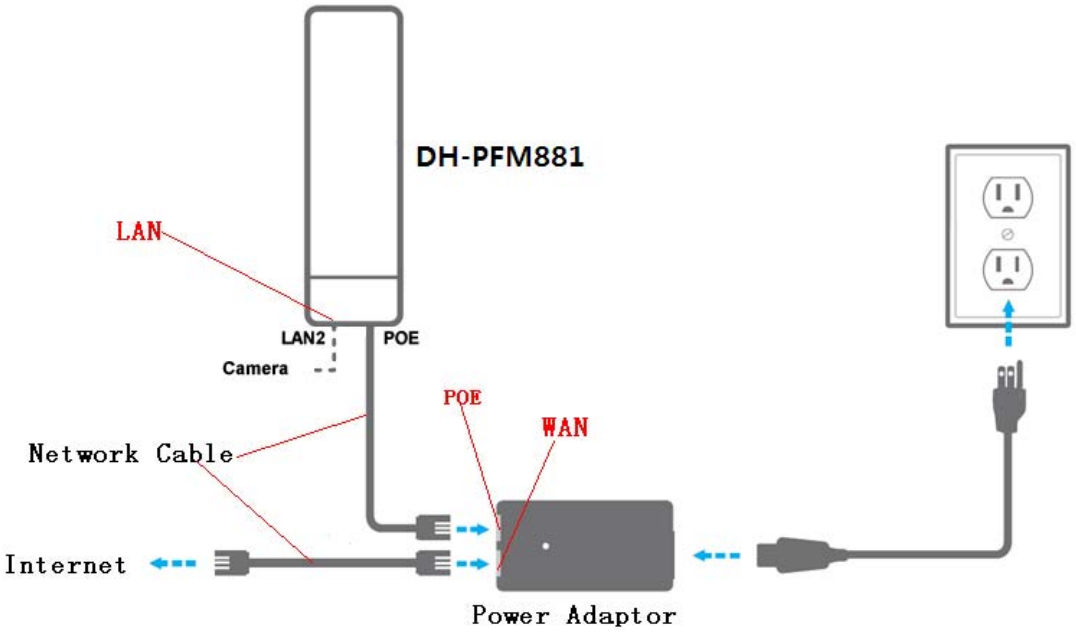

Figure 21 Connection figure of router mode

The Network page is shown in Figure 22.

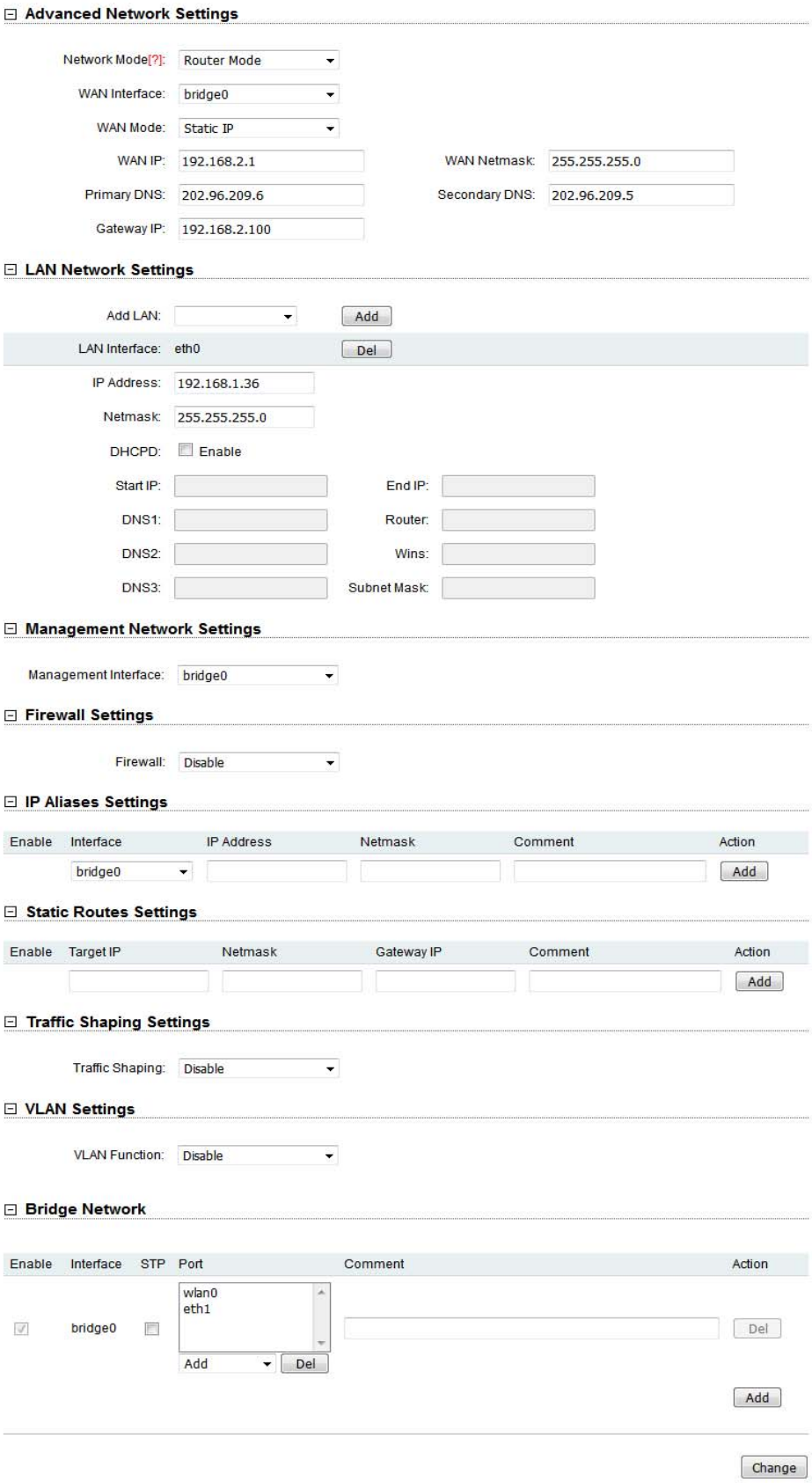

Figure 22 Network Router mode

WAN Mode： WAN mode can be configured to DHCP/PPPoE/Static IP. When set to DHCP, the device can dynamically get the IP address; otherwise, user needs to manually set the IP address, Netmask, gateway and other information.

WAN IP： WAN IP address. It should be set to the same segment of IP address of the internet provided by ISP, please check with the ISP for this information.

WAN Netmask： WAN Netmask, use can check with the ISP for this information.

Note: WAN IP address should not be the same as the IP devices of the internet to avoid collision.

Primary DNS and Secondary DNS: Please check with the ISP for the information.

Gateway IP： The IP address of WAN gateway.

7.2 Bridge mode

In Bridge mode, there is no WAN port. The LAN port of the POE adaptor, and the LAN2 port of the DH-PFM881 device can all be the LAN port, and the user can choose one of them to use as LAN port. Please refer to Figure 3 for the connections in Bridge mode, and the IP address/Netmask information setting is the same as Router mode.

7.3 Management

The IP address of the device can be modified, and the management of the device can be performed by setting the specified management interface.

7.4 Firewall

When the firewall is enabled, the device can allow only some devices to be associated to. Shown in Figure 23, and there are 4 cases of Firewall filtering.

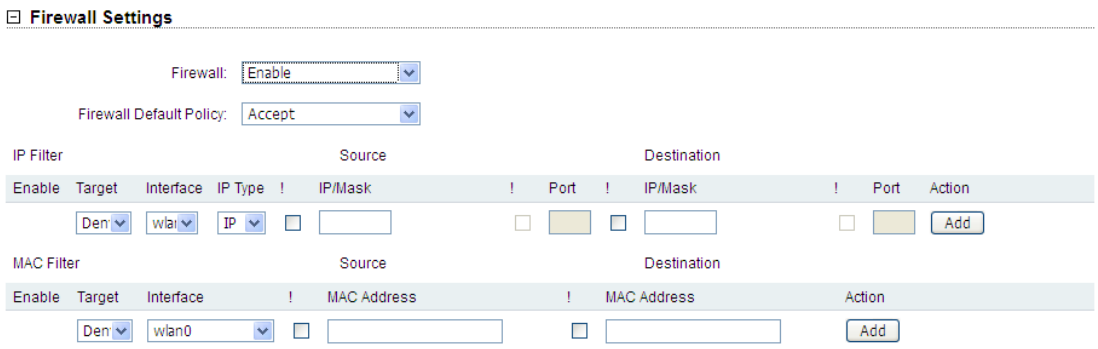

Figure 23 Firewall

1. Accept one or several devices with particular MAC address.
2. Deny one or several devices with particular MAC address.
3. Accept one or several devices with particular IP address.
4. Deny one or several devices with particular IP address.

7.5 IP Aliases

Add multiple IP to a network interface.

7.6 Static Routes

This feature can be set to static routing.

7.7 Traffic Shaping

Traffic shaping is used to control the traffic of ingress/egress based on each network port. As show below, the ingress of wlan0 is limited to 1024Kbps, and the egress is limited to 2048Kbps. That means the receiving rate of the wireless link is limited within 1Mbps, the sending rate is limited to less than 2Mbps. But usually, the input limited effect is not obviously, that's because we could not control how quickly the traffic arrives. However, when a port sends out egress traffic, it can control how quickly the traffic exits.

Burst defines the how many bytes allowed for downloading/uploading during a quick time. That leads to momentary throughput can greater than the limit value.

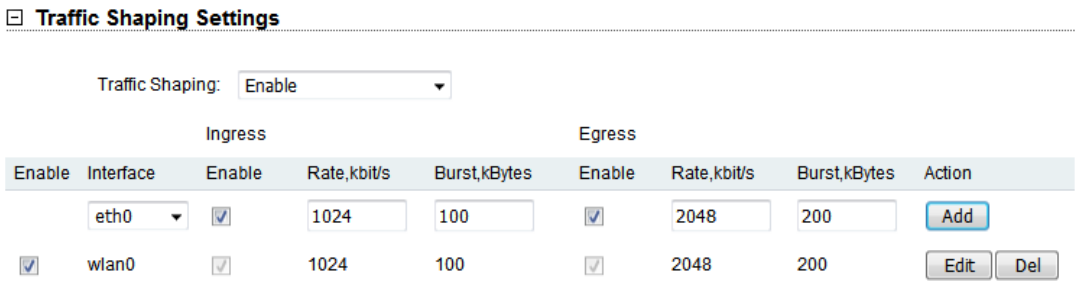

Figure 24 Traffic Shaping Settings

- Ingress traffic entering wlan0, control the input rate
- Egress traffic exiting wlan0, control the output rate

The relationship of rate and burst for ingress:

- Set burst to 0, the rate of ingress is unlimited
- Set burst to about 1/10 of rate limit, the rate curve is stable
- Set burst larger than rate limit, the rate curve will hold a high value for a while then down to stable

Below is the table that reflects the relationship between ingress rate limit and burst.

Ingress		Throughput when reach stable	
RateLimit(kbps)	Burst(Kbytes)	(Mbps)	Description
10000	0	29.587	Unlimited
10000	10	4.286	Stable
10000	100	8.037	Oblique up to stable
10000	1000	8.825	From 9.5 down to stable
10000	10000	8.6	From 28.5 down to stable
10000	40000	8.6	Hold on 10 seconds at 29.6, then suddenly down to stable

The relationship of rate and burst for egress:

- Set burst less than 1/10 of rate limit, the rate curve is stable totally
- Set burst larger than rate limit, the rate curve will hold a while at a higher value then down to stable

Below is the table that reflects the relationship between egress rate limit and burst.

Egress		Throughput when reach stable	
RateLimit(kbps)	Burst(Kbytes)	(Mbps)	Description
20000	0	18.853	Stable
20000	20	19.021	Stable
20000	200	19.205	Stable
20000	2000	19.437	From 23.5 down to stable
20000	20000	19.2	Hold on 20 seconds at 24.5, then suddenly down to stable
20000	80000	19.2	Hold on several minutes at 24.5, then suddenly down to stable

7.8 VLAN Settings

The VLAN function allows user to create multiple virtual local area network. As show below, we add a VLAN on port wlan0. The VLAN ID is 10. The range of VLAN ID is 2~4094. Each VLAN ID represents a different VLAN.

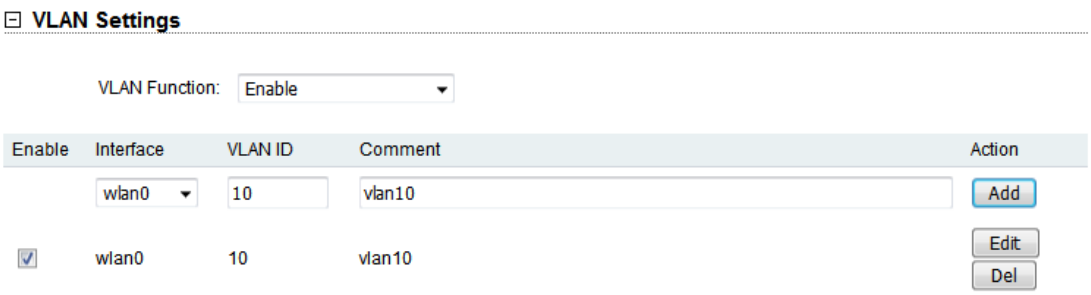

Figure 25 VLAN

Bridge function is needed to use together with VLAN. As show below, we add VLAN 10 on port eth0 and wlan0, they are eth0.10 and wlan0.10, and put them into the same bridge. The packets from eth0.10 or wlan0.10 will be added a VLAN label which ID is 10. That requires: the opposite wireless connection side must support VLAN 10, the device which connects with eth0 is also need to support VLAN 10.

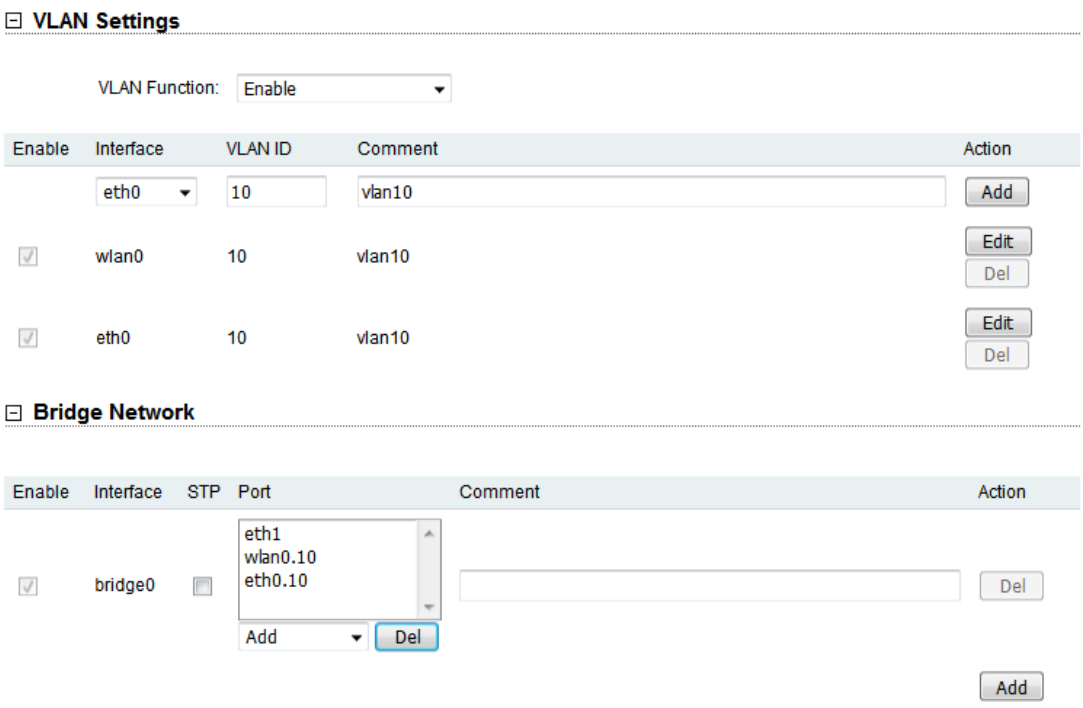

Figure 26 VLAN Setting

Below is a common usage:

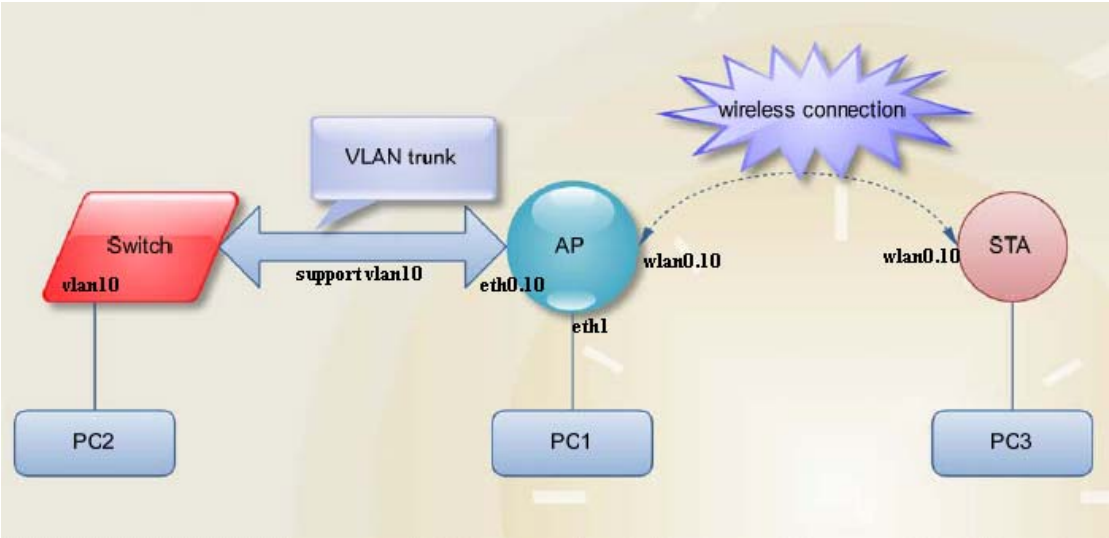

Figure 27 VLAN Scenarios

8 Advanced

The Advanced page is shown in Figure 28.

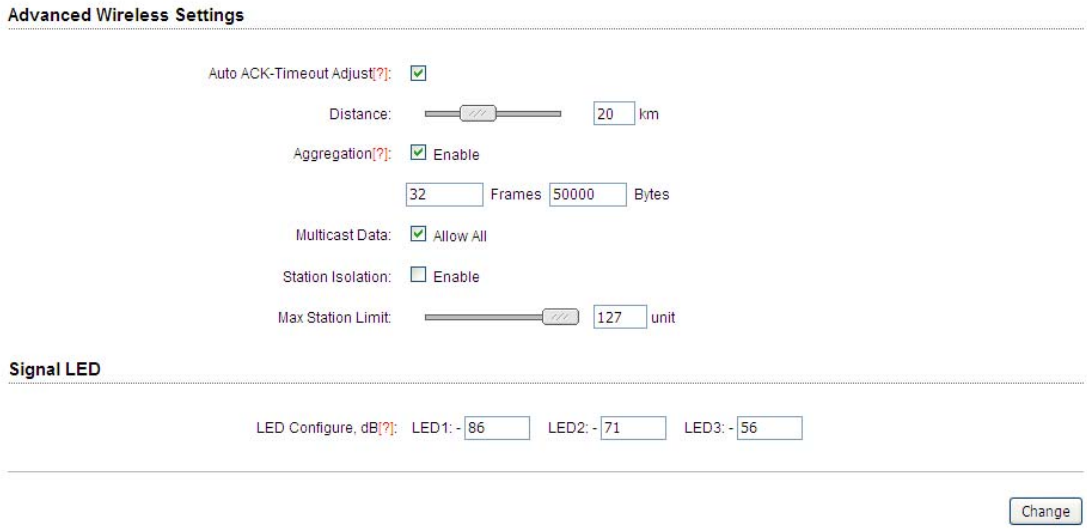

Figure 28 Advanced

Auto ACK-Timeout Adjust: It is suggested to enable this function, so that the distance between 2 DH-PFM881 devices can be detected and all the related parameters can be optimized to achieve the best link quality.

Distance: The distance can be set manually if the Auto ACK-Timeout Adjust is disabled, otherwise, the distance parameter is not allowed to be set. It is suggested the distance is set automatically by enabling Auto ACK-Timeout Adjust parameter.

Aggregation: It enables several data frames of 802.11 to be aggregated and transmitted out, thus improve the throughput. In default, it's enabled.

Multicast Data: When it's enabled, DH-PFM881 devices allow multicast function.

Station Isolation: Enable this feature can make connection to with an access point, the WDS access points, WDS repeater equipment cannot communicate with each other, even though the client IP duplicate nor of communication have any impact.

Max Station Limit: By setting it to limit the number of clients and WDS clients that are connected to an access point, a WDS access point, a WDS repeater.

LED configure: This is to configure the signal strength value needed to light on.

There are 3 LEDs on DH-PFM881 devices (LED3 value > LED2 value > LED1 value). The default values are -86dBm, -71dBm and -56dBm. When LED1 value < signal strength < LED2 value, LED1 is lighted on; When LED2 value < signal strength < LED3 value, both the LED1 and LED2 are lighted on; When signal strength > LED3 value, all three LEDs are lighted on.

9 System

System page is shown in Figure 29, and it is divided into the following 4 parts: Configuration, Firmware, Device Setting, Accounts.

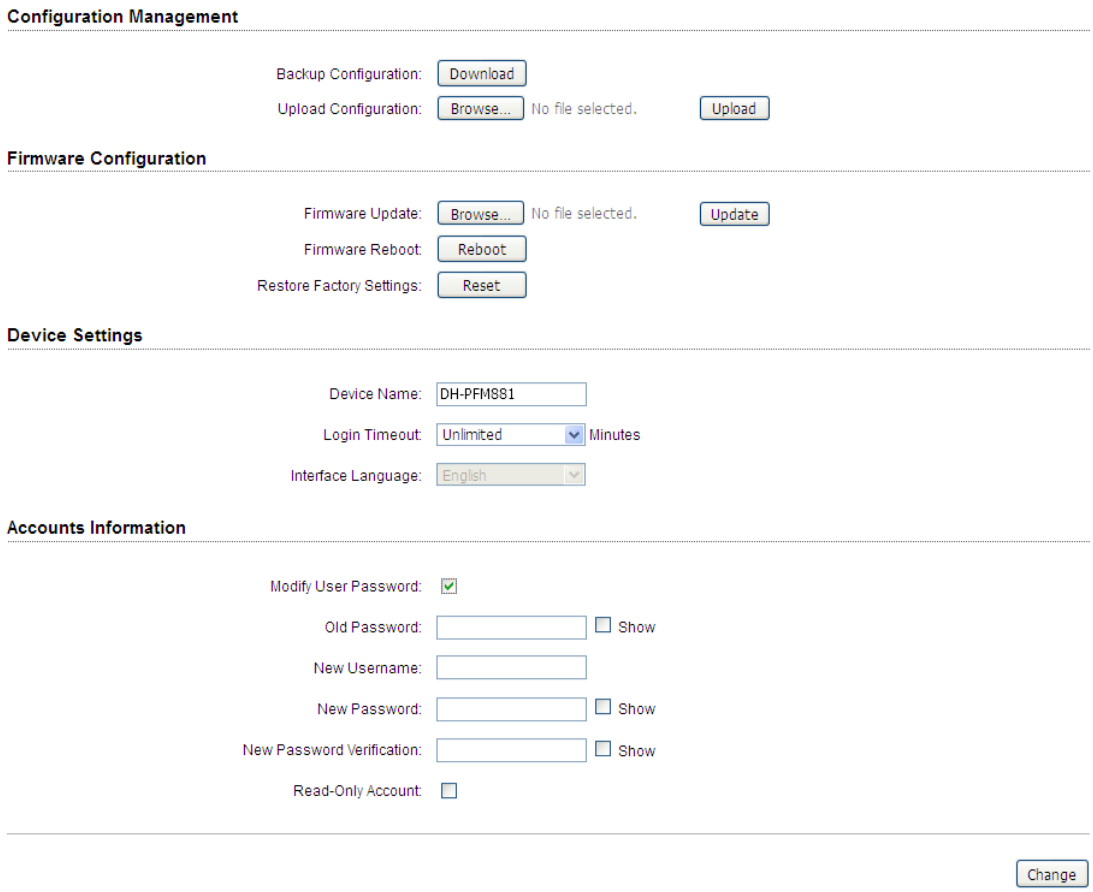

Figure 29 System Page

Backup configuration : When clicking Download button, the current configuration can be backed up to a file.

Upload configuration：When clicking browse, user can choose the backup configuration file and then click upload, so that the configuration stored in the backup file can be applied.

Firmware update：Click browse button and choose the file, and then click update button, the firmware can be updated to the latest version.

Firmware reboot：Click the Reboot button to reboot the device.

Restore Factory Settings：Click the Reset button to restore to the factory default settings.

Device name：It can be set to any name needed.

Login Timeout：Login Timeout setting.

Interface Language：Language setting, currently only supports English。

Accounts：The user can modify the name and password of user and Read-Only Account.

10 Tools

The Tools page is shown in Figure 30.

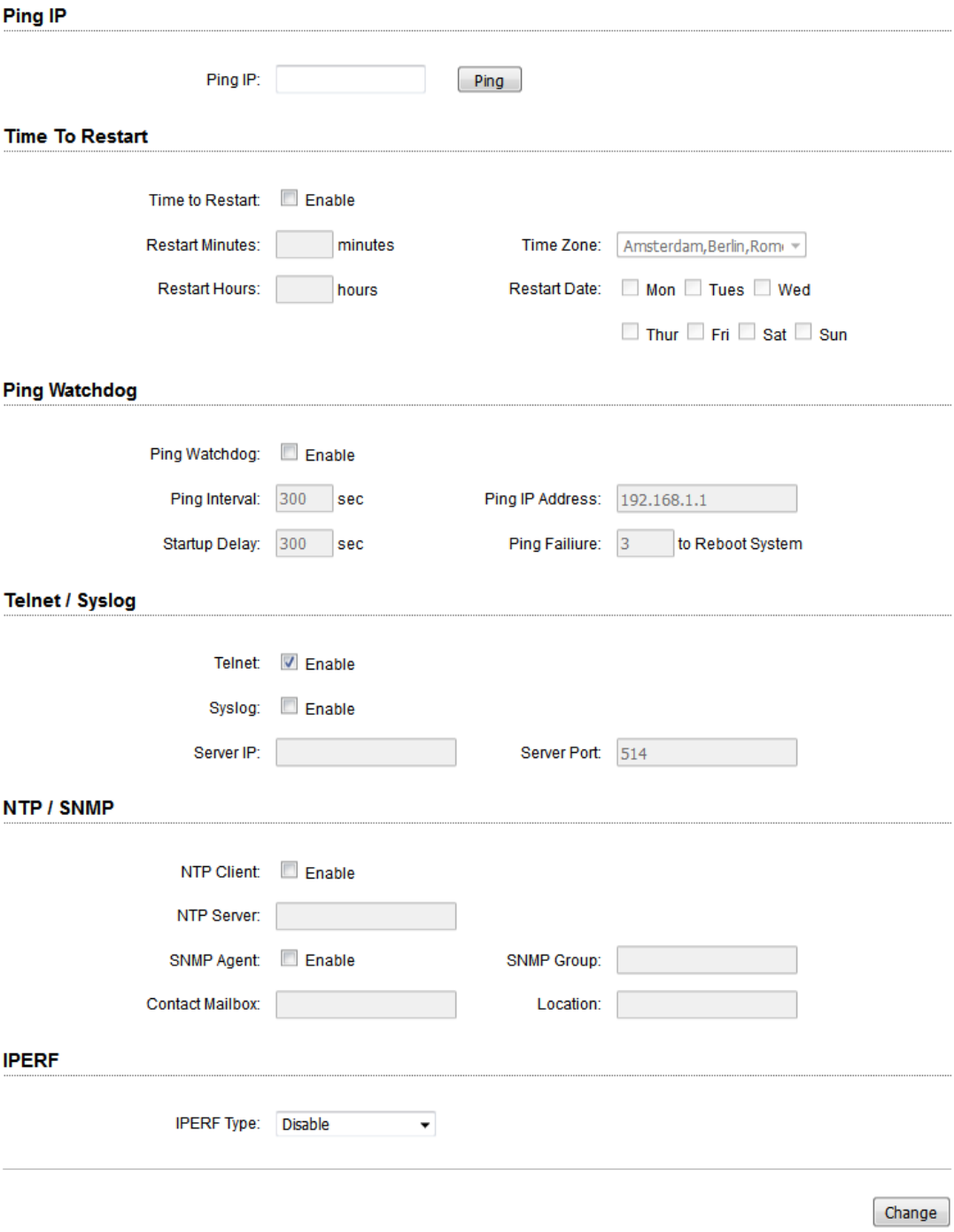

Figure 30 Tools

Ping IP: User can input the destination IP address of another device, and click Ping button. If that destination device is successfully connected to the DH-PFM881 device, the result shows Alive, otherwise shows Not Alive.

Time To Restart: Timing restart equipment.

Ping Watchdog： The ping watchdog sets the DH-PFM881 Device to continuously ping a user-defined IP address (for example, it can be the IP address of the AP the Client is connecting to). If it is unable to ping under the user defined constraints, the DH-PFM881 device will automatically reboot. It is highly recommended that users enable this feature at the side of "Station" and disable this feature at the side of "Access Point".

Ping Interval： Specify time interval (in seconds) between the ping requests are sent by the Ping Watchdog.

Ping IP Address：Specify an IP address of the target which will be monitored by Ping Watchdog. If this feature is enabled at the side of "Station", Ping IP Address should be the IP address of the AP the Client is connecting to.

Startup Delay: specify initial time delay (in seconds) until first ping request is sent by the Ping Watchdog.

Ping Failure：Specify the number of ping replies. If the specified number of ping replies is not received continuously, the Ping Watchdog will reboot the device.

Note：If users want to modify the parameters of Ping Watchdog, please disable it first and then apply. When the web page shows that Ping Watchdog is really disabled, users can now re-enable it with modified parameters.

Telnet/Syslog： When telnet is enabled, the user can input command "Telnet 192.168.1.36" in the DOS window of Windows XP or Windows 7 PC, and then telnet to the DH-PFM881 and manipulate the DH-PFM881 device. When telnet is disabled, this operation is disabled.

When Syslog is enabled, and the System Log server's IP is also set here, the log information will be output to the Syslog server automatically.

NTP/SNMP：If this NTP server is set, and the DH-PFM881 device can access to this NTP server. DH-PFM881 device automatically calibrate the time and date information with the NTP server and show the time information in the Status page.

When SNMP is enabled, use can check the working condition and information of the DH-PFM881 device.

IPERF： Test equipment throughput. Device 1 select the "server" and the IPERF interval is the time to display the throughput of the web page. Device 2 select the "client" and the IPERF server to fill in the IP address of the device 1. The number of IPERF threads for testing the number of threads running at the same time, it is recommended to set up 10. IPERF test time for running IPERF seconds. IPERF interval time is the time for the display of the throughput of the web page. For testing, please click the "Test" button.

11 AC Management

AC Management page is shown in Figure 31。After this function is enabled, the AC management system must be used.

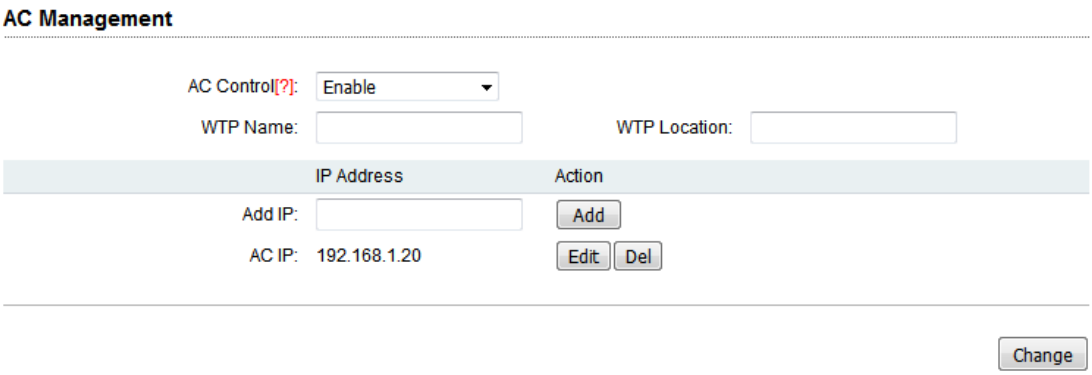

Figure 31 AC Management

WTP Name：It's the name of the device that is displayed on the AC.

WTP Location：It's the location information that is displayed on the AC.

AC IP：This IP address can add up to eight, add the IP address is AC management

interface IP and equipment is the same segment. After the AC control function is enabled, click save, application, this time the device will take effect on the AC configuration and restart, the device will join AC. After the AC control function is enabled, the user is able to display the current state of the page on the device page. After the AC control function is disabled, the user is able to modify the device's page.

Note: the client must be able to join the AC after it is connected to an access point that has been joined to the AC.

12 Logout

When you click logout button, the web will quit and return login web.

13 Network Configuration Examples

13.1 AP and Station Network

In the point-to-point working scenario, user can configure one DH-PFM881 device to AP, and another to station mode, shown in Figure 32.

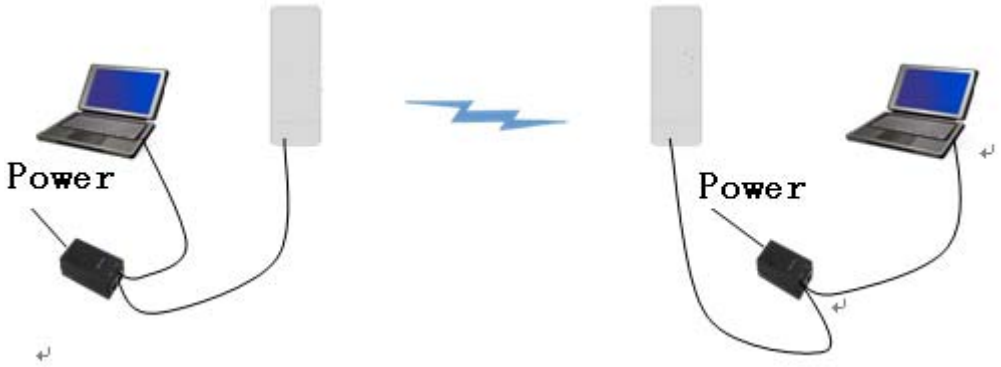

Figure 32 AP and Station network

To make the above network work, user need to use computers to configure the two devices, and the detail configurations are described in the following:

1. Configure the 2 DH-PFM881 devices to bridge mode, and disable the firewall, and set different LAN IP for the 2 devices.

2. In wireless menu, configure the 2 devices to AP and station separately, set the same SSID, the same channel bandwidth (20MHz for default), and set the same encryption and password for both of the devices.

3. After the above setting is done, using one computer to ping the IP address of the other computer, if they are connected, user can watch the connection status in the Status page.

13.2 WDS Access Point, WDS Station, WDS Repeater Network

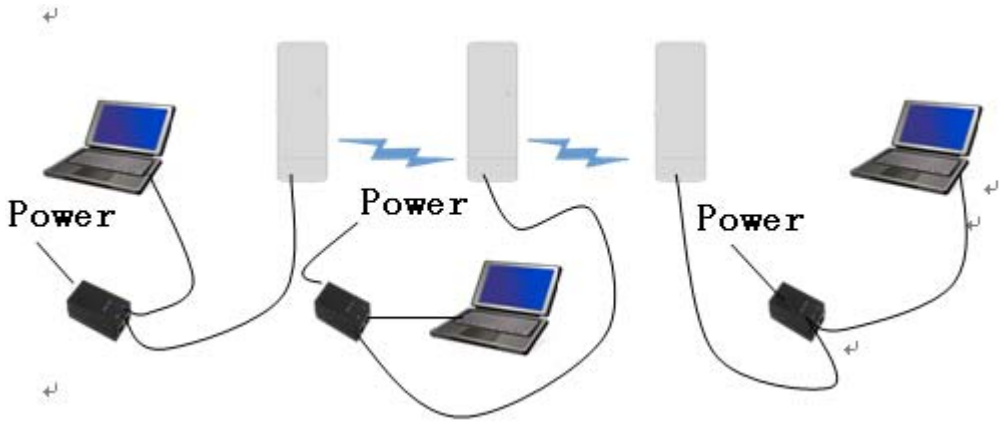

Figure 33 WDS Network

If there is a block, such as a building is in between the point-to-point connection, one TuroBridge5E device can be put between the PTP connection as a relay, which is "WDS AP, WDS Station, WDS Repeater" network, shown in the above Figure 33.

Three DH-PFM881 devices need to be configured as shown in Figure 33:

1. Configure the 3 devices to be bridge mode.

2. In the wireless menu, make the following configurations:

- Configure the 3 devices to WDS Access Point/WDS Repeater/WDS Station separately

- Configure the 3 devices' SSID to be the same

- Configure WDS AP and WDS Repeater frequency to be the same, for example: 5785MHz

- Configure the encryption method and password to be the same.

3. To verify if the network is correctly setup, please use the computer to connect one of the three devices to ping the IP of any of the other two devices. If the ping is successfully, the network connection works correctly.

13.3 Router Mode

In the Router mode, the DH-PFM881 works as a router and the network connection is shown in Figure 34. In Figure 34, The POE port of the POE adaptor is connected to the DH-PFM881 device's POE port, and the LAN port of the POE adaptor is connected to the internet. Meanwhile, the LAN port of DH-PFM881 device is connected to one computer, and then user can configure the device.

Figure 34 Router mode

After the above connection is done, configure the DH-PFM881 device using the web based configuration menu.

1. In wireless page, set the device to route mode, disable the firewall. If the internet provided by the ISP (DH-PFM881 connected to) has a DHCP server, user can set DH-PFM881's WAN mode to DHCP (Dynamic IP) so that it can obtain the IP address automatically.

   If the internet provided by the ISP(DH-PFM881 connected to) doesn't have a DHCP server, user need to manually configure all the parameters given by the ISP, such as the WAN IP, WAN subnet mask, LAN IP, LAN subnet mask, Default gateway, Primary DNS, Secondary DNS.

   Note: LAN IP address and WAN IP address cannot be in the same IP segment. For example, if LAN IP is 192.168.1.*, then WAN IP must be set to 192.168.2.* or 192.168.3.*.

2. In wireless page, set wireless mode to Access Point, set SSID to a random name, and set output power to a value needed(Max output power is recommended in the outdoor long distance environment). Then the user needs to choose a wireless channel and an encryption method.

3. Enable DHCPD.

4. When the above settings are done, use a computer to connect to DH-PFM881 device, and then check whether the connection is successfully.

   Note: Users can check whether the connection is successfully by ping DH-PFM881 device's WAN IP address. If the ping is successfully, this connection is successfully.

Appendix-A Troubleshooting

1. The device cannot be started after power on.

1. The Ethernet cable between the DH-PFM881 device and the POE adaptor is more than 40 meters long.

2. The Ethernet cable quality is not good enough, and it should be Cat 5e or even Cat 6 cable.

3. The RJ-45 plugs are not well connected.

2. Cannot be restored to the factory setting

Please manually push the Reset button for 5~10 seconds until all LEDs are light on, then the user can log in the device by typing the default IP address 192.168.1.36.

3. My computer cannot be connected to the DH-PFM881.

Please try the following method to solve the problem:

1. Adjust the direction of the DH-PFM881 device.

   Please rotate the DH-PFM881 device since the antenna inside the device is directional.

2. Switch to other wireless channel

Switch to other wireless channel 'cause there are much interferences in this channel.

3. Turn off the other interference sources

   Maybe there are other WIFI devices nearby and cause interferences. Try to turn off other WIFI devices nearby, or move DH-PFM881 to another clean environment.

4. The signal strength between 2 DH-PFM881 devices is too weak, and the throughput is low.

1. The DH-PFM881 AP and Station devices are not Line-of-Sight, or there are blocks like a building in between the AP and Station devices.

2. The Station device and AP device is not aligned very well, including both horizontally and vertically, since the antenna of the DH-PFM881 is directional.

3. The Station device is installed in the windows, and the windows glass shields the wireless signal.

4. The distance between the AP and Station devices is too far.

5. The signal strength is high, but the throughput is low

1. There are too much interferences, or multi-path interferences. For example, there are too much 2.4GHz or 5.8GHz WIFI device working nearby.

2. The RJ45 ports of the DH-PFM881 device don't work well.

6. During the point-to-point or point-to-multi-point connection, when ping from one device to another, the latency is too long or the packet is lost.

1. Isolate the several APs if they are connected to one POE switch.

2. The RJ45 ports are not connected very well.

7. The internet access is lost and the internet speed is low.

1. There are too much stations connected to one AP.
2. AP signal is too weak.
3. There are interference sources nearby.
4. Check the number of users and the max internet speed provided by the ISP.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: This product has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.

This equipment should be installed and operated with a minimum distance 20cm between the radiator and your body