TP-LINK®

User Guide

TL-WA830RE

300Mbps Wireless N Range Extender

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FCC STATEMENT

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

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/ TV technician for help.

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.

2) This device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

"To comply with FCC RF exposure compliance requirements, this grant is applicable to only Mobile Configurations. The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter."

CE Mark Warning

CE1588

This is a class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 4 dBi. Antennas not included in this list or having a gain greater than 4 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.

Canadian Compliance Statement

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1)This device may not cause interference, and

(2)This device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme aux norms CNR exemptes de licence d'Industrie Canada. Le fonctionnement est soumis aux deux conditions suivantes:

(1)cet appareil ne doit pas provoquer d'interférences et

(2)cet appareil doit accepter toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité de l'appareil.

Industry Canada Statement

Complies with the Canadian ICES-003 Class B specifications.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This device complies with RSS 210 of Industry Canada. This Class B device meets all the requirements of the Canadian interference-causing equipment regulations.

Cet appareil numérique de la Classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Korea Warning Statements

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低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

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Safety Information

- When product has power button, the power button is one of the way to shut off the product; when there is no power button, the only way to completely shut off power is to disconnect the product or the power adapter from the power source.

- Don't disassemble the product, or make repairs yourself. You run the risk of electric shock and voiding the limited warranty. If you need service, please contact us.

- Avoid water and wet locations.

This product can be used in the following countries:

AT	BG	BY	CA	CZ	DE	DK	EE
ES	FI	FR	GB	GR	HU	IE	IT
LT	LV	MT	NL	NO	PL	PT	RO
RU	SE	SK	TR	UA			

TP-LINK® TP-LINK TECHNOLOGIES CO., LTD

DECLARATION OF CONFORMITY

For the following equipment:

Product Description: **300Mbps Wireless N Range Extender**

Model No.: **TL-WA830RE**

Trademark: **TP-LINK**

We declare under our own responsibility that the above products satisfy all the technical regulations applicable to the product within the scope of Council Directives:

Directives 1999/5/EC, Directives 2004/108/EC, Directives 2006/95/EC, Directives 1999/519/EC, Directives 2011/65/EU

The above product is in conformity with the following standards or other normative documents

ETSI EN 300 328 V1.8.1

ETSI EN 301 489-1 V1.9.2:2011& ETSI EN 301 489-17 V2.2.1

EN 55022:2010

EN 55024:2010

EN 61000-3-2:2006+A1:2009+A2:2009

EN 61000-3-3:2008

EN60950-1:2006+A11：2009+A1:2010+A12:2011

EN62311:2008

The product carries the CE Mark:

CE1588

Person is responsible for marking this declaration:

Yang Hongliang

Product Manager of International Business

Date of issue: 2015

TP-LINK TECHNOLOGIES CO., LTD.

Building 24 (floors 1, 3, 4, 5), and 28 (floors 1-4) Central Science and Technology Park, Shennan Rd, Nanshan, Shenzhen, China

CONTENTS

Package Contents

The following items should be found in your package:

➢ One TL-WA830RE 300Mbps Wireless N Range Extender

➢ Ethernet Cable

➢ One Power Adapter for TL-WA830RE 300Mbps Wireless N Range Extender

➢ Quick Installation Guide

➢ One Resource CD for TL-WA830RE 300Mbps Wireless N Range Extender, including:

- This User Guide

- Other helpful information

) **Note:**

Make sure that the package contains the above items. If any of the listed items is damaged or missing, please contact with your distributor.

Conventions

The AP, the Range Extender, the Device or TL-WA830RE mentioned in this User guide stands for TL-WA830RE 300Mbps Wireless N Range Extender without any explanations.

Parameters provided in the pictures are just references for setting up the product, which may differ from the actual situation. You can set the parameters according to your demand.

Chapter 1 Introduction

1.1 Product Overview

The TL-WA830RE 300Mbps Wireless N Range Extender is dedicated to Small Office/Home Office (SOHO) wireless network solutions. It will enlarge your existing wireless network and mobility within your wireless network while also allowing you to connect the wireless devices to a wired environment. Increased mobility and the absence of cabling will be beneficial for your network.

With using IEEE 802.11n wireless technology, this device can transmit wireless data at the rate of up to 300Mbps. With multiple protection measures, including wireless LAN 64/128/152-bit WEP encryption, Wi-Fi protected Access (WPA2-PSK, WPA-PSK), the TL-WA830RE 300Mbps Wireless N Range Extender delivers complete data privacy.

It supports an easy, web-based setup for installation and management. Even though you may not be familiar with the Range Extender, you can easily configure it with the help of this Guide. Before installing the Range Extender, please look through this Guide to get the full information of the TL-WA830RE 300Mbps Wireless N Range Extender.

1.2 Main Features

➢ Make use of IEEE 802.11n wireless technology

➢ Provides multiple encryption security Types including: 64/128/152-bit WEP and WPA/WPA2-PSK

➢ Supports Built-in DHCP server

➢ Supports multiple operating modes including: Range Extender, Access Point

➢ Supports Firmware Upgrade

➢ Supports Remote and Web management

1.3 Appearance

1.3.1 The Front Panel

Figure 1-1

The front panel of the TL-WA830RE consists of several LED indicators, which is designed to indicate connections. View from left to right, Table 1-1 describes as follows.

LED Explanation

Name	Status	Indication
⏻ Power	Off	No Power
	On	Power on
✿ System	Off	The device has a system error
	On	The device is initialising
	Flashing	The device is working properly

|	Off	There is no device linked to the corresponding port
🖵 LAN	On	There is a device linked to the corresponding port but no activity
	Flashing	There is an active device linked to the corresponding port
📶 WLAN	Off	The Wireless function is disabled
	Flashing	The Wireless function is enabled
⑴ WPS	On	The Range Extender has connected the Router successfully
	Flashing	The Range Extender is connecting the Router
	Off	The Range Extender has not connected any Router yet

Table 1-1

1.3.2 The Rear Panel
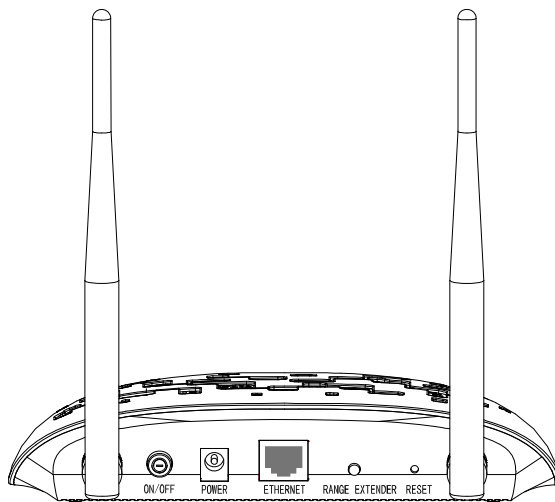
Figure 1-2

Viewed from left to right, the following parts are located on the rear panel of TL-WA830RE.

Wireless antenna: Two high gain antennas are used to transmit and receive wireless data.

ON/OFF: This button is to power on or off the Ranger Extender.

POWER: The power port connects to the power adapter provided with the TL-WA830RE 300Mbps Wireless N Range Extender.

ETHERNET: One 10/100Mbps RJ45 Ethernet port connects to a network device.

RANGE EXTENDER: If your Wireless Router or AP supports WPS or QSS function, you can press the WPS or QSS button and then press the RANGE EXTENDER button to establish a secure connection between the Wireless Router (or AP) and the Range Extender TL-WA830RE.

RESET: This button is used to restore the Range Extender's factory default settings.

There are two ways to reset the Range Extender's factory defaults:

Method One: With the Range Extender powered on, use a pin to press and hold the Reset button (about 8 seconds) until the System LED becomes quick-flash from slow-flash. And then release the button and wait the Range Extender to reboot to its factory default settings.

Method Two: Restore the default settings from "**System Tools** > **Factory Defaults**" of the Range Extender's Web-based management page.

Chapter 2 Hardware Installation

2.1 Before You Begin

Please read this User Guide carefully before installing and using the equipment. The operating distance range of your wireless connection can vary significantly depending on the physical position of the wireless devices. Factors that can weaken signals by getting in the way of your network's radio waves are metal appliances or obstructions, and walls. Typical ranges vary base on the types of materials and background RF (radio frequency) noise in your home or office.

In order to optimize the performance of TL-WA830RE, please follow the instructions below to achieve **an ideal location:**

1) *Half-way Between* - Generally, the ideal location for TL-WA830RE is half-way between the Wireless Router and Wireless Client. If the wireless signal is not satisfactory, you may place TL-WA830RE somewhat nearer to the Wireless Router.
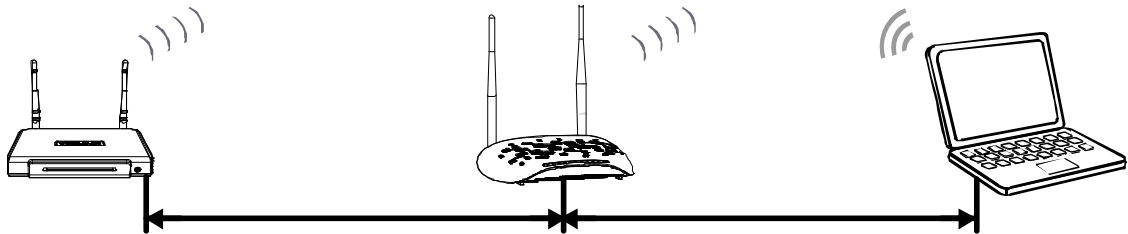
2) *Higher Position* - Place TL-WA830RE on a higher position, like on a desk.

3) *No Obstacles and Spacious* - Clear obstacles in the way between TL-WA830RE and Wireless Router. It's better to locate it in a spacious place, such as near the corridors.

4) *No Interference* - Keep TL-WA830RE far away from wireless interference, which may come from electrical appliances that works in the same frequency band as TL-WA830RE, such as Bluetooth devices, cordless phones, microwave ovens, etc.

5) *At a Certain Angle* - For a better repeating performance, it's recommended to adjust the antennas of TL-WA830RE to a certain angle, preferably 60°.
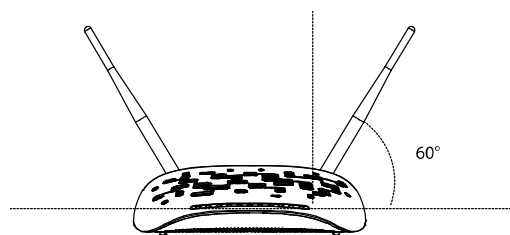
☞ **Note:**

TP-LINK recommends that you connect to the Range Extender *when* your home network connection is poor, or when you want a larger wireless coverage to eliminate "dead zones". As in compliance with the wireless transmission protocol, all the Range Extender devices are set to work in half-duplex instead of full-duplex mode. In other words, the Range Extender has to process one-way communication between your root Wireless Router (or AP) and the terminal clients; so the transmission time will be double-increased, while the speed will be half- decreased.

2.2 Basic Requirements

- Use only the power adapter provided with your Range Extender.
- The electrical outlet shall be installed near the device and shall be easily accessible.
- Place your Range Extender in a well-ventilated place far from direct sunlight, any heater or heating vent.
- Leave at least 2 inches (5cm) space around the device for heat dissipation.
- Turn off your Range Extender and unplug the power adapter in a lighting storm to avoid damage.
- Use Web browser, such as Microsoft Internet Explorer 5.0 or above, Netscape Navigator 6.0 or above.
- Operating temperature of the Range Extender should be 0℃~40℃ (32℉~104℉).
- Operating humidity of the Range Extender should be 10%~90%RH (Non-condensing).
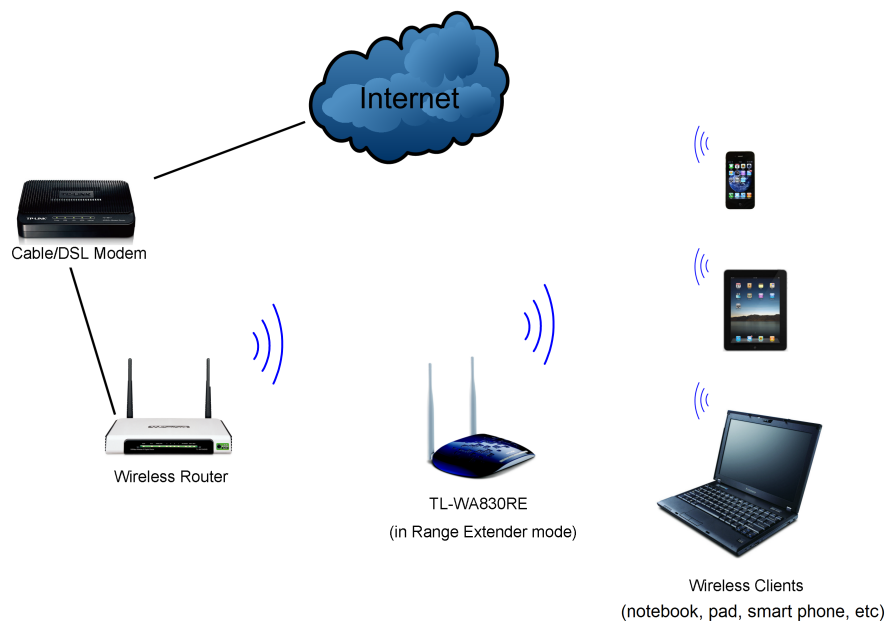
2.3 Connecting the Device

Figure 2-1 Typical connection of TL-WA830RE （in Range Extender mode）

To establish a typical connection of the Range Extender, please take the following steps:

1. Connect the Cable/DSL modem to a Wireless Router with an Ethernet cable.

2. Place your TL-WA830RE **next to** the Wireless Router, and then power on it. Connect the TL-WA830RE to the Wireless Router wirelessly.

3. Connect your Wireless Clients (such as notebook, pad, smart phone, etc.) to TL-WA830RE wirelessly. Or you can connect your PC to the sole LAN port of Range Extender via an Ethernet cable.

4. Log in the web-based management page of TL-WA830RE and complete the configurations. (Please refer to Chapter 3 Quick Installation Guide or Chapter 4 Configure the Device for the configurations, as you need.)

5. Adjust an ideal location for TL-WA830RE, and adjust the direction of the antenna. (Please refer to Section 2.1 Before You Begin for detailed information about ideal location.)

☞ **Note:**

1. Above is the typical wireless connection of TL-WA830RE in Range Extender mode. While, if you want to connect your computer equipped with wireless adapter to a wired network wirelessly. Please refer to Appendix A: Application Example.

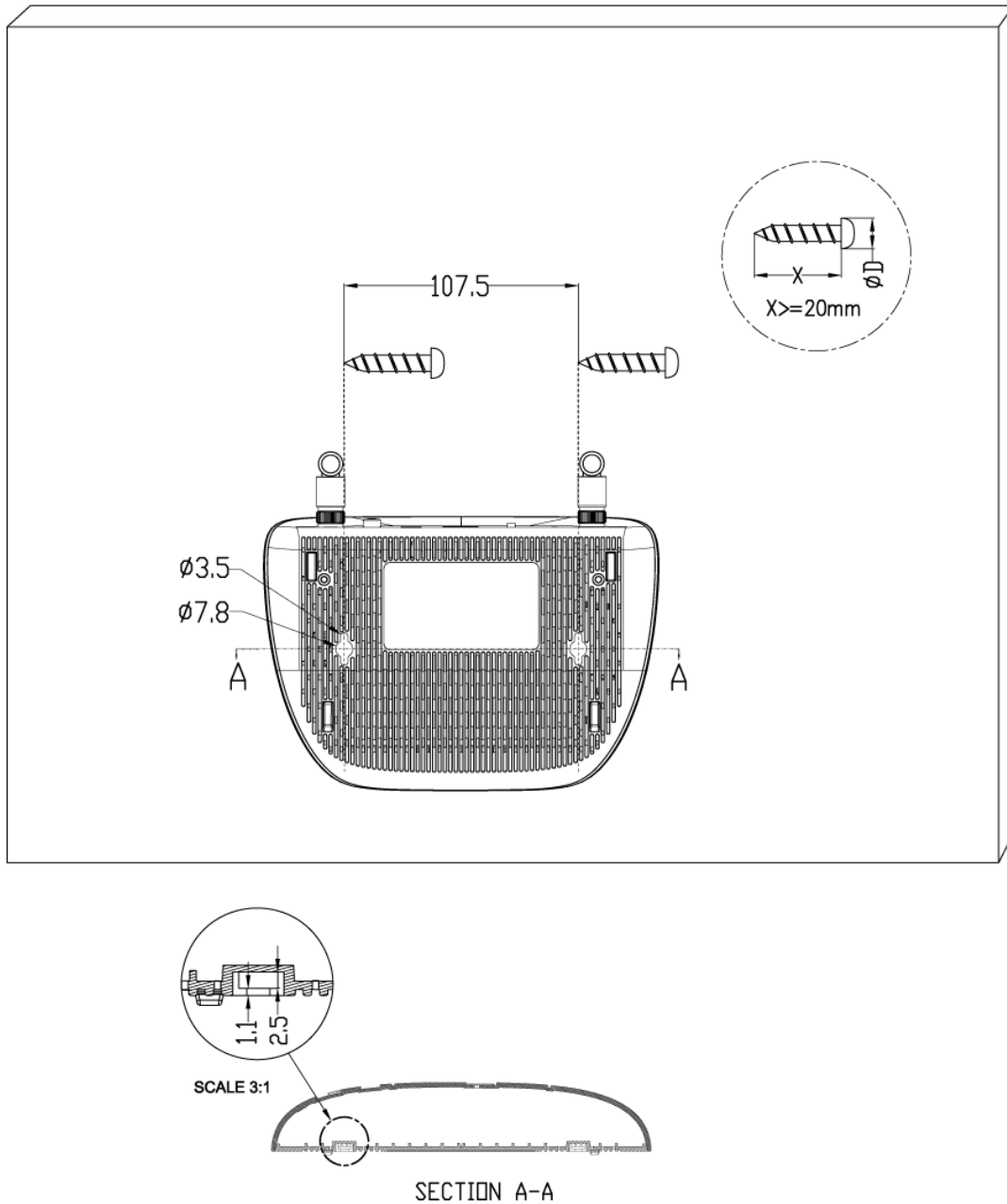2. Generally, the device is horizontally located. TL-WA830RE also qualifies for wall-mount installation.

Figure 2-2 Wall-mount Install

The diameter of the screw, 3.5mm<D<7.8mm, and the distance of two screws is 107.5mm. The screw that project from the wall need around 4.3mm based, and the length of the screw need to be at least 20mm to withstand the weight of the product.

Chapter 3   Quick Installation Guide

This chapter will guide you to configure your PC to communicate with the Range Extender and to configure and manage the TL-WA830RE 300Mbps Wireless N Range Extender easily with a Web-based utility.

With a Web-based utility, it is easy to configure and manage the TL-WA830RE 300Mbps Wireless N Range Extender. The Web-based utility can be used on any Windows, Macintosh or UNIX OS with a Web browser, such as Microsoft Internet Explorer, Mozilla Firefox or Apple Safari.

1. To access the configuration utility, open a web-browser and type in the domain name *http://tplinkrepeater.net* in the address field of the browser.
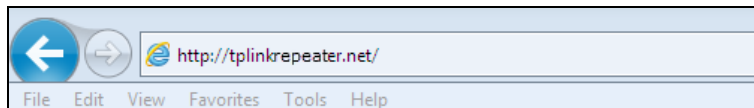
Figure 3-1 Login to the Range Extender

After a moment, a login window will appear as shown in Figure 3-8. Enter **admin** for the User Name and Password (both in lower case letters). Then click **OK** or press Enter.
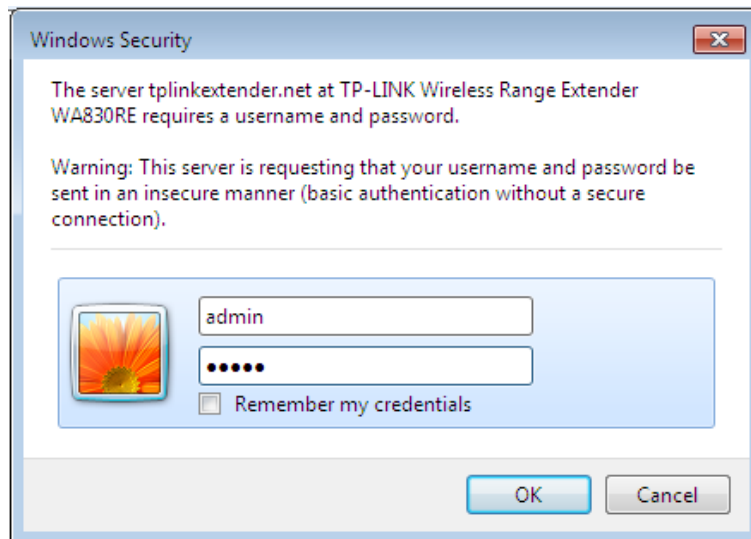
Figure 3-2 Login Windows

☞ **Note:**

If the above screen does not prompt, it means that your web-browser has been set to a proxy. Go to **Tools menu>Internet Options>Connections>LAN Settings**, in the screen that appears, cancel the **Using Proxy** checkbox, and click **OK** to finish it.

2. After successfully logging in, there will pop up the **Quick Setup Start** page. Click **Next** to get the quick setup started.
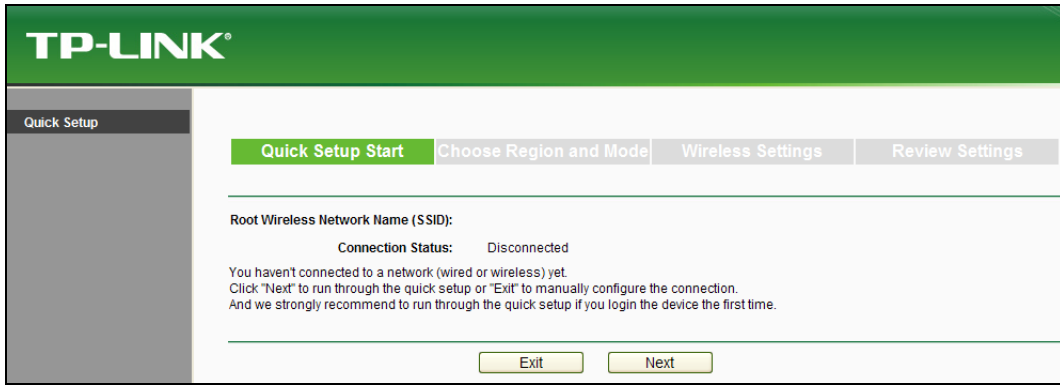
Figure 3-3 Quick Setup Start

3.   And then Figure 3-4 will appear for you to choose operation mode and region. There are two Operation Modes, including Range Extender and Access Point. The available setting options are different in different operation modes, and they are explained as below.
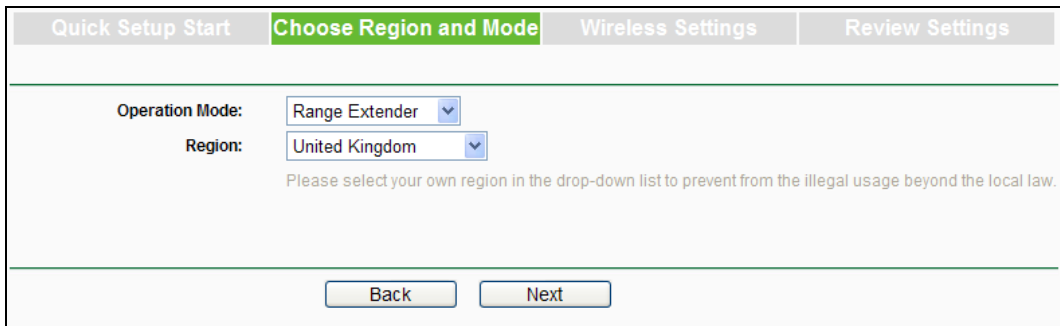

Figure 3-4 Quick Setup – Choose Region and Mode

A.   If choosing **Range Extender**, please take the following steps to finish your quick setup.

First, the device will detect the existing network (in Figure 3-5) and then a list of available wireless network will appear. Check the box before the SSID of your desired network, and then click **Next**. If you could not find your wireless network name (SSID) in the list, you can click **Rescan** to redetect it or tick the checkbox before "Set SSID and MAC Manually" to manually configure the wireless settings.
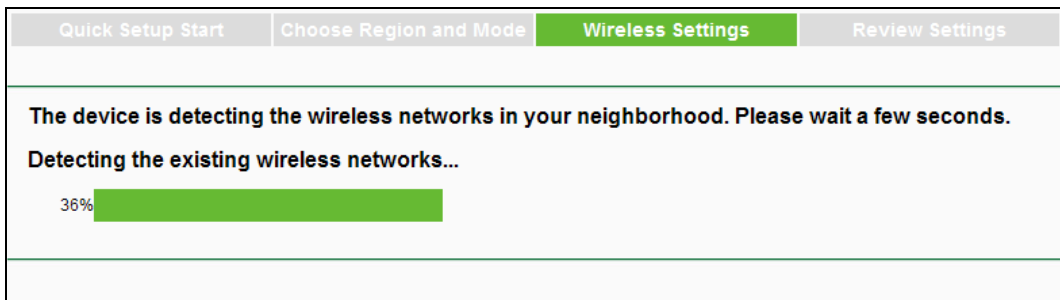

Figure 3-5 Quick Setup – Detect Existing Network

Quick Setup Start	Choose Region and Mode	**Wireless Settings**	Review Settings		

Available Wireless Networks: 11   [Back] [Rescan] [Next]

Choose	SSID	Signal	MAC	Channel	Security
☐	TP-LINK_6FB412		00-0A-EB-70-20-37	6	None
☐	TP-LINK_A18184		EC-17-2F-A1-81-84	6	None
☑	Network1		94-0C-6D-2F-3C-BE	9	WPA-PSK
☐	TP-LINK_81D3CA		B0-48-7A-81-D3-CA	2	None
☐	tplink123		E0-05-C5-15-04-15	11	WPA-PSK
☐	TP-LINK_4234CC		F8-D1-11-42-34-CC	11	WPA-PSK
☐	TP-LINK_18F710		00-23-CD-18-F7-10	9	WPA2-PSK
☐	941test		00-27-19-E9-74-4E	9	WPA2-PSK
☐	TP-LINK_011000		00-32-20-01-10-00	11	WPA-PSK
☐	TP-LINK_E6C6EF		E0-05-C5-74-11-50	6	None
☐	TP-LINK_6A188A		28-10-7B-F3-31-D8	6	None

☐ Set SSID and MAC Manually   [Back] [Rescan] [Next]

Figure 3-6 Quick Setup – Available Wireless Networks

Next, Wireless Settings page will appear as shown in Figure 3-7, where you need to enter the Wireless Password of your selected target network. Then click **Next** to proceed.

Quick Setup Start	Choose Region and Mode	**Wireless Settings**	Review Settings

Extended SSID: Network1   (also called Wireless Network Name)

MAC of Root Device: 94-0C-6D-2F-3C-BE   (also called BSSID)

Wireless Security: Most Secure(WPA-PSK/WPA2-PS ▼)

Wireless Password: 1234567890

(The length of password should be between 8 and 63 characters which are case-sensitive.)

Note: please ensure that your wireless password is the same as your root device when works in range extender mode.

[Back]   [Next]

Figure 3-7 Quick Setup – Wireless Settings

Finally, double-check your wireless setting and network setting; if verified, click **Finish** to reboot the Device and have the previous settings take effect; if anything wrong, click **Back** to return the previous pages and reconfigure it.

Figure 3-8 Quick Setup – Review Settings

☞ **Note:**

It's recommended to click the **Export Settings** button to save these settings as a txt file for your future reference.

B. If choosing **Access Point**, please take the following steps to finish your quick setup.

First, there will pop up the Wireless Settings page, where you need to set the necessary wireless parameters, such as SSID, Wireless Security, and Wireless Password. Then click **Next**.

Figure 3-9 Quick Setup – Wireless Settings

Finally, double-check your wireless setting and network setting; if verified, click **Finish** to reboot the Device and have the previous settings take effect; if anything wrong, click **Back** to return the previous pages and reconfigure it.

Figure 3-10 Quick Setup – Review Settings

☞ **Note:**

1. It's recommended to click the **Export Settings** button to save these settings as a txt file for your future reference.

2. After rebooting, it may take about 2 minutes for successful connection, please wait patiently.

Chapter 4 Configure the Device

This Chapter describes how to configure your Range Extender via the web-based management page. The TL-WA830RE 300Mbps Wireless N Range Extender is easy to configure and manage with the Web-based (Internet Explorer, Netscape® Navigator, Firefox, Safari, Opera or Chrome) management page, which can be launched on any windows, Macintosh or UNIX OS with a web browser.

After a successful login, you can configure and manage the device. There are seven main menus on the leftmost column of the web-based management page: **Status**, **Quick Setup**, **WPS**, **Network**, **Wireless**, **DHCP** and **System Tools**. Submenus will be available after clicking one of the main menus. On the right of the web-based management page are the detailed explanations and instructions for the corresponding page.

4.1 Status

Selecting **Status** will enable you to view the Range Extender's current status and configuration, all of which are read-only.

Figure 4-1 Status

- ➢ **Firmware Version -** This field displays the current firmware version of the Range Extender.

- ➢ **Hardware Version -** This field displays the current hardware version of the Range Extender.

- ➢ **Connection Status to Existing Network** - This part shows you the current information of the root wireless network which the device is connecting to.

  - ● **Root Wireless Network Name (SSID)** - It shows the name of the wireless network which your device is connecting to.
  - ● **Signal** - It shows the root wireless network's signal strength that the device has received.
  - ● **Connection Status** - It shows whether your device has been connected to a wireless network currently. "**Connected**" means the range extender have connected to a wireless network, while if it shows "disconnected", you can click "**connect**" to connect.

- ➢ **Wired -** This field displays the current settings or information for the Network.

  - ● **MAC Address** - The physical address of the system, as seen from the **Network -> LAN** page.
  - ● **IP Address** - The IP address of the wired LAN.
  - ● **Subnet Mask** - The subnet mask associated with IP address.

- ➢ **Wireless -** This field displays basic information or status for wireless function.

  - ● **Operation Mode** - Indicates the mode which the device is working on. "Disable" means the wireless radio has been turned off. You can configure it in the **Wireless -> Wireless Settings** page.
  - ● **Local Wireless Network Name (SSID)** - The Device's wireless network name (also called SSID) which your PC or other device can be connected to.
  - ● **Channel** - The current wireless channel in use.
  - ● **Mode** - The current wireless mode which the Range Extender works on.
  - ● **Channel Width** - The bandwidth of the wireless channel.
  - ● **Wireless Rate** - It shows the current wireless rate between the range extender and your PC or other devices which are connected to the it.

- ➢ **Traffic Statistics -** This field displays the Range Extender's traffic statistics.

  - ● **Sent (Bytes)** - Traffic that counted in bytes has been sent out from wireless.
  - ● **Sent (Packets)** - Traffic that counted in packets has been sent out from wireless.
  - ● **Received (Bytes)** - Traffic that counted in bytes has been received from wireless.
  - ● **Received (Packets)** - Traffic that counted in packets has been received from wireless.

- ➢ **System Up Time -** This filed displays the run time of the Range Extender since it's powered on or reset.

- ➢ Click the **Refresh** button to get the latest status and settings of the device.

) **Note:**

If you select Access Point mode in Figure 3-4, the wireless status in Figure 4-1 will change, similar to the figure below:

Wireless

Operation Mode:	Access Point
Wireless Network Name:	Network1
Channel:	Auto (Current channel 11)
Mode:	11bgn mixed
Channel Width:	Automatic
Wireless Rate:	300Mbps
MAC Address:	00-0A-EB-13-09-19

4.2 Quick Setup

Please refer to Chapter 3 Quick Installation Guide.

4.3 WPS

WPS (**Wi-Fi Protected Setup**) can help you to quickly and securely connect to a network. This section will guide you to add a new wireless device to an existing network quickly by WPS function. The WPS function can be configured on the page (shown as Figure 4-3), only when you have the device working in Access Point mode.

☞ **Note:**

The WPS unction is only available when the Operation Mode is set to **Access Point**; in other words, if you select **Range Extender** as the Operation Mode in Figure 3-4, the WPS function is not available. In that case, the WPS page will appear as Figure 4-2.

WPS (Wi-Fi Protected Setup)

Operation Mode:	Range Extender
WPS Status:	Disabled Enable WPS
Current PIN:	12345670 Restore PIN Gen New PIN
	☐ Disable PIN of this device
Add a new device:	Add Device

Note: The software WPS function cannot be configured when the device works in **Range Extender** mode.
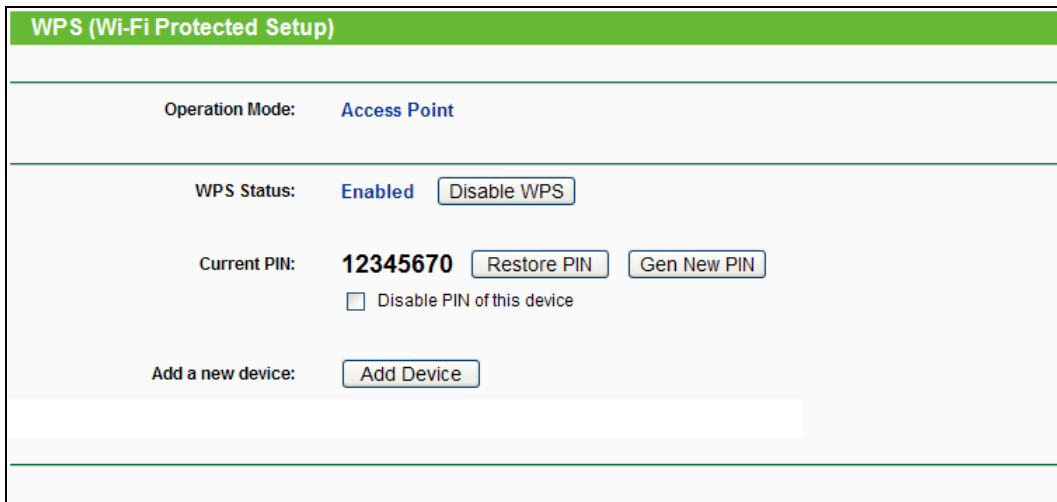
Figure 4-2 WPS – Disabled

Figure 4-3   WPS - Enabled

➢ **Operation Mode -** Displays the current operation mode of the device.

➢ **WPS Status -** To enable or disable the WPS function here.

➢ **Current PIN -** The current value of the device's PIN is displayed here. The default PIN of the device can be found in the label or User Guide.

➢ **Restore PIN -** Restore the PIN of the device to its default.

➢ **Gen New PIN -** Click this button, and then you can get a new random value for the device's PIN. You can ensure the network security by generating a new PIN.

➢ **Disable PIN of this device** - WPS external registrar of entering this device's PIN can be disabled or enabled manually. If this device receives multiple failed attempts to authenticate an external Registrar, this function will be disabled automatically.

➢ **Add device -** You can add a new device to the existing network manually by clicking this button.

To add a new device:

If the wireless adapter supports WPS, you can establish a wireless connection between wireless adapter and device using either PBC (Push Button Configuration) method or PIN method.

☞ **Note:**

To build a successful connection by WPS, you should also do the corresponding configuration of the network adapter for WPS function meanwhile. And as for the configuration of the network adapter, here takes the Wireless Adapter of our company for example.

Method One: Push the button of the Range Extender and Wireless Adapter

Step 1:   Keep the "WPS Status" as **Enabled** and click the **Add Device** button in Figure 4-3, then the following screen will appear.
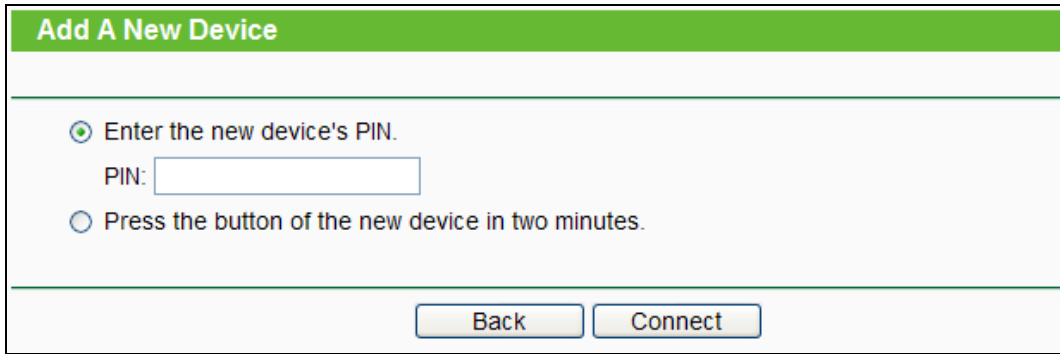
Figure 4-4　Add A New Device

Step 2:　Choose "**Press the button of the new device in two minutes**" and click **Connect**.

Step 3:　For the configuration of the wireless adapter, please choose "**Push the button on my access point or wireless router.**" in the configuration utility of the WPS (as shown below), and click **Connect**.

Figure 4-5 The WPS Configuration Screen of Wireless Adapter

Step 4:　Wait until the next screen appears. Click **OK** to complete the WPS configuration.

Figure 4-6 The WPS Configuration Screen of Wireless Adapter

Method Two: Enter the PIN into my Range Extender

Step 1: Configure the wireless adapter. Please choose "**Enter the PIN of this device into my access point or wireless adapter**" in the configuration utility of the WPS (as shown below), and click **Connect**.
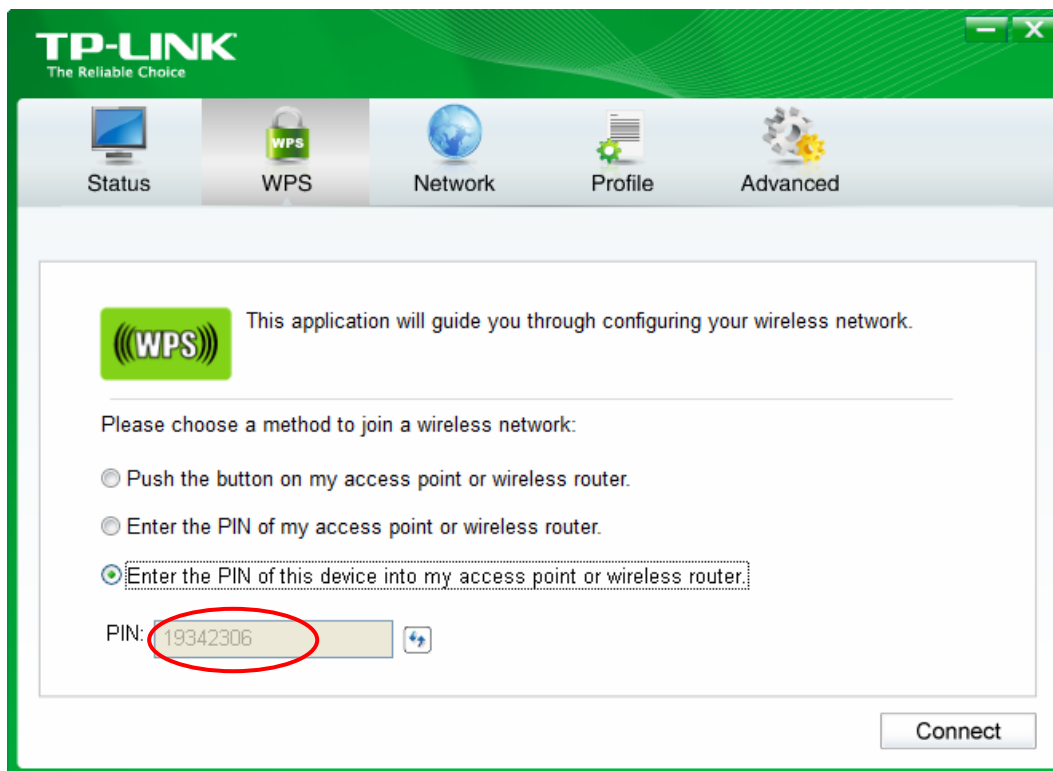
The WPS Configuration Screen of wireless adapter

☞ **Note:**

In this example, the default PIN code of this adapter is 19342306 as the above figure shows.

Step 2: Configure the Router. Keep the default "WPS Status" as **Enabled** and click the **Add device** button in Figure 4-3, then the following screen will appear.

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Step 3: Choose **Enter the new device's PIN** and enter the PIN code of the wireless adapter in the field behind **PIN** in the previous figure. Then click **Connect**.

Method Three: Enter the PIN from my Range Extender

Step 1: Get the Current PIN code of the Range Extender in Figure 4-3 (each Range Extender has its unique PIN code. Here takes the PIN code 12345670 of this Range Extender for example).

Step 2: For the configuration of the wireless adapter, please choose "**Enter the PIN of my access point or wireless router**" in the configuration utility of the WPS (as shown below), and enter the PIN code of the Range Extender into the **PIN** field. Then click **Connect**.

Figure 4-7 The WPS Configuration Screen of Wireless Adapter

) **Note:**

The default PIN code of the Range Extender can be found in its label or the WPS configuration screen as Figure 4-3.

You will see the following screen when the new device has successfully connected to the network.
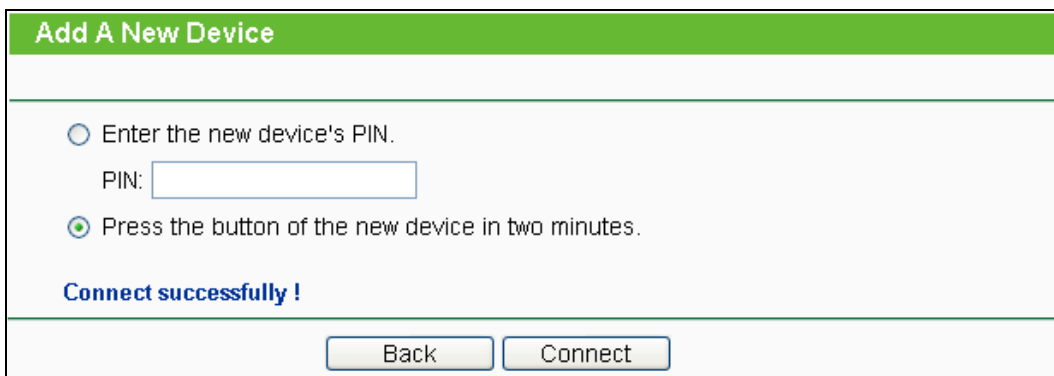

Figure 4-8

) **Note:**

1. The WPS LED on the Range Extender will light green for five minutes if the device has been successfully added to the network.

2. The WPS function cannot be configured if the Wireless function of the Range Extender is disabled. Please make sure the Wireless function is enabled before configuring the WPS.

4.4　Network

The **Network** option allows you to customize your local network manually by changing the default settings of the Range Extender.

Selecting **Network** will enable you to configure the IP parameters of Network on this page.

Figure 4-9 Network

➢ **MAC Address** - The physical address of the LAN ports, as seen from the LAN. The value cannot be changed.

➢ **Type** - Several IP types are supported, including: (1) Static IP; (2) Smart IP (DHCP), and they are explained below.

  ● **Static IP** - In this type, you can configure IP Address/Gateway manually.

  ● **Smart IP (DHCP)** - In this type, if your Range Extender have connected to a router, your client will dynamically get an IP Address/Gateway from the Router, otherwise the client will get a IP Address/Gateway in the same network as you set below. And this type is recommended.

➢ **IP Address -** Enter the IP address of your Range Extender in dotted-decimal notation (factory default setting is 192.168.0.254).

➢ **Subnet Mask -** An address code that determines the size of the network. Normally use 255.255.255.0 as the subnet mask.

➢ **Gateway -** The gateway should be in the same subnet as your IP address.

) **Note:**

1. If you are not familiar with the setting items in this page, it's strongly recommended to keep the provided default values, otherwise may result in lower wireless network performance or even can't work.

2. If you choose Static IP, the domain name log in function won't work, and you have to use the IP you set to log in the Range Extender's web based utility.

4.5　Wireless

The **Wireless** option, improving functionality and performance for wireless network, can help you make the Range Extender an ideal solution for your wireless network. Here you can create a wireless local area network just through a few settings. Wireless Settings is used for the configuration of some basic parameters of the Range Extender. Wireless Security provides three different security types to secure your data and thus provide greater security for your wireless network. MAC filtering allows you to control the access of wireless stations to the Range Extender.

Wireless Advanced allows you to configure some advanced parameters for the Range Extender. Throughput Monitor helps to watch wireless throughput information Wireless statistics enables you to get detailed information about the current connected wireless stations.

There are six submenus under the Wireless menu (shown in Figure 4-10): **Wireless Settings**, **Wireless Security**, **Wireless MAC Filtering**, **Wireless Advanced**, **Wireless Statistics** and **Throughput Monitor**. Click any of them, and you will be able to configure the corresponding function. The detailed explanations for each submenu are provided below.
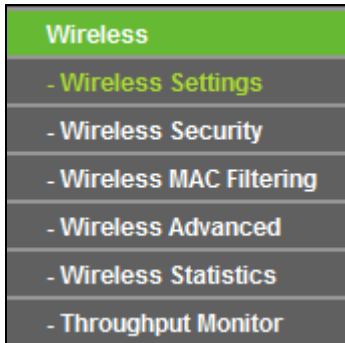
Figure 4-10 Wireless menu

4.5.1 Wireless Settings

Selecting **Wireless** > **Wireless Settings** will enable you to configure the basic settings for your wireless network on the screen below (Figure 4-12).This page allows you to configure the wireless mode for your device. Several operation modes are supported here, including **Access Point**, **Range Extender mode 2**, and **Range Extender mode 1**. The available setting options for each operation mode are different from those of the other.

1) Access Point: This mode allows wireless stations to access this device.

Figure 4-11 Wireless Settings in Access Point mode

➢ **Operation Mode -** Three Operation Modes are supported, including: Access Point, Range Extender mode 2, Range Extender mode 1.

> **SSID** (Set Service Identifier) **-** Identifies your wireless network name. Create a name up to 32 characters and make sure all wireless points in the wireless network with the same SSID. The default SSID is TP-LINK_Extender_XXXXXX (XXXXXX indicates the last unique six characters of each device's MAC address). This value is case-sensitive. For example, *TEST* is NOT the same as *test*.

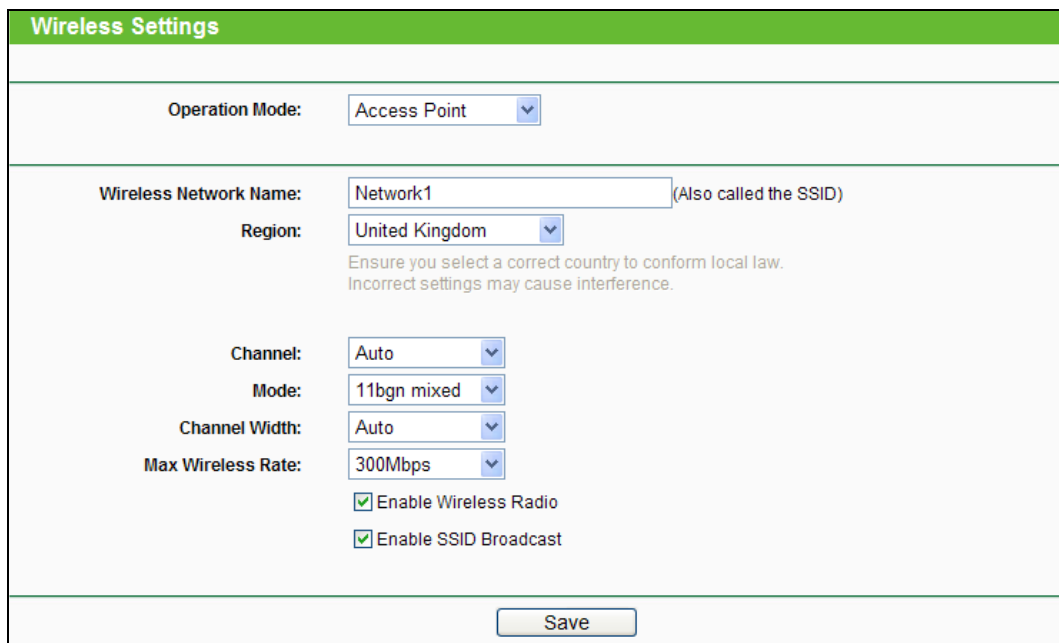> **Region -** Specifies the region where the wireless function of the Range Extender can be used. Select your region from the drop-down list. If your country or region is not listed, please contact your local government agency for assistance.

) **Note:**

The default region is United Kingdom. When you select your local region from the pull-down list, the dialog shown in Figure appears below. Click **OK**.
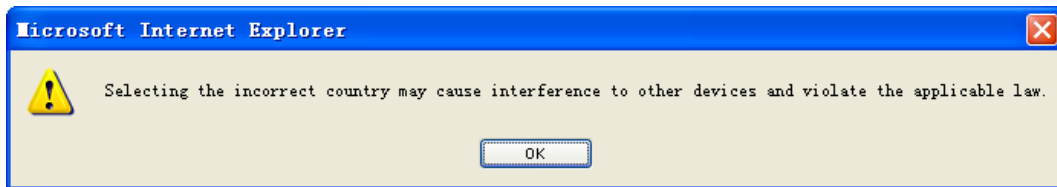
> **Channel -** Determines the operating frequency to be used. It is not necessary to change the wireless channel unless you notice interference problems with another nearby access point.

> **Mode -** Select the desired wireless mode. The options are:

- **11b only -** Only 802.11b wireless stations can connect to the device.

- **11g only -** Only 802.11g wireless stations can connect to the device.

- **11n only -** Only 802.11n wireless stations can connect to the device.

- **11bg mixed -** Both 802.11b and 802.11g wireless stations can connect to the device.

- **11bgn mixed -** All 802.11b, 802.11g and 802.11n wireless stations can connect to the device.

> **Channel Width -** Determines the channel width to be used. It is unnecessary to change the default value unless required.

> **Max Wireless Rate** - You can limit the maximum wireless rate of the device through this field.

> **Enable Wireless Radio -** Select or deselect this check box to allow or deny wireless stations to access the device.

> **Enable SSID Broadcast -** Select or deselect this check box to allow or deny the device to broadcast its name (SSID) on the air. If it's allowed, when wireless clients survey the local area for wireless networks to associate with, they will detect the SSID broadcast by the device.

) **Note:**

To apply any settings you have altered on the page, please click the **Save** button, and then you will be reminded to reboot the device.
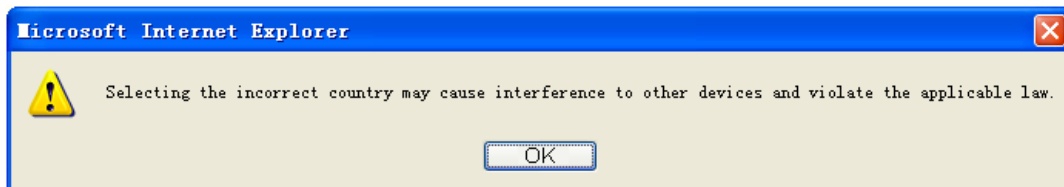
2) **Range Extender mode 2:** In this mode, the Range Extender with WDS enabled will relay data to an associated root Range Extender. Range Extender function is enabled meanwhile. The wireless repeater relays signal between its stations and the root AP for greater wireless range. Please input the MAC address of root AP in the field **"MAC Address of Root AP"**.

Figure 4-12 Wireless Settings in Range Extender mode 2

➢ **Operation Mode -** Three Operation Modes are supported, including: Access Point, Range Extender mode 2 and Range Extender mode 1.

➢ **Survey** - Click this button, you can search the AP which runs in the current channel.

➢ **Wireless Name of Remote AP** - The SSID of the AP your device is going to connect to as a client. You can also use the search function to select the SSID to join.

➢ **MAC Address of Remote AP** - The BSSID of the AP your device is going to connect to as a client. You can also use the search function to select the BSSID to join.

➢ **Region** - Select your region from the drop-down list. This field specifies the region where the wireless function of this device can be used. It may be illegal to use the wireless function of this device in a region while you chose a different region in the drop-down list. If your country or region is not listed, please contact your local government agency for assistance.

) **Note:**

The default region is United Kingdom. When you select your local region from the pull-down list, the dialog shown in Figure appears below. Click **OK**.
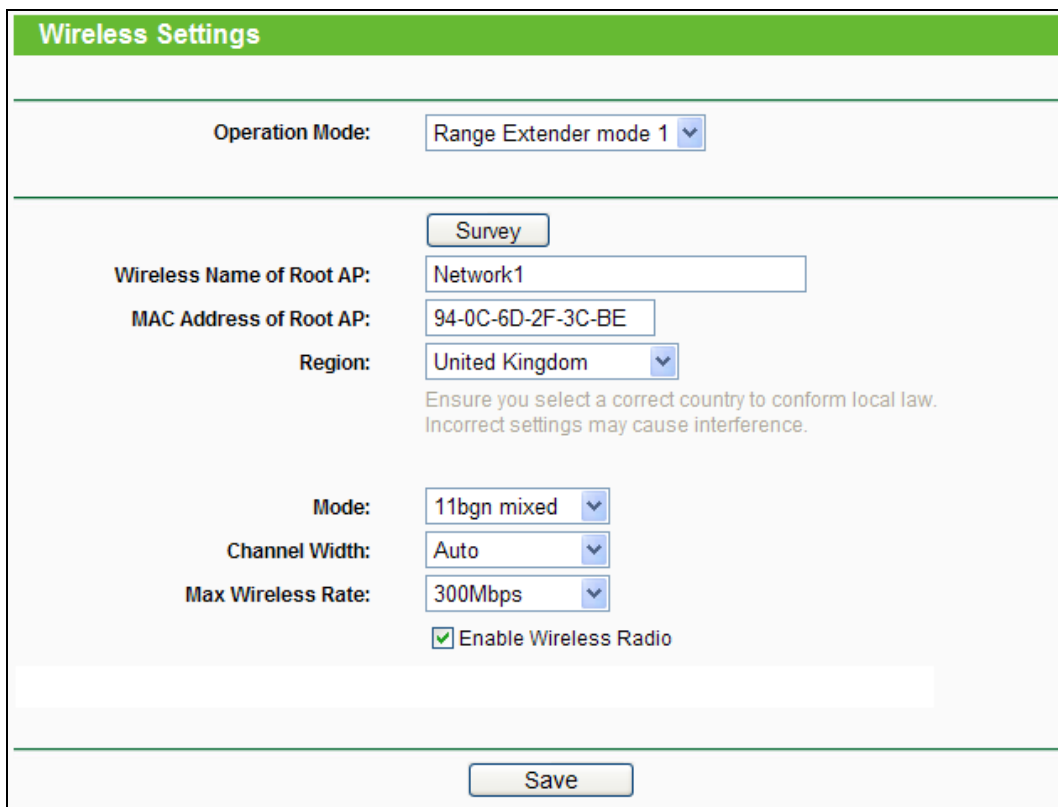

Note Dialog

) **Note:**

Restricted by local law regulations, version for North America does not have region selection option.

- **Mode** - If all of the wireless devices connected with this device can connect in the same transmission mode (eg. 802.11b), you can choose "Only" mode (eg. 11b only). If you have some devices that use a different transmission mode, choose the appropriate "Mixed" mode.

- **Channel Width** - The bandwidth of the wireless channel.

- **Max Wireless Rate** - You can limit the maximum wireless rate of the device through this field.

- **Enable Wireless Radio -** Select or deselect this check box to allow or deny wireless stations to access the device.

☞ **Note:**

To apply any settings you have altered on the page, please click the **Save** button, and then you will be reminded to reboot the device.

3) **Range Extender mode 1:** In this mode, the Range Extender with WDS disabled will relay data to an associated root AP. AP function is enabled meanwhile. The wireless repeater relays signal between its stations and the root AP for greater wireless range. Please input the MAC address of root AP in the field **"MAC Address of Root AP"**.

Figure 4-13 Wireless Settings in Range Extender mode 1

- **Operation Mode -** Three Operation Modes are supported, including: Access Point, Range Extender mode 2 and Range Extender mode 1.

- **Survey** - Click this button, you can search the AP which runs in the current channel.

- **Wireless Name of Remote AP** - The SSID of the AP your device is going to connect to as a client. You can also use the search function to select the SSID to join.

- **MAC Address of Remote AP** - The BSSID of the AP your device is going to connect to as a client. You can also use the search function to select the BSSID to join.

➢ **Region** - Select your region from the drop-down list. This field specifies the region where the wireless function of this device can be used. It may be illegal to use the wireless function of this device in a region while you chose a different region in the drop-down list. If your country or region is not listed, please contact your local government agency for assistance.

 ☞ **Note:**

The default region is United Kingdom. When you select your local region from the pull-down list, the dialog shown in Figure appears below. Click **OK**.

Note Dialog

 ☞ **Note:**

Restricted by local law regulations, version for North America does not have region selection option.

➢ **Mode** - If all of the wireless devices connected with this device can connect in the same transmission mode (eg. 802.11b), you can choose "Only" mode (eg. 11b only). If you have some devices that use a different transmission mode, choose the appropriate "Mixed" mode.

➢ **Channel Width** - The bandwidth of the wireless channel.

➢ **Max Wireless Rate** - You can limit the maximum wireless rate of the device through this field.

➢ **Enable Wireless Radio -** Select or deselect this check box to allow or deny wireless stations to access the device.

To apply any settings you have altered on the page, please click the **Save** button, and then you will be reminded to reboot the device.

4.5.2 Wireless Security

Selecting **Wireless** > **Wireless Security** will enable you to configure wireless security for your wireless network to protect your data from intruders. The Range Extender provides three security types: WEP, WPA/WPA2-Enterprise and WPA/WPA2-Personal. Wireless security can be set on the following screens. The security options are different for different operation mode.

1) Access Point

Figure 4-14 Wireless Security - Access Point

➢ **Operation Mode -** Shows the current operation mode.

➢ **Disable Security -** Check this box radio button to disable wireless security. If disabled, the wireless stations will be able to connect this device without encryption. It is strongly recommended that you choose one of the security types to enable security.

➢ **WPA/WPA2-Personal -** Select WPA based on pre-shared key.

• **Version -** You can select one of following versions.

1) **Automatic** - Select **WPA-PSK** or **WPA2-PSK** automatically based on the wireless station's capability and request.

2) **WPA-PSK -** Pre-shared key of WPA.

3) **WPA2-PSK -** Pre-shared key of WPA2.

• **Encryption** - When you select **WPA-PSK** or **WPA2-PSK** for **Authentication Type**, you can select either **Automatic**, **TKIP** or **AES** as **Encryption**.

• **Wireless Password** - Enter a passphrase here.

• **Group Key Update Period** - Specify the group key update interval in seconds. The value can be either 0 or at least 30. Enter 0 to disable the update.

➢ **WPA/WPA2-Enterprise -** Select WPA/WPA2 based on Radius Server.

- **Version -** You can select one of following versions.

    1) **Automatic -** Select **WPA** or **WPA2** automatically based on the wireless station's capability and request.

    2) **WPA -** Wi-Fi Protected Access.

    3) **WPA2 -** WPA version 2.

- **Encryption** - You can select either **Automatic**, **TKIP** or **AES**.

- **Radius Server IP** - Enter the IP address of the Radius Server.

- **Radius Port** - Enter the port used by radius service.

- **Radius Password** - Enter the password for the Radius Server.

- **Group Key Update Period** - Specify the group key update interval in seconds. The value can be either 0 or at least 30. Enter 0 to disable the update.

➢ **WEP -** Select 802.11 WEP security.

- **Type** - You can select one of following types.

    1) **Automatic** - Select **Shared Key** or **Open System** authentication type automatically based on the wireless station's capability and request.

    2) **Shared Key** - Select 802.11 **Shared Key** authentication type.

    3) **Open System** - Select 802.11 **Open System** authentication.

- **WEP Key Format** - You can select **ASCII** or **Hexadecimal** format. ASCII format stands for any combination of keyboard characters in the specified length. Hexadecimal format stands for any combination of hexadecimal digits (0-9, a-f, A-F) in the specified length.

- **WEP Key** - Select which of the four keys will be used and enter the matching WEP key information for your network in the selected key radio button. These values must be identical on all wireless stations in your network.

- **Key Type** - You can select the WEP key length (**64-bit**, or **128-bit**, or **152-bit**.) for encryption. "Disabled" means this WEP key entry is invalid.

    1) For **64-bit** encryption **-** You can enter 10 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 5 ASCII characters.

    2) For **128-bit** encryption **-** You can enter 26 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 13 ASCII characters.

    3) For **152-bit** encryption **-** You can enter 32 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 16 ASCII characters.

☞ **Note:**

If you do not set the key, the wireless security function is still disabled even if you have selected Shared Key as Authentication Type.

Be sure to click the **Save** button to save your settings on this page.

2) Range Extender mode 2

Figure 4-15 Wireless Security –Range Extender mode 2

➢ **Operation Mode -** Shows the current operation mode.

➢ **Disable Security -** Check this box radio button to disable wireless security. If disabled, the wireless stations will be able to connect this device without encryption. It is strongly recommended that you choose one of the security types to enable security.

➢ **WPA/ WPA2-Personal -** Select WPA based on pre-shared key.

• **Version -** You can select one of following versions.

1) **Automatic** - Select **WPA-PSK** or **WPA2-PSK** automatically based on the wireless station's capability and request.

2) **WPA-PSK -** Pre-shared key of WPA.

3) **WPA2-PSK -** Pre-shared key of WPA2.

• **Encryption** - When you select **WPA-PSK** or **WPA2-PSK** for **Authentication Type**, you can select either **Automatic**, **TKIP** or **AES** as **Encryption**.

• **Wireless Password** - Enter a passphrase here.

• **Group Key Update Period** - Specify the group key update interval in seconds. The value can be either 0 or at least 30. Enter 0 to disable the update.

➢ **WEP -** Select 802.11 WEP security.

• **Type** - You can select one of following types.

1) **Automatic** - Select **Shared Key** or **Open System** authentication type automatically based on the wireless station's capability and request.

2) **Shared Key** - Select 802.11 **Shared Key** authentication type.

3) **Open System** - Select 802.11 **Open System** authentication.

- **WEP Key Format** - You can select **ASCII** or **Hexadecimal** format. ASCII format stands for any combination of keyboard characters in the specified length. Hexadecimal format stands for any combination of hexadecimal digits (0-9, a-f, A-F) in the specified length.

- **WEP Key** - Select which of the four keys will be used and enter the matching WEP key information for your network in the selected key radio button. These values must be identical on all wireless stations in your network.

- **Key Type** - You can select the WEP key length (**64-bit**, or **128-bit**, or **152-bit**.) for encryption. "Disabled" means this WEP key entry is invalid.

  1) For **64-bit** encryption **-** You can enter 10 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 5 ASCII characters.

  2) For **128-bit** encryption **-** You can enter 26 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 13 ASCII characters.

  3) For **152-bit** encryption **-** You can enter 32 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 16 ASCII characters.

☞ **Note:**

If you do not set the key, the wireless security function is still disabled even if you have selected Shared Key as Authentication Type.

Be sure to click the **Save** button to save your settings on this page.

3) Range Extender mode 1

Figure 4-16 Wireless Security – Range Extender mode 1

➢ **Operation Mode -** Shows the current operation mode.

➢ **Disable Security -** Check this box radio button to disable wireless security. If disabled, the wireless stations will be able to connect this device without encryption. It is strongly recommended that you choose one of the security types to enable security.

➢ **WPA/ WPA2-Personal -** Select WPA based on pre-shared key.

  • **Version -** You can select one of following versions.

    1) **Automatic** - Select **WPA-PSK** or **WPA2-PSK** automatically based on the wireless station's capability and request.

    2) **WPA-PSK -** Pre-shared key of WPA.

    3) **WPA2-PSK -** Pre-shared key of WPA2.

  • **Encryption** - When you select **WPA-PSK** or **WPA2-PSK** for **Authentication Type**, you can select either **Automatic**, **TKIP** or **AES** as **Encryption**.

  • **Wireless Password** - Enter a passphrase here.

  • **Group Key Update Period** - Specify the group key update interval in seconds. The value can be either 0 or at least 30. Enter 0 to disable the update.

➢ **WEP -** Select 802.11 WEP security.

  • **Type** - You can select one of following types.

1) **Automatic** - Select **Shared Key** or **Open System** authentication type automatically based on the wireless station's capability and request.

2) **Shared Key** - Select 802.11 **Shared Key** authentication type.

3) **Open System** - Select 802.11 **Open System** authentication.

- **WEP Key Format** - You can select **ASCII** or **Hexadecimal** format. ASCII format stands for any combination of keyboard characters in the specified length. Hexadecimal format stands for any combination of hexadecimal digits (0-9, a-f, A-F) in the specified length.

- **WEP Key** - Select which of the four keys will be used and enter the matching WEP key information for your network in the selected key radio button. These values must be identical on all wireless stations in your network.

- **Key Type** - You can select the WEP key length (**64-bit**, or **128-bit**, or **152-bit**.) for encryption. "Disabled" means this WEP key entry is invalid.

    1) For **64-bit** encryption **-** You can enter 10 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 5 ASCII characters.

    2) For **128-bit** encryption **-** You can enter 26 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 13 ASCII characters.

    3) For **152-bit** encryption **-** You can enter 32 hexadecimal digits (any combination of 0-9, a-f, A-F, zero key is not permitted) or 16 ASCII characters.

☞ **Note:**

If you do not set the key, the wireless security function is still disabled even if you have selected Shared Key as Authentication Type.

Be sure to click the **Save** button to save your settings on this page.

4.5.3 Wireless MAC Filtering

Selecting **Wireless** > **Wireless MAC Filtering** will allow you to set up some filtering rules to control wireless stations accessing the device, which depend on the station's MAC address on the following screen as shown Figure 4-17. As the configuration is the same in each operation mode, here we just take that in Range Extender mode 1 for example.

Figure 4-17 Wireless MAC address Filtering

The Wireless MAC Address Filtering feature allows you to control wireless stations accessing the device, which depend on the station's MAC addresses.

➢ **Operation Mode -** Shows the current operation mode.

➢ **Wireless MAC Filtering -** Click the **Enable** button to trigger the Wireless MAC Address Filtering function. The default setting is disabled.

To Add a Wireless MAC Address filtering entry, click the **Add New…** button. The "Add or Modify Wireless MAC Address Filtering entry" page will appear, shown in Figure 4-18.

Figure 4-18 Add or Modify Wireless MAC Address Filtering entry

➢ **MAC Address -** Enter the wireless station's MAC address that you want to control.

➢ **Description -** Give a simple description of the wireless station.

➢ **Status -** Select a status for this entry, either **Enabled** or **Disabled**.

To set up an entry, follow these instructions:

First, you must decide whether the unspecified wireless stations can access the device or not. If you desire that the unspecified wireless stations can access the device, please select the radio button **Allow the stations not specified by any enabled entries in the list to access**, otherwise, select the radio button **Deny the stations not specified by any enabled entries in the list to access**.

To add a MAC Address Filtering entry, follow these instructions:

1. Enter the appropriate MAC Address into the **MAC Address** field. The format of the MAC Address is XX-XX-XX-XX-XX-XX (X is any hexadecimal digit). For example: 00-0A-EB-B0-00-0B.

2. Enter a simple description of the wireless station in the **Description** field. For example: Wireless station A.

3. Select **Enabled** or **Disabled** for this entry on the **Status** pull-down list.

4. Click the **Save** button to save this entry.

To add additional entries, repeat steps 1-4.

To modify or delete an existing entry:

1. Click the **Modify** in the entry you want to modify. If you want to delete the entry, click the **Delete**.

2. Modify the information.

3.   Click the **Save** button.

Click the **Enable All** button to make all entries enabled

Click the **Disable All** button to make all entries disabled.

Click the **Delete All** button to delete all entries

Click the **Next** button to go to the next page and click the **Previous** button to return to the previous page.

For example: If you desire that the wireless station A with MAC address 00-0A-EB-00- 07-BE is able to access the device, while all other wireless stations cannot access the device, you should configure the **Wireless MAC Address Filtering** list by following these steps:

1.   Click the **Enable** button to enable this function.

2.   Select the radio button: **Deny the stations not specified by any enabled entries in the list to access** for **Filtering Rules.**

3.   Delete all or disable all entries if there are any entries already.

4.   Click the **Add New...** button and enter the MAC address 00-0A-EB-00-07-BE in the **MAC Address** field, enter Wireless Station A in the **Description** field and select **Enabled** in the **Status** pull-down list. Click the **Save** button.

The filtering rules that configured should be similar to the following list:

ID	MAC Address	Status	Description	Modify
1	00-0A-EB-00-07-BE	Enabled	wireless station A	**Modify** Delete

☞ **Note:**

If you enable the function and select the "**Deny the stations not specified by any enabled entries in the list to access**" for **Filtering Rules**, and there are not any enabled entries in the list, thus, no wireless stations can access the device.

4.5.4 Wireless Advanced

Selecting **Wireless** > **Wireless Advanced** will allow you to do some advanced settings for the device in the following screen shown in Figure 4-19. As the configuration for each operation mode is almost the same, we take that in Range Extender mode 1 for example here.

Figure 4-19 Wireless Advanced

➢ **Operation Mode -** Shows the current Operation Mode.

➢ **Transmit Power -** Specifies the transmit power of the device. You can select **High**, **Middle** or **Low** which you would like. **High** is the default setting and is recommended.

➢ **Beacon Interval -** Specifies a value between 40-1000 milliseconds. The beacons are the packets sent by the device to synchronize a wireless network. Beacon Interval value determines the time interval of the beacons. The default value is 100.

➢ **RTS Threshold -** Specifies the RTS (Request to Send) Threshold. If the packet is larger than the specified RTS Threshold size, the device will send RTS frames to a particular receiving station and negotiate the sending of a data frame. The default value is 2346.

➢ **Fragmentation Threshold -** This value is the maximum size determining whether packets will be fragmented. Setting the Fragmentation Threshold too low may result in poor network performance since excessive packets. 2346 is the default setting and is recommended.

➢ **DTIM Interval -** Determines the interval of the Delivery Traffic Indication Message (DTIM). You can specify the value between 1-255 Beacon Intervals. The default value is 1, which indicates the DTIM Interval is the same as Beacon Interval.

➢ **Enable WMM -** WMM function can guarantee the packets with high- priority messages being transmitted preferentially. It is strongly recommended enabled.

➢ **Enable Short GI -** This function is recommended for it will increase the data capacity by reducing the guard interval time.

➢ **Enable AP Isolation -** Isolates all connected wireless stations so that wireless stations cannot access each other through WLAN.

4.5.5 Wireless Statistics

Selecting **Wireless** > **Wireless Statistics** will allow you to see the wireless transmission information in the following screen shown in Figure 4-20.

Figure 4-20 Statistics of the device attached wireless stations

➢ **Operation Mode -** Shows the current operation mode

➢ **MAC Address -** Shows the connected wireless station's MAC address

➢ **Current Status -** The connected wireless station's running status, one of STA-AUTH / STA-ASSOC / STA-JOINED / WPA / WPA-PSK / WPA2 / WPA2-PSK / AP-UP / AP-DOWN / Disconnected

➢ **Received Packets -** packets received by the station

➢ **Sent Packets -** packets sent by the station

You cannot change any of the values on this page. To update this page and to show the current connected wireless stations, click the **Refresh** button.

If the numbers of connected wireless stations go beyond one page, click the **Next** button to go to the next page and click the **Previous** button to return the previous page.

☞ **Note:**

This page will be refreshed automatically every 5 seconds.

4.5.6 Throughput Monitor

Selecting **Wireless** > **Throughput Monitor** will helps to watch wireless throughput information in the following screen shown in Figure 4-21.
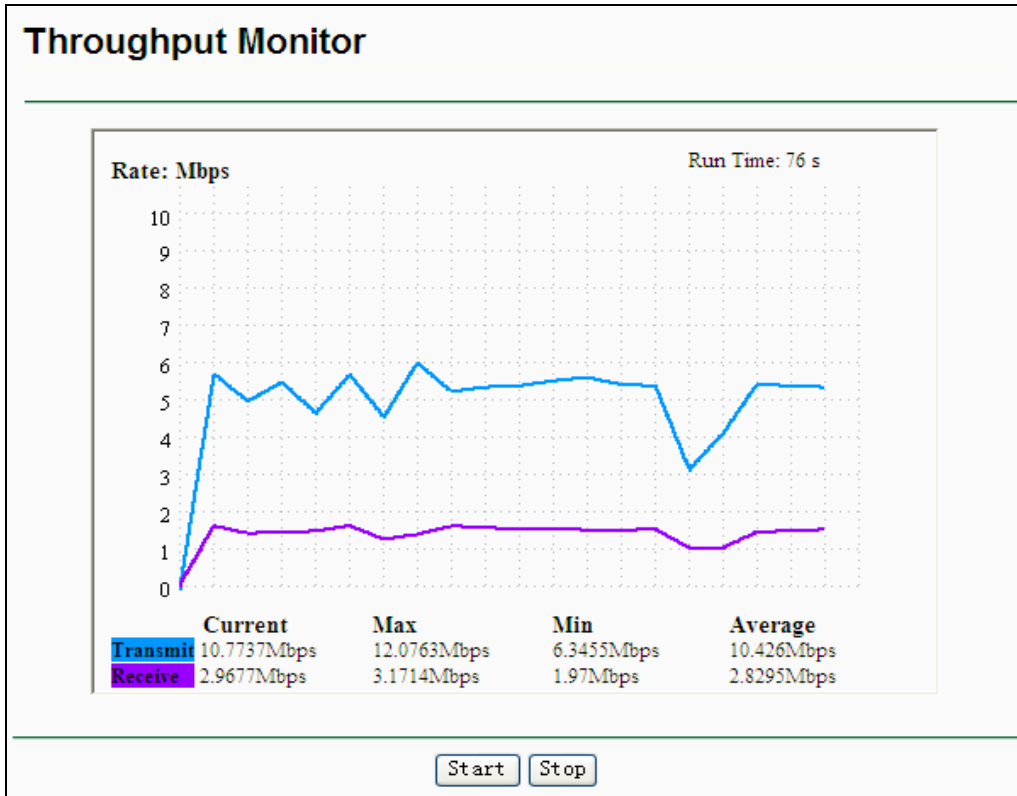
Figure 4-21 Throughput Monitor

➢ **Rate -** The Throughput unit.

➢ **Run Time -** How long this function is running.

➢ **Transmit -** Wireless transmit rate information.

➢ **Receive -** Wireless receive rate information.

Click the **Start** button to start wireless throughput monitor.

Click the **Stop** button to stop wireless throughput monitor.

4.6 DHCP

DHCP stands for Dynamic Host Configuration Protocol. The DHCP Server will automatically assign dynamic IP addresses to the computers on the network. This protocol simplifies network management and allows new wireless devices to receive IP addresses automatically without the need to manually assign new IP addresses.

There are three submenus under the DHCP menu (shown as Figure 4-22): **DHCP Settings**, **DHCP Client List** and **Address Reservation**. Clicking any of them will enable you to configure the corresponding function. The detailed explanations for each submenu are provided below.
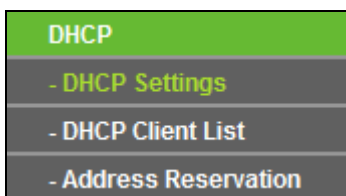
Figure 4-22 The DHCP menu

4.6.1 DHCP Settings

Selecting **DHCP** > **DHCP Settings** will enable you to set up the Range Extender as a DHCP (Dynamic Host Configuration Protocol) server, which provides the TCP/IP configuration for all the PCs that are connected to the system on the LAN. The DHCP Server can be configured on the page (shown as Figure 4-24), only when you've set the Network LAN type as Static IP in Figure 4-9.

☞ **Note:**

The DHCP Settings function cannot be configured if you have chosen Smart IP (DHCP) in **Network -> LAN**, in which situation the device will help you configure the DHCP automatically as you need. The DHCP Settings page will appear as Figure 4-23.

Figure 4-23 DHCP Settings – Disabled

Figure 4-24 DHCP Settings – Enabled

➢ **DHCP Server -** Selecting the radio button before **Disable/Enable** will disable/enable the DHCP server on your Range Extender. The default setting is **Enable**. If you disable the Server, you must have another DHCP server within your network or else you must manually configure the computer.

➢ **Start IP Address -** This field specifies the first address in the IP Address pool. 192.168.0.100 is the default start IP address.

> ➤ **End IP Address** - This field specifies the last address in the IP Address pool. 192.168.0.199 is the default end IP address.

> ➤ **Address Lease Time -** Enter the amount of time for the PC to connect to the Range Extender with its current assigned dynamic IP address. The time is measured in minutes. After the time is up, the PC will be automatically assigned a new dynamic IP address. The range of the time is 1 ~ 2880 minutes. The default value is 120 minutes.

> ➤ **Default Gateway (optional) -** Enter the IP address of the gateway for your LAN. The factory default setting is 0.0.0.0.

> ➤ **Default Domain (optional) -** Enter the domain name of the your DHCP server. You can leave the field blank.

> ➤ **Primary DNS (optional) -** Enter the DNS IP address provided by your ISP. Consult your ISP if you don't know the DNS value. The factory default setting is 0.0.0.0.

> ➤ **Secondary DNS (optional) -** Enter the IP address of another DNS server if your ISP provides two DNS servers. The factory default setting is 0.0.0.0.

Click **Save** to save the changes.

☞ **Note:**

To use the DHCP server function of the device, you should configure all computers in the LAN as "Obtain an IP Address automatically" mode. This function will not take effect until the device reboots.

4.6.2 DHCP Client List

Selecting **DHCP** > **DHCP Client List** will enable you to view the Client Name, MAC Address, Assigned IP and Lease Time for each DHCP Client attached to the device (Figure 4-25).

Figure 4-25 DHCP Clients List

> ➤ **ID -** Here displays the index of the DHCP client.

> ➤ **Client Name -** Here displays the name of the DHCP client.

> ➤ **MAC Address -** Here displays the MAC address of the DHCP client.

> ➤ **Assigned IP -** Here displays the IP address that the Range Extender has allocated to the DHCP client.

> ➤ **Lease Time -** Here displays the time of the DHCP client leased. Before the time is up, DHCP client will request to renew the lease automatically.

You cannot change any of the values on this page. To update this page and to show the current attached devices, click on the **Refresh** button.

4.6.3 Address Reservation

Selecting **DHCP** > **Address Reservation** will enable you to specify a reserved IP address for a PC on the LAN, so the PC will always obtain the same IP address each time when it accesses the Range Extender. Reserved IP addresses should be assigned to servers that require permanent IP settings. The screen below is used for address reservation (shown in Figure 4-26).

Figure 4-26 Address Reservation

➢ **MAC Address -** Here displays the MAC address of the PC for which you want to reserve an IP address.

➢ **Reserved IP Address -** Here displays the IP address that the Range Extender is reserved.

➢ **Status -** Here shows whether the entry is enabled or not

➢ **Modify -** To modify or delete an existing entry.

To Reserve IP Addresses, you can follow these steps:

1. Enter the MAC Address (The format for the MAC Address is XX-XX-XX-XX-XX-XX) and the IP address in dotted-decimal notation of the computer you wish to add.

2. Click the **Save** button.

To modify a Reserved IP Address, you can follow these steps:

1. Select the reserved address entry as you desired, modify it. If you wish to delete the entry, click the **Delete** link of the entry.

2. Click the **Save** button.

Click the **Add New...** button to add a new Address Reservation entry.

Click the **Enable All** button to enable all the entries in the table.

Click the **Disable All** button to disable all the entries in the table.

Click the **Delete All** button to delete all the entries in the table.

Click the **Next** button to go to the next page, or click the **Previous** button return to the previous page.

)☞ **Note:**

The changes won't take effect until the device reboots.

4.7   System Tools

System Tools option helps you to optimize the configuration of your device. SNMP can help you to manage the device locally or remotely with specified software. The diagnostic tools (Ping and Traceroute) allow you to check the connections of your network components. You can upgrade the Range Extender to the latest version of firmware as well as backup or restore the Range Extender's configuration files. Ping Watch Dog can help to continuously monitor a particular connection to a remote host. It's suggested that you change the default password to a more secure one because it controls access to the device's web-based management page. Besides, you can find out what happened to the system in System Log.

There are nine submenus under the **System Tools** menu (shown as Figure 4-27): **SNMP**, **Diagnostic**, **Ping Watch Dog**, **Firmware Upgrade**, **Factory Defaults**, **Backup & Restore**, **Reboot**, **Password**, and **System Log**. Clicking any of them will enable you to configure the corresponding function. The detailed explanations for each submenu are provided below.

System Tools
- SNMP
- Diagnostic
- Ping Watch Dog
- Firmware Upgrade
- Factory Defaults
- Backup & Restore
- Reboot
- Password
- System Log

Figure 4-27 The System Tools menu

4.7.1 SNMP

Selecting **System Tools** > **SNMP** to enable this function will allow the network management station to retrieve statistics and status from the SNMP agent in this device. Simple Network Management Protocol (SNMP) is a popular network monitoring and management protocol, used to refer to a collection of specifications for network management that include the protocol itself. To use this function, select Enable and enter the following parameters in Figure 4-28.

Figure 4-28 SNMP Settings

➢ **SNMP Agent -** Select the radio button before **Enable** will enable this function if you want to have remote control through SNMPv1/v2 agent with MIB-II. Select the radio button before **Disable** will disable this function. The default setting is **Disable**.

➢ **SysContact -** The textual identification of the contact person for this managed node.

➢ **SysName -** An administratively-assigned name for this managed node.

➢ **SysLocation -** The physical location of this node.

☞ **Note:**

Specifying one of these values via the Device's Web-Based Utility makes the corresponding object read-only. If there isn't such a config setting, then the write request will succeed (assuming suitable access control settings), but the new value would be forgotten the next time the agent was restarted.

➢ **Get Community -** Enter the community name that allows Read-Only access to the Device's SNMP information. The community name can be considered a group password. The default setting is "**public**".

➢ **Get Source -** Get source defines the IP address or subnet for management systems that can read information from this 'get' community device.

➢ **Set Community -** Enter the community name that allows Read/Write access to the Device's SNMP information. The community name can be considered a group password. The default setting is "**private**".

➢ **Set Source -** Set source defines the IP address or subnet for management systems that can control this 'set' community device.

☞ **Note:**

A restricted source can be a specific IP address (e.g. 10.10.10.1), or a subnet - represented as IP/BITS (e.g. 10.10.10.0/24). If an IP Address of 0.0.0.0 is specified, the agent will accept all requests under the corresponding community name.

Click the **Save** button to save your settings.

4.7.2 Diagnostic

Selecting **System Tools** > **Diagnostic** allow you to check the connections of your network components on the screen shown in Figure 4-29.

Figure 4-29 Diagnostic

Diagnostic Tools - Click the radio button to select one diagnostic tool

- **Ping** - This diagnostic tool troubleshoots connectivity, reachability, and name resolution to a given host or gateway by using the Internet Control Message Protocol (ICMP) protocol's mandatory Echo Request datagram to elicit an ICMP Echo Response from a host or gateway. You can use ping to test both numeric IP address or domain name. If pinging the IP address is successful, but pinging the domain name is not, you might have a name resolution problem. In this case, ensure that the domain name you are specifying can be resolved by using Domain Name System (DNS) queries.

- **Traceroute** - This diagnostic tool determines the path taken to a given host by sending Internet Control Message Protocol (ICMP) Echo Request messages with varying Time to Live (TTL) values to the destination. Each gateway along the path is required to decrement the TTL in an IP packet by at least 1 before forwarding it. Effectively, the TTL is a maximum link counter. When the TTL on a packet reaches 0, the gateway is expected to return an ICMP Time Exceeded response to your device. Traceroute determines the path by sending the first Echo Request message with a TTL of 1 and incrementing the TTL by 1 on each subsequent transmission until the target responds or the maximum number of hops is reached. The maximum number of hops is 20 by default and can be specified in the field "Traceroute Max TTL". The path is determined by examining the ICMP Time Exceeded messages returned by intermediate gateways and the Echo Reply message returned by the destination. However, some gateways do not return Time Exceeded messages for packets

with expired TTL values and are invisible to the traceroute tool. In this case, a row of asterisks (*) is displayed for that hop.

IP Address - Enter the IP Address (such as 202.108.22.5) of the PC whose connection you wish to diagnose.

Ping Count - Specifies the number of Echo Request messages sent. The default is 4.

Ping Packet Size - Specifies the number of data bytes to be sent. The default is 64.

Ping Timeout - Specifies the time to wait for a response in milliseconds. The default is 800.

Traceroute Max TTL - Set the maximum number of hops (max TTL to be reached) in the path to search for the target (destination). The default is 20.

Click the **Start** button to start the diagnostic procedure.

The **Diagnostic Results** page displays the result of diagnosis.

If the result is similar to the following screen, the connectivity of the Internet is fine.

```
Diagnostic Results

Pinging 202.108.22.5 with 64 bytes of data:

Reply from 202.108.22.5: bytes=64  time=1  TTL=127  seq=1
Reply from 202.108.22.5: bytes=64  time=1  TTL=127  seq=2
Reply from 202.108.22.5: bytes=64  time=1  TTL=127  seq=3
Reply from 202.108.22.5: bytes=64  time=1  TTL=127  seq=4

Ping statistics for 202.108.22.5
  Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milliseconds:
  Minimum = 1, Maximum = 1, Average = 1
```

Figure 4-30   Diagnostic Results

) **Note:**

1. Only one user can use this tool at one time.

2. Options "Number of Pings", "Ping Size" and "Ping Timeout" are only available for Ping function. Option "Tracert Hops" is available only for Tracert function.

4.7.3 Ping Watch Dog

Selecting **System Tools** > **Ping Watch Dog** allows you to continuously monitor the particular connection between the device to a remote host. It makes this device continuously ping a user defined IP address (it can be the internet gateway for example). If it is unable to ping under the user defined constraints, this device will automatically reboot.

Figure 4-31 Ping Watch Dog Utility

➢ **Enable -** Turn on/off Ping Watch Dog.

➢ **IP Address -** The IP address of the target host where the Ping Watch Dog Utility is sending ping packets.

➢ **Interval -** Time internal between two ping packets which are sent out continuously.

➢ **Delay -** Time delay before first ping packet is sent out when the device is restarted.

➢ **Fail Count -** Upper limit of the ping packet the device can drop continuously. If this value is overrun, the device will restart automatically.

Be sure to click the **Save** button to make your settings in operation.

4.7.4 Firmware Upgrade

Selecting **System Tools** > **Firmware Upgrade** allows you to upgrade the latest version of firmware for the device on the screen shown in Figure 4-32.

Figure 4-32 Firmware Upgrade

New firmware versions are posted at http://www.tp-link.com and can be downloaded for free.

➢ **Firmware Version -** Here displays the current firmware version.

➢ **Hardware Version -** Here displays the current hardware version. The hardware version of the upgrade file must accord with the current hardware version.

☞ Note:

1. There is no need to upgrade the firmware unless the new firmware has a new feature you want to use. However, when experiencing problems caused by the device itself, you can try to upgrade the firmware.

2. Before upgrading the device's firmware, you should write down some of your customized settings to avoid losing important configuration settings of device.

To upgrade the device's firmware, follow these instructions:

1. Download a more recent firmware upgrade file from the TP-LINK website (http://www.tp-link.com).

2. Enter the path name or click **Browse…** to select the downloaded file on the computer into the **File** blank.

3. Click **Upgrade**.

☞ Note:

Do not turn off the device or press the **Reset** button while the firmware is being upgraded. The device will reboot after the Upgrading has been finished.

4.7.5 Factory Defaults

Selecting **System Tools** > **Factory Default** allows you to restore the factory default settings for the device on the screen shown in Figure 4-33.
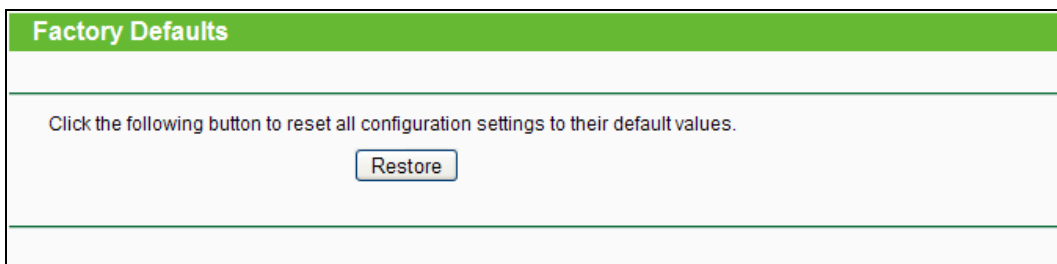
Figure 4-33 Restore Factory Defaults

Click **Restore** to reset all configuration settings to their default values.

- Default **User Name**: admin

- Default **Password**: admin

- Default **IP Address**: 192.168.0.254

- Default **Subnet Mask**: 255.255.255.0

☞ Note:

Any settings you have saved will be lost when the default settings are restored.

4.7.6 Backup & Restore

Selecting **System Tools** > **Backup & Restore** allows you to save all configuration settings to your local computer as a file or restore the device's configuration on the screen shown in Figure 4-34.

Figure 4-34 Save or Restore the Configuration

Click **Backup** to save all configuration settings to your local computer as a file.

To restore the device's configuration, follow these instructions:

- Click **Browse…** to find the configuration file which you want to restore.

- Click **Restore** to update the configuration with the file whose path is the one you have input or selected in the blank.

☞ **Note:**

The current configuration will be covered with the uploading configuration file. Wrong process will lead this device unmanaged. The restoring process lasts for 20 seconds and this device will restart automatically then. Keep the power of this device on during the process, in case of any damage.

4.7.7 Reboot

Selecting **System Tools** > **Reboot** allows you to reboot the device on the screen shown in Figure 4-35.

Figure 4-35 Reboot the device
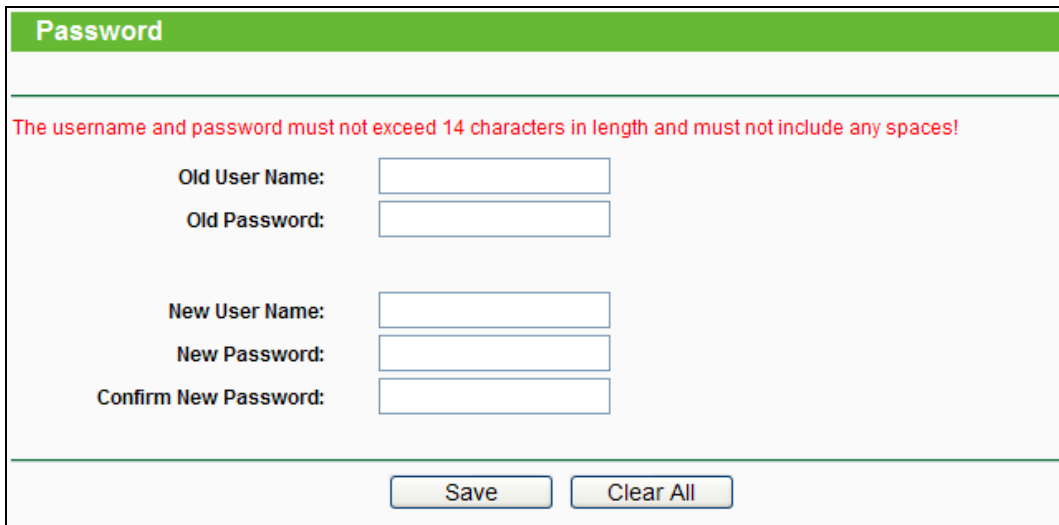
Click the **Reboot** button to reboot the device.

Some settings of the device will take effect only after rebooting, which include:

- Change LAN IP Address (System will reboot automatically).

- Change the Wireless configurations.

- Change the Web Management Port.

- Upgrade the firmware of the device (system will reboot automatically).

- Restore the device's settings to factory defaults (system will reboot automatically).

- Update the configuration with a file (system will reboot automatically).

4.7.8 Password

Selecting **System Tools** > **Password** allows you to change the factory default user name and password of the device on the screen shown in Figure 4-36.

Figure 4-36 Password

It is strongly recommended that you change the factory default user name and password of the device. All users who try to access the device's web-based management page or Quick Setup will be prompted for the device's user name and password.

☞ **Note:**

The new user name and password must not exceed 14 characters in length and must not include any spaces. Enter the new Password twice to confirm it.

Click **Save** when finished.

Click **Clear All** to clear all.

4.7.9 System Log

Selecting **System Tools** > **System Log** allows you to query the Logs of the device on the screen shown in Figure 4-37.

Figure 4-37 System Log

The device can keep logs of all traffic. You can query the logs to find what happened to the device.

➢ **Log Type -** By selecting the log type, only logs of this type will be shown.

➢ **Log Level -** By selecting the log level, only logs of this level will be shown.

Click the **Refresh** button to show the latest log list..

Click the **Save Log** button to save all the logs in a txt file.

Click the **Clear Log** button to delete all the logs from the system permanently, not just from the page.

Click the **Next** button to go to the next page, or click the **Previous** button return to the previous page.

Appendix A: Application Example

The TL-WA830RE relays signal between its stations and the root AP for greater wireless range. It allows you to connect the device with a Router around either with or without any Ethernet cable.
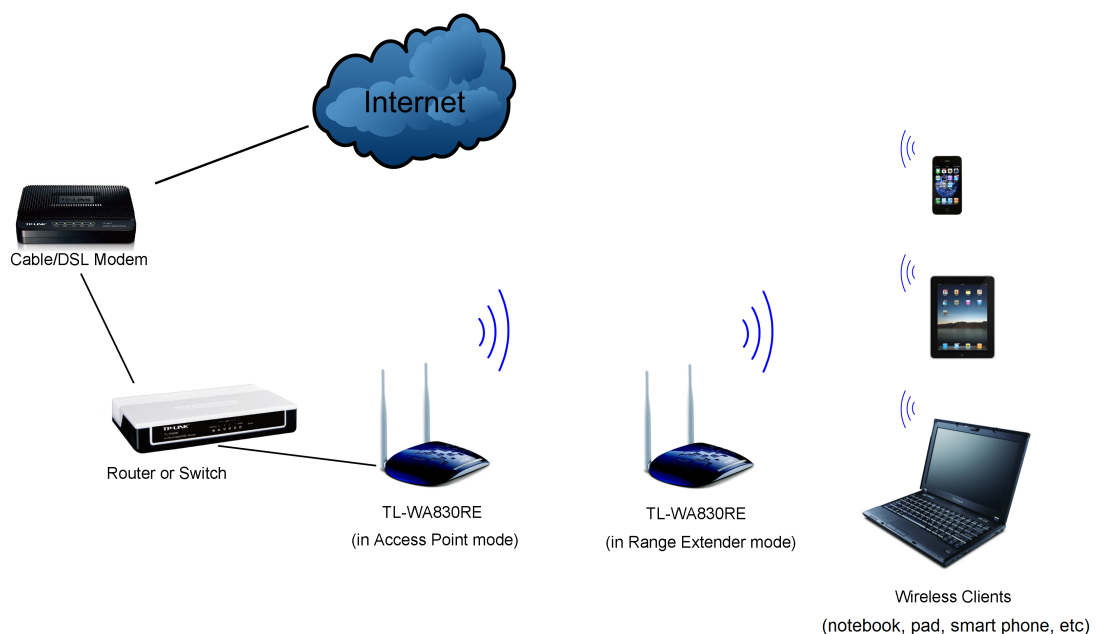
The situation is that you want to connect your computer equipped with wireless adapter to a wired network wirelessly. Then you can take the following instructions to achieve that.

Step 1: Configure your TL-WA830RE to **Access Point** mode.

1) Connect your TL-WA830RE to your PC with an Ethernet cable.
2) Log on to the web-based management page. Configure your TL-WA830RE in the **Access Point** mode and check the **Enable SSID Broadcast** box (Please refer to 4.5.1 Wireless Settings.)
3) View the **Wireless** > **Wireless Settings** page and note down the SSID of the Range Extender. You are suggested to name a unique and easy-to-remember SSID, and set the wireless security for your wireless network (Please refer to 4.5.1 Wireless Settings and 4.5.2 Wireless Security.)
4) Remove the Ethernet cable between TL-WA830RE and your PC.
5) Connect your TL-WA830RE to the front-end Router or Switch with an Ethernet cable.

Step 2: Configure your TL-WA830RE to **Range Extender** mode.

1) Connect your TL-WA830RE to your PC with an Ethernet cable.
2) Log on to the web-based management page. Configure your TL-WA830RE in the **Range Extender** mode and check the **Enable SSID Broadcast** box (Please refer to 4.5.1 Wireless Settings.)
3) View the **Wireless** > **Wireless Settings** page and note down the SSID of the Range Extender. You are suggested to name a unique and easy-to-remember SSID, and set the wireless security for your wireless network (Please refer to 4.5.1 Wireless Settings and 4.5.2 Wireless Security.)
4) Remove the Ethernet cable between TL-WA830RE and your PC.

Internet

Cable/DSL Modem

Router or Switch

TL-WA830RE
(in Access Point mode)

TL-WA830RE
(in Range Extender mode)

Wireless Clients
(notebook, pad, smart phone, etc)

Step 3: Configure your PC to connect to the network wirelessly. (Operation in Windows XP is taken as an example here.)

1)   Click **Start**, right-click **My Network Connections** and select **Properties**.
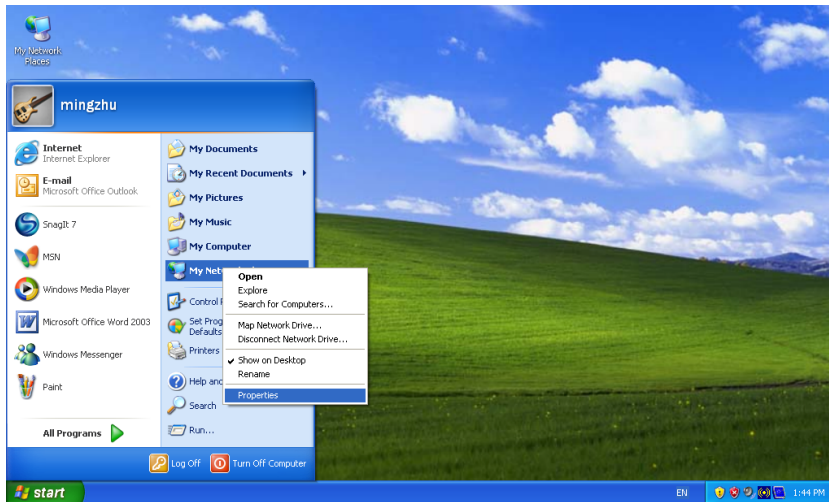
2)   On the **My Network Connections** window, right-click **Wireless Network Connection** and select **Enable** to activate the wireless network function.
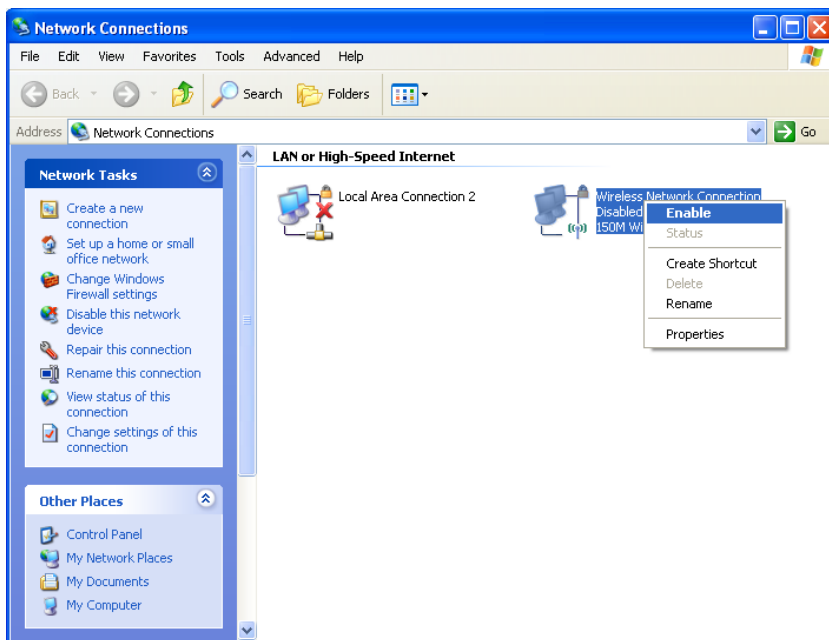
3)   Right-click the wireless connection icon "   " at the right-bottom of the desktop and then select **View Available Wireless Networks**.
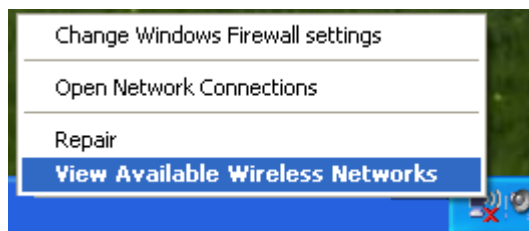
4)   Highlight the SSID of the Range Extender (here takes TP-LINK for example) and click **Connect**.
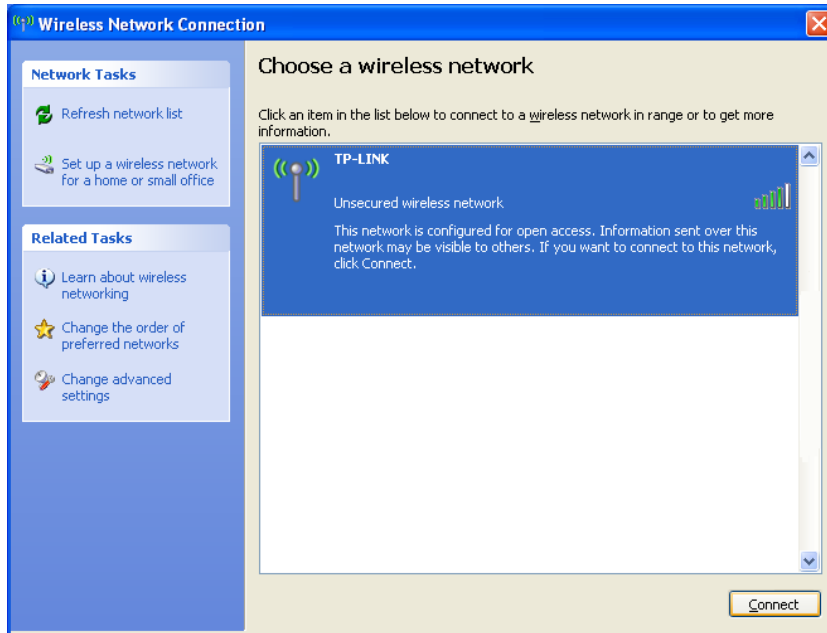
5) Then the following page will display, which indicates your successful connection to the wired network via wireless means.
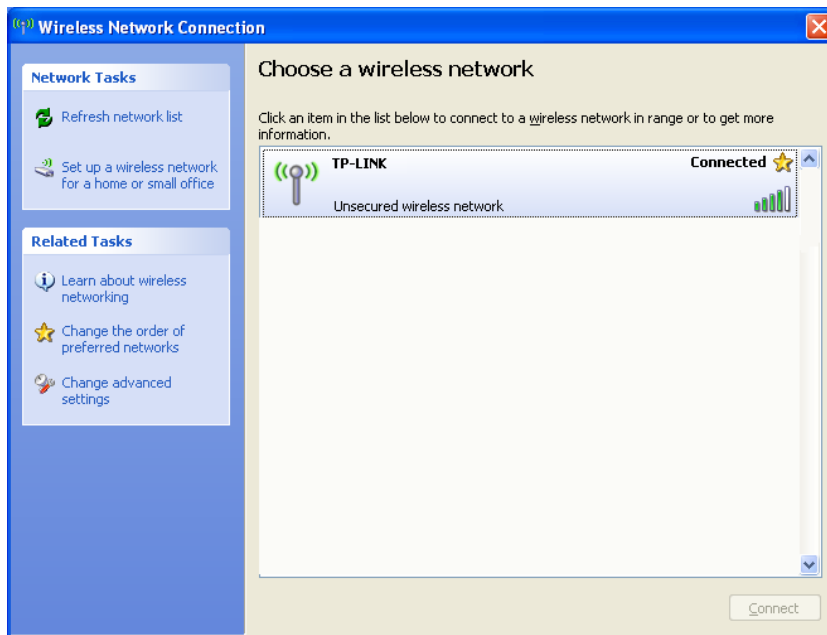
Appendix B: Factory Defaults

Item	Default Value
Common Default Settings	
Username	admin
Password	admin
IP Address	192.168.0.254
Subnet Mask	255.255.255.0
Domain	http://tplinkrepeater.net
Wireless	
SSID	TP-LINK_Extender_XXXXXX
Wireless Security	Disabled
Wireless MAC Address Filtering	Disabled

☞ **Note:**

The default SSID is TP-LINK_Extender_XXXXXX (XXXXXX indicates the last unique six characters of each device's MAC address). This value is case-sensitive.

Appendix C: Troubleshooting

1. **How do I restore my Range Extender's configuration to its factory default settings?**

   With the Range Extender TL-WA830RE powered on, use a pin to press and hold the **RESET** button on the rear panel for more than 8 seconds before releasing it.

) **Note:**

   Once the Range Extender is reset, the current configuration settings will be lost and you will need to reconfigure it.

2. **What can I do if I forget my password?**

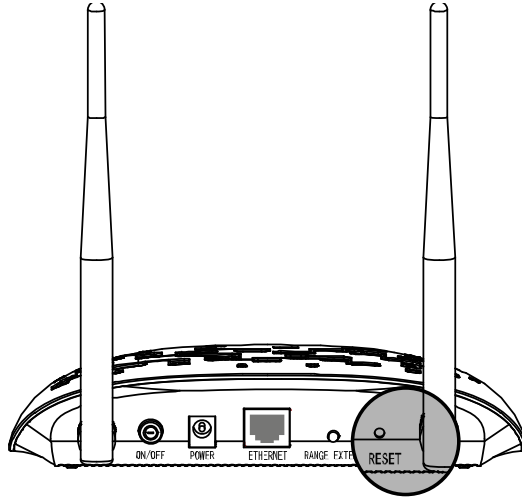   1) Restore the Range Extender's configuration to its factory default settings. If you don't know how to do that, please refer to previous section **T1**;

   2) Use the default user name and password: **admin**, **admin**;

   3) Try to reconfigure your Range Extender by following the instructions of this UG.

3. **What can I do if I cannot access the web-based configuration page?**

   1) Check to verify all the connections (either wireless or wired ones) are proper. If yes, please proceed to the next step; otherwise, check the connections again.

   2) Try to obtain an IP address and gateway; if succeed, open your web-browser, enter the default domain http://tplinkrepeater.net in the address field and get logged in.
   If you are unable to log in, please **RESET** the device, and then use the default IP address to get into the web-based configuration page, reconfigure the device.

   3) Feel free to contact our technical support, if the problem still persists.

4. **How can I know that my wireless signal has been repeated and boosted by TL-WA830RE?**

   An easy way is to compare the signal strength of your target wireless network (symbolized by its SSID), with TL-WA830RE in operation vs. out of operation. Before comparison, you'd better make sure your computer can obtain an IP address from your target wireless network and thus access the Internet, either via TL-WA830RE or without.

5. Why does the wireless transmission rate speed down, while the wireless signal is stronger after repeated by TL-WA830RE?

In compliance with the wireless transmission protocol, all the Range Extender devices are set to work in half-duplex instead of full-duplex mode. In other words, the Range Extender has to process one-way communication between your root Wireless Router (or AP) and the terminal clients; so the transmission time will be double-increased, while the speed will be half-decreased.

TP-LINK recommends that you connect to the Range Extender when your home network connection is poor, or when you want a larger wireless coverage to eliminate "dead zones".

Appendix D: Specifications

General	
Standards and Protocols	IEEE 802.3, 802.3u, 802.11n, 802.11b and 802.11g, TCP/IP, DHCP
Safety & Emission	FCC、CE
Ports	One 10/100M Auto-Negotiation LAN RJ45 port
Wireless	
Frequency Band	2.4~2.4835GHz
Radio Data Rate	11n：up to 300Mbps（Automatic） 11g：54/48/36/24/18/12/9/6M（Automatic） 11b：11/5.5/2/1M（Automatic）
Frequency Expansion	DSSS (Direct Sequence Spread Spectrum)
Modulation	DBPSK, DQPSK, CCK, OFDM, 16-QAM, 64-QAM
Security	WEP, WPA/WPA2-Enterprise, WPA/WPA2-Personal
Sensitivity @PER	270M: -68dBm@10% PER 108M: -68dBm@10% PER; 54M: -68dBm@10% PER 11M: -85dBm@8% PER; 6M: -88dBm@10% PER 1M: -90dBm@8% PER
Antenna Gain	2*5dBi
Physical and Environment	
Working Temperature	0℃~40℃ (32℉~104℉)
Working Humidity	10% ~ 90% RH, Non-condensing
Storage Temperature	-40℃~70℃(-40℉~158℉)
Storage Humidity	5% ~ 95% RH, Non-condensing

Appendix E: Glossary

- **802.11b -** The 802.11b standard specifies a wireless networking at 11 Mbps using direct-sequence spread-spectrum (DSSS) technology and operating in the unlicensed radio spectrum at 2.4GHz, and WEP encryption for security. 802.11b networks are also referred to as Wi-Fi networks.

- **802.11g -** specification for wireless networking at 54 Mbps using direct-sequence spread-spectrum (DSSS) technology, using OFDM modulation and operating in the unlicensed radio spectrum at 2.4GHz, and backward compatibility with IEEE 802.11b devices, and WEP encryption for security.

- **802.11n -** 802.11n builds upon previous 802.11 standards by adding MIMO (multiple-input multiple-output). MIMO uses multiple transmitter and receiver antennas to allow for increased data throughput via spatial multiplexing and increased range by exploiting the spatial diversity, perhaps through coding schemes like Alamouti coding. The Enhanced Wireless Consortium (EWC) was formed to help accelerate the IEEE 802.11n development process and promote a technology specification for interoperability of next-generation wireless local area networking (WLAN) products.

- **Access Point (Range Extender) -** A wireless LAN transceiver or "base station" that can connect a wired LAN to one or many wireless devices. Access points can also bridge to each other.

- **DNS** (**D**omain **N**ame **S**ystem) **–** An Internet Service that translates the names of websites into IP addresses.

- **Domain Name -** A descriptive name for an address or group of addresses on the Internet.

- **DoS** (**D**enial **o**f **S**ervice) **-** A hacker attack designed to prevent your computer or network from operating or communicating.

- **DSL** (**D**igital **S**ubscriber **L**ine) **-** A technology that allows data to be sent or received over existing traditional phone lines.

- **ISP** (**I**nternet **S**ervice **P**rovider) **-** A company that provides access to the Internet.

- **MTU** (**Maximum Transmission Unit**) **-** The size in bytes of the largest packet that can be transmitted.

- **SSID -** A **S**ervice **S**et **Id**entification is a thirty-two character (maximum) alphanumeric key identifying a wireless local area network. For the wireless devices in a network to communicate with each other, all devices must be configured with the same SSID. This is typically the configuration parameter for a wireless PC card. It corresponds to the ESSID in the wireless Access Point and to the wireless network name.

- **WEP** (**W**ired **E**quivalent **P**rivacy) **-** A data privacy mechanism based on a 64-bit or 128-bit or 152-bit shared key algorithm, as described in the IEEE 802.11 standard.

- **Wi-Fi –**A trademark of the Wi-Fi Alliance and the brand name for products using the IEEE 802.11 family of standards.

- **WLAN** (**W**ireless **L**ocal **A**rea **N**etwork) **-** A group of computers and associated devices communicate with each other wirelessly, which network serving users are limited in a local area.

- **WPA (Wi-Fi P**rotected **A**ccess**) -** WPA is a security technology for wireless networks that

improves on the authentication and encryption features of WEP (Wired Equivalent Privacy). In fact, WPA was developed by the networking industry in response to the shortcomings of WEP. One of the key technologies behind WPA is the Temporal Key Integrity Protocol (TKIP). TKIP addresses the encryption weaknesses of WEP. Another key component of WPA is built-in authentication that WEP does not offer. With this feature, WPA provides roughly comparable security to VPN tunneling with WEP, with the benefit of easier administration and use. This is similar to 802.1x support and requires a RADIUS server in order to implement. The Wi-Fi Alliance will call this, WPA-Enterprise. One variation of WPA is called WPA Pre Shared Key or WPA-Personal for short - this provides an authentication alternative to an expensive RADIUS server. WPA-Personal is a simplified but still powerful form of WPA most suitable for home Wi-Fi networking. To use WPA-Personal, a person sets a static key or "passphrase" as with WEP. But, using TKIP, WPA-Personal automatically changes the keys at a preset time interval, making it much more difficult for hackers to find and exploit them. The Wi-Fi Alliance will call this, WPA-Personal.