X650

Wireless LAN Concurrent Dual Band Gigabit Router

User's Guide

Edition 1.0, 04/2013

www.zyxel.com

Default Settings

Router IP Address: **192.168.1.1**

Username: admin

Password: 1234

1 Contents

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Federal Communication Commission Interference Statement

FCC Part 15

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

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 and correct the interference through one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from the circuit the receiver is connected to.
4. Consult the dealer or an experienced radio technician for help.

- Changes or modifications not expressly approved by ZyXEL could void the user's authority to operate the equipment.

- Operations in the 5.15-5.25 GHz band are restricted to indoor usage only.

FCC Caution

This equipment must be installed and operated in accordance with the provided instructions and a minimum 20cm of spacing must be provided between the computer mounted antenna and a person's body (excluding extremities of hands, wrist and feet) during wireless modes of operation.

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

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

This device is restricted to indoor use when operated in the 5.15 to 5.25 GHz frequency range.

Federal Communication Commission (FCC) Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation.

The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The equipment version marketed in the US is restricted to usage of channels 1-11 only.

R&TTE Compliance Statement

This equipment complies with all the requirements of DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of March 9, 1999 on radio equipment and telecommunication terminal Equipment and the mutual recognition of their conformity (R&TTE).

The R&TTE Directive repeals and replaces the directive 98/13/EEC (Telecommunications Terminal Equipment and Satellite Earth Station Equipment) As of April 8, 2000.

Safety

This equipment is designed with the utmost care for the safety of those who install and use it. However, special attention must be paid to the dangers of electric shock and static electricity when working with electrical equipment. All guidelines of this and of the computer manufacture must therefore be allowed at all times to ensure safe use of the equipment.

2 Product Information

2.1 Introduction

Thank you for purchasing the X650 wireless concurrent dual band router from ZyXEL! This cost-effective router is the best choice for *Small office / Home office* users as it allows all computers and network devices to share a single xDSL / cable modem internet connection at high speed. Easy installation procedures allow any computer users to setup a network environment within minutes, even if they are inexperienced. When the number of your computers and network-enabled devices grows, you can also expand the number of network slots by simply attaching a hub or switch to extend the scope of your network!

With 2.4GHz and 5GHz radios built-in, the X650 supports both of the IEEE 802.11b/g/n and 802.11a/n/ac wireless network capabilities simultaneously, making it possible for all computers and wireless-enabled network devices (including PDAs, Smart phones, Game consoles, Tablets and more!) to connect to it without any additional cabling. New 11ac wireless capability also gives you the highest speed wireless experience. With a compatible wireless card installed in your PC, you can transfer files at up to 300Mbps+867Mbps (data rate). The radio coverage is also doubled, so there is no need to worry if your office or house is really big!

Other features of the X650 include:

- Supports 2.4GHz and 5GHz wireless devices simultaneously.
- High wireless access throughput, up to 300Mbps+867Mbps (data rate)
- Allows multiple users to share a single Internet line.
- Four wired LAN ports (10/100/1000M) and one WAN port (10/100/1000M).
- Provides IEEE 802.11a/b/g/n/ac wireless LAN capability.
- Supports DHCP (Server/Client) for easy IP-address setup.
- Advanced network and security features like: Special Applications, QoS, DMZ, Virtual Servers, Access Control, Firewall.

- Easy to use Web-based GUI for network configuration and management purposes.
- Remote management function allows configuration and upgrades from a remote computer (over the Internet).
- Auto MDI / MDI-X function for all wired Ethernet ports.

2.2 Safety Information

In order to maintain the safety of users and your properties, please follow the safety instructions below:

1. The X650 is designed for indoor use only; DO NOT place outdoors.

2. DO NOT place X650 in or near hot or humid places, like kitchens or bathrooms. Also, do not leave X650 in a car during the summer.

3. DO NOT pull any connected cable with force; disconnect it from the X650 first.

4. If you want to place the X650 in high places or hang it on the wall, please make sure the router is firmly secured. Falling from high places will damage the router and its accessories, voiding their warranty.

5. Accessories of the X650, like its antenna and power supply, are a danger to small children under 3 years old. They could put the small parts in their nose or mouth and cause serious damage. KEEP THIS ROUTER OUT OF THE REACH OF CHILDREN!

6. The X650 will become hot when being used for long time (*This is normal and is not a malfunction).* DO NOT put the X650 on paper, cloth, or any other flammable materials.

7. There is no user-serviceable part inside the X650. If you found that the router is not working properly, please contact your dealer of purchase and ask for help. DO NOT disassemble the X650 as this action would void warranty.

8. If the X650 falls into water while it is powered on, DO NOT use your hand

to pick it up. Switch the electrical power off before you do anything or contact an experienced technician for help.

9. If you smell something strange or even see smoke coming out from the X650 or its power supply, remove the power supply or switch the electrical power off immediately and call the dealer of purchase for help.

2.3 System Requirements

- Internet connection (provided by xDSL or a cable modem with a RJ-45 Ethernet port).
- Computer or network device(s) with wired or wireless network interface card.
- Web browser (*Microsoft Internet Explorer 4.0 or above, Netscape Navigator 4.7 or above, Opera web browser, or Safari web browser).*
- An available AC power socket (100 – 240V, 50/60Hz)

2.4 Package Contents

Before starting to use the X650, please check if there is anything missing from the package and contact your dealer of purchase to claim any missing items:

☐ X650 Broadband Gigabit Router
☐ Quick Installation Guide
☐ User Manual CD ROM
☐ A/C Power Adapter (5V2ADC)

2.5 Getting Familiar with your X650

Front Panel
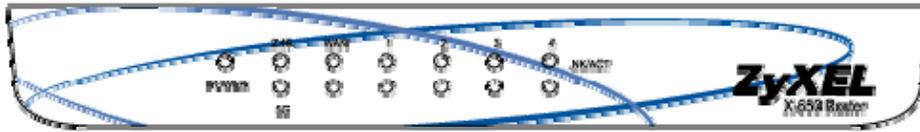
LED Name	Light Status	Description
PWR	On	Router is switched on and correctly powered.
2.4G	On	2.4GHz Wireless WPS function is enabled.
	Off	2.4GHz Wireless network is switched off.
	Flashing	2.4GHz Wireless LAN activity (transferring or receiving data).
5G	On	5GHz Wireless WPS function is enabled.
	Off	5GHz Wireless network is switched off.
	Flashing	5GHz Wireless LAN activity (transferring or receiving data).
LAN 1-4 LNK/ACT	On	LAN port is connected.
	Off	LAN port is not connected.
	Flashing	LAN activity (transferring or receiving data).
WAN LNK/ACT	On	WAN port is connected.
	Off	WAN port is not connected.
	Flashing	WAN activity (transferring or receiving data).
LAN 1-4 1000M	On	LAN port is linked in 1000Mbps speed.
	Off	LAN port is linked in 10/100Mbps speed.
WAN 1000M	On	WAN port is linked in 1000Mbps speed.
	Off	WAN port is linked in 10/100Mbps speed.

Back Panel
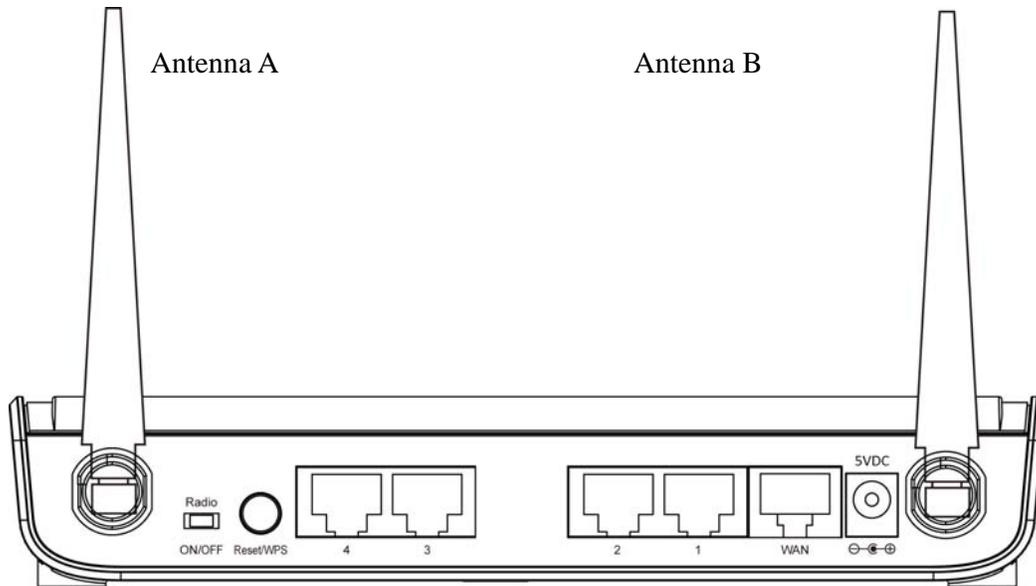
Item Name	Description
Antenna A/B	Dual band 3dBi antenna.
Radio ON/OFF	Toggle button to activate or deactivate the wireless function.
Reset / WPS	Reset the router to factory default settings (clear all settings) or start WPS function. Press this button and hold for 10 seconds to restore all settings to factory defaults; press this button for less than 5 seconds once to start 2.4GHz & 5GHz wireless WPS function.
WAN	Wide Area Network (WAN / Internet) port.
1 – 4	Local Area Network (LAN) ports 1 to 4.
Power	Power connector, connects to A/C power adapter.

Antenna Angle

Please adjust antenna angle to 45 degrees as it appears in the graphic below in order to get the better wireless range.
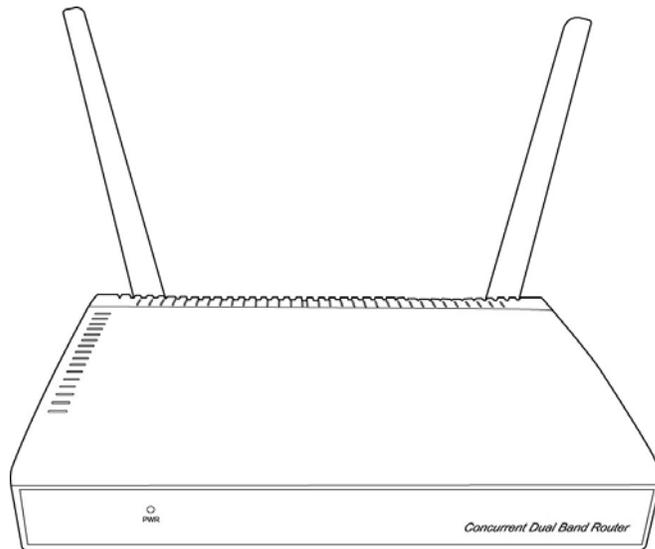
The front of the X650 has the strongest wireless signal, so try to adjust the front of this wireless router so that it is facing the other wireless network products.

3 System and Network Setup

3.1 Build network connection

Please follow these instructions to build the network connection between your new wireless router and your computers/network devices:

1. Connect your xDSL / Cable modem to the WAN port of the X650 by Ethernet cable.
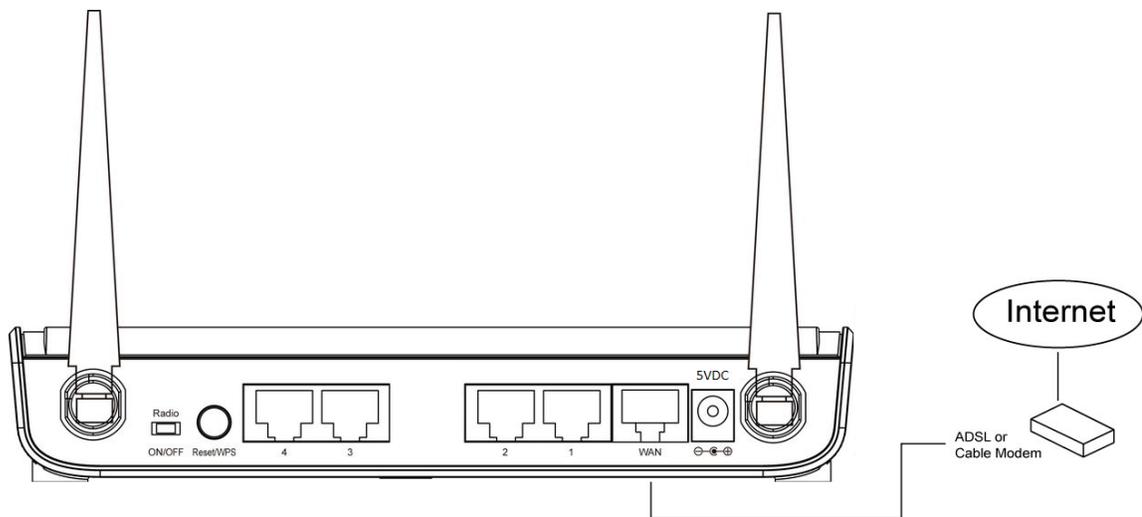
2. Connect all your computers and network devices (network-enabled consumer devices other than computers, like game consoles or switches / hubs) to the LAN port of the X650.
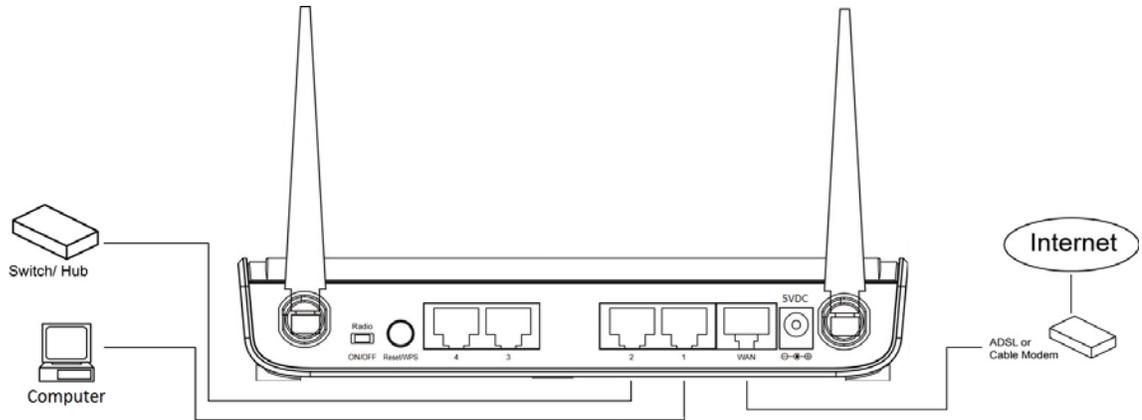
3. Connect the A/C power adapter to the wall socket, and then connect it to the 'Power' socket of the X650.
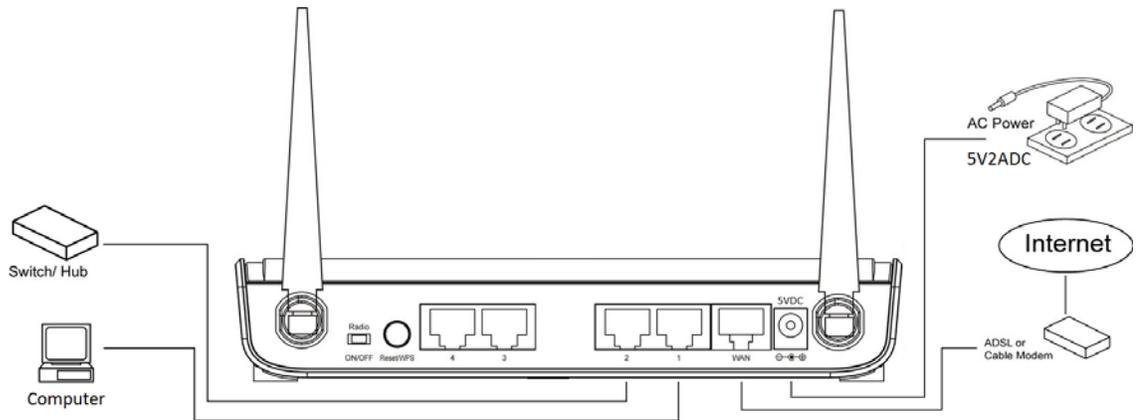
4. Please check all LEDs on the front panel. 'PWR' LED should be steadily on, WAN and LAN LEDs should be on if the computer / network device connected to the respective port of the router is powered on and correctly connected. If PWD LED is not on, or any LED you expected is not on, please recheck the cabling or jump to *'10.2 Troubleshooting'* for possible reasons and solutions.

3.2 Connecting to X650 by web browser

After the network connection is built, the next step is to setup the X650 with proper network parameters, so it can work properly in your network environment.

Before you can connect to the X650 and start configuration procedures, your computer must be able to get an IP address automatically (use dynamic IP address). If it is set to use static IP address, or if you are unsure, please follow these instructions to configure your computer to use dynamic IP address:

If the operating system of your computer is…

Windows 95/98/Me   - please go to section 3.2.1
Windows 2000   - please go to section 3.2.2
Windows XP   - please go to section 3.2.3
Windows Vista/Windows 7 - please go to section 3.2.4
Windows 8   - please go to section 3.2.5

3.2.1 Windows 95/98/Me IP address setup:

1. Click 'Start' button (it should be located at lower-left corner of your computer), then click control panel. Double-click *Network* icon, and *Network* window will appear. Select 'TCP/IP', then click 'Properties'.
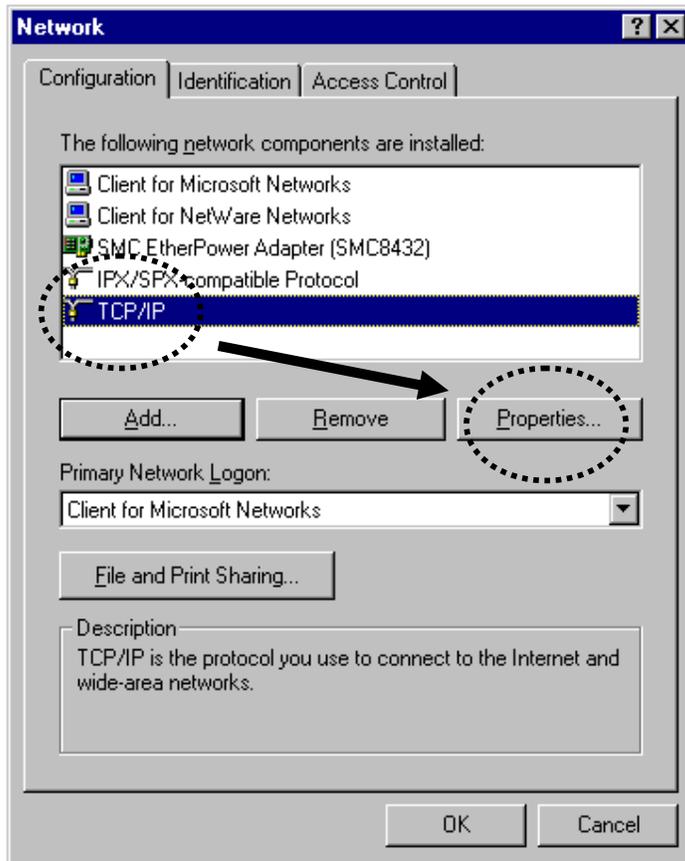
2. Select 'Obtain an IP address from a DHCP server' and then click 'OK'.
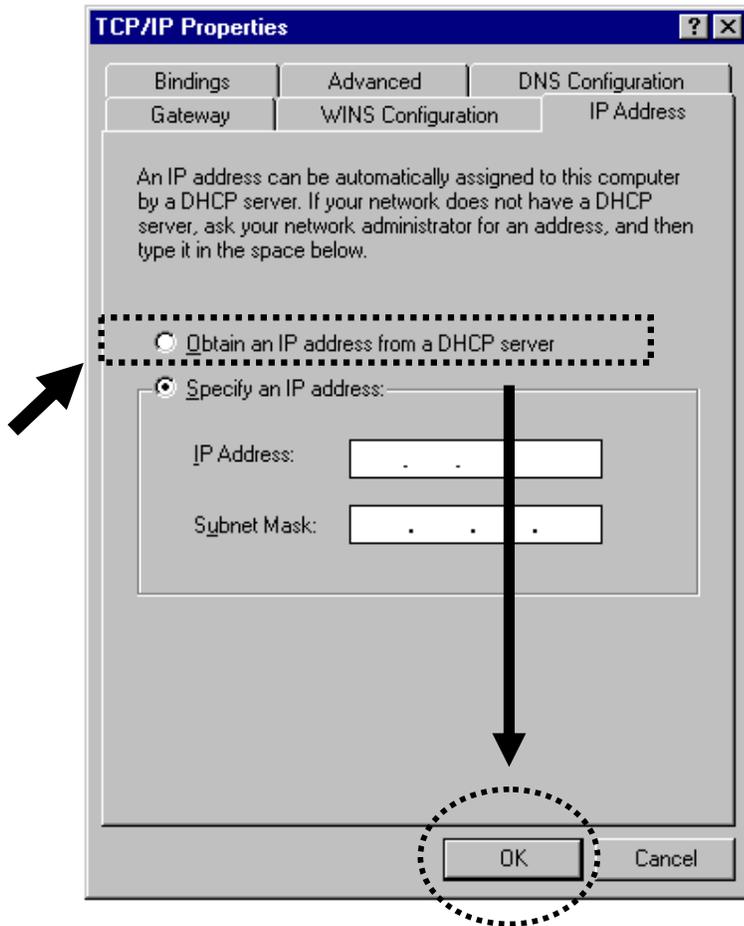
3.2.2 Windows 2000 IP address setup:

1. Click the 'Start' button (it should be located in the lower-left corner of your computer screen), then click 'Control Panel'. Double-click the ***Network and Dial-up Connections*** icon; click ***Local Area Connection*** and the ***Local Area Connection Properties*** window will appear. Select 'Internet Protocol (TCP/IP)' and then click 'Properties'
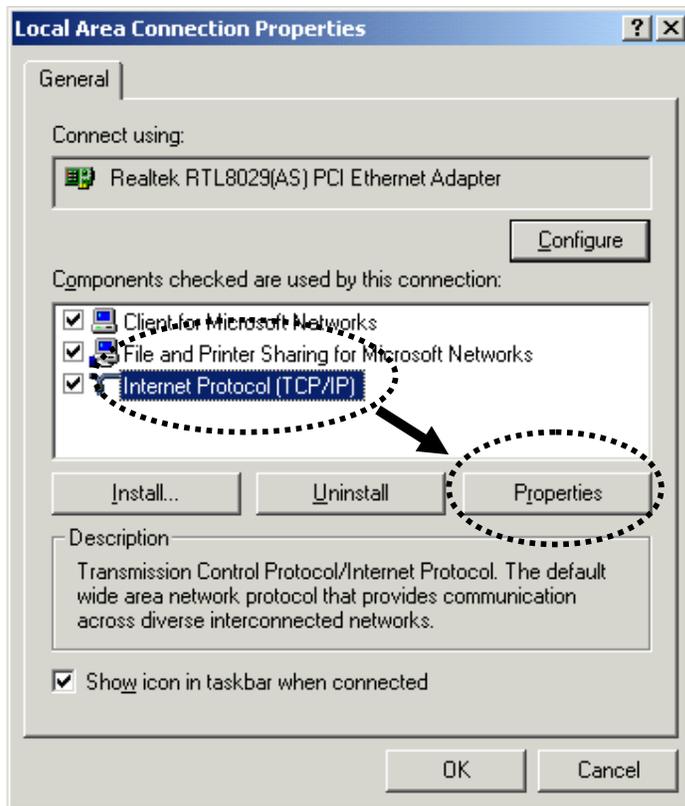
2. Select 'Obtain an IP address automatically' and 'Obtain DNS server address automatically', then click 'OK'.
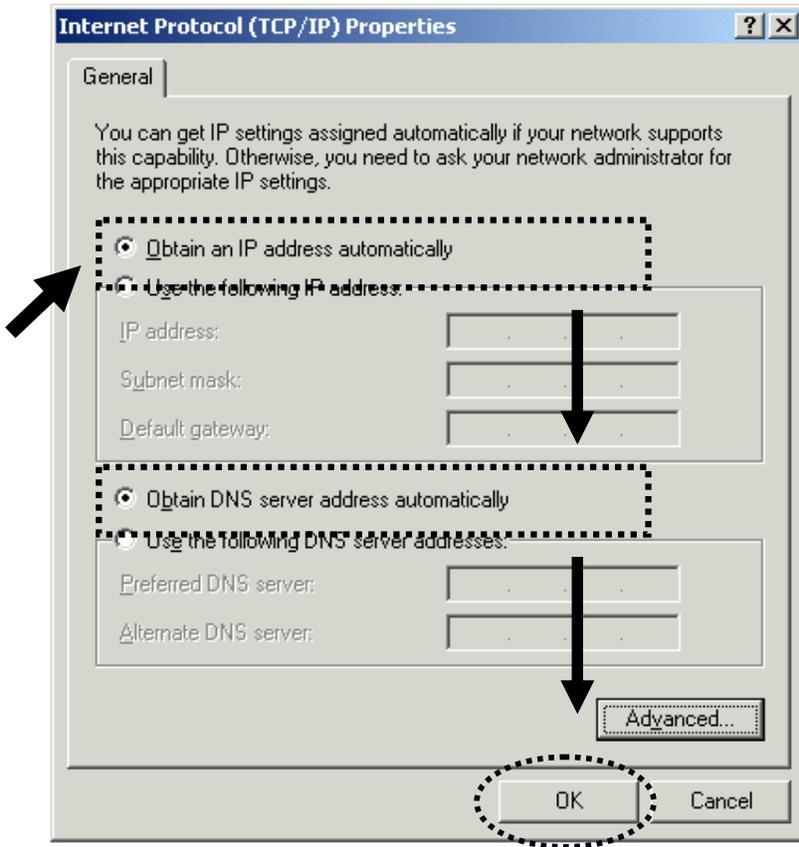
3.2.3 Windows XP IP address setup:

1. Click the 'Start' button (it should be located in the lower-left corner of your computer screen), then click 'Control Panel'. Double-click **Network and Internet Connections** icon, click **Network Connections,** and then double-click **Local Area Connection. Local Area Connection Properties** window will appear. Select 'Internet Protocol (TCP/IP)' and then click 'Properties'.

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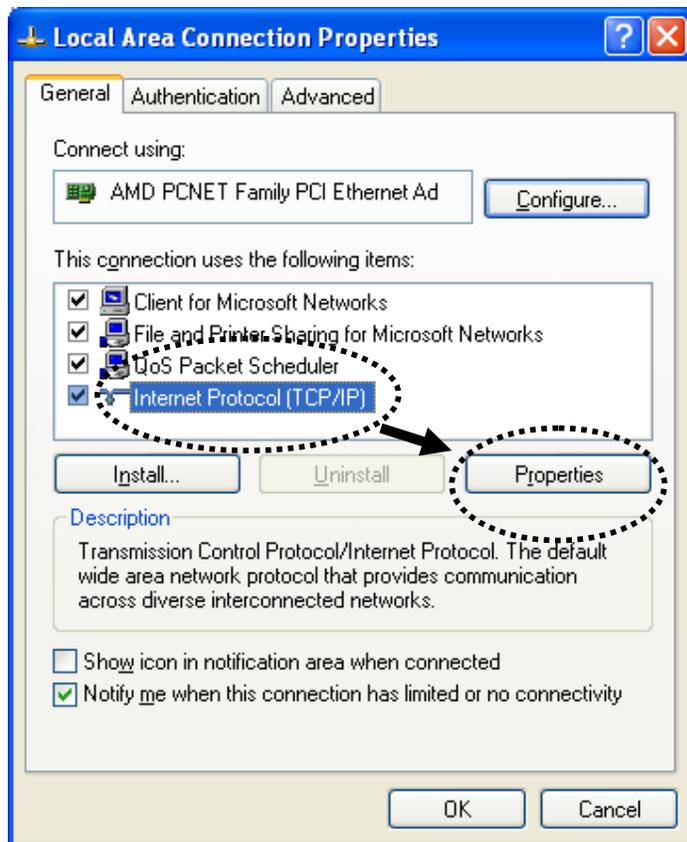
2. Select 'Obtain an IP address automatically' and 'Obtain DNS server address automatically', then click 'OK'.
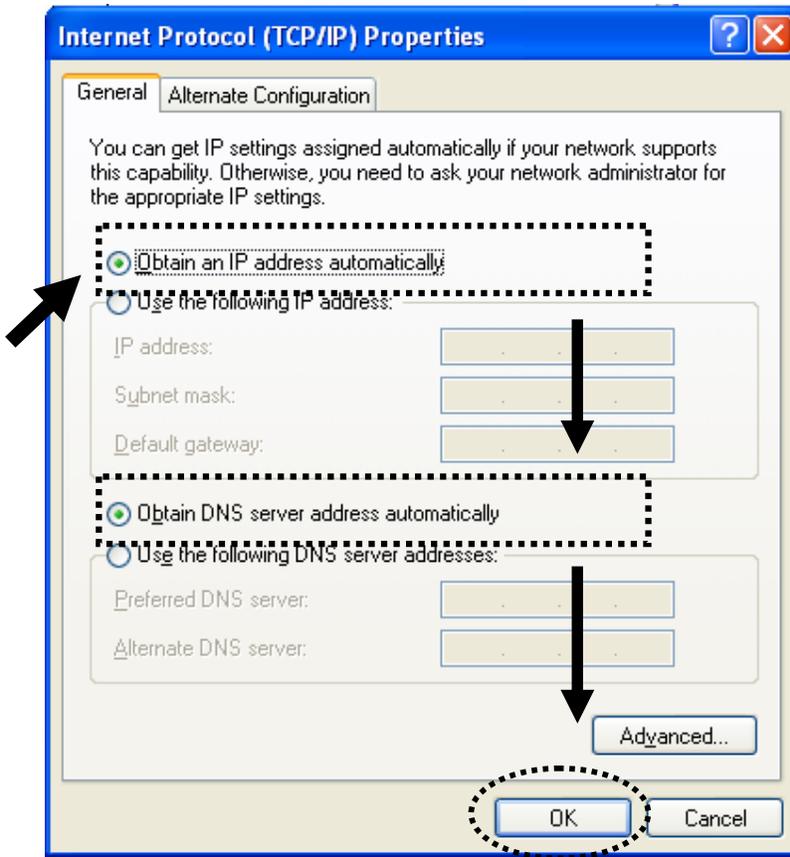
3.2.4 Windows Vista/Windows 7 IP address setup:

1. Click 'Start' button (it should be located in the lower-left corner of your computer screen), then click 'Control Panel'. Click **Network and Sharing Center**, and then click **Change Adapter Settings.** Right-click **Local Area Connection,** then select 'Properties'.When **Local Area Connection Properties** window appears, select 'Internet Protocol Version 4 (TCP / IPv4)', and then click 'Properties'.
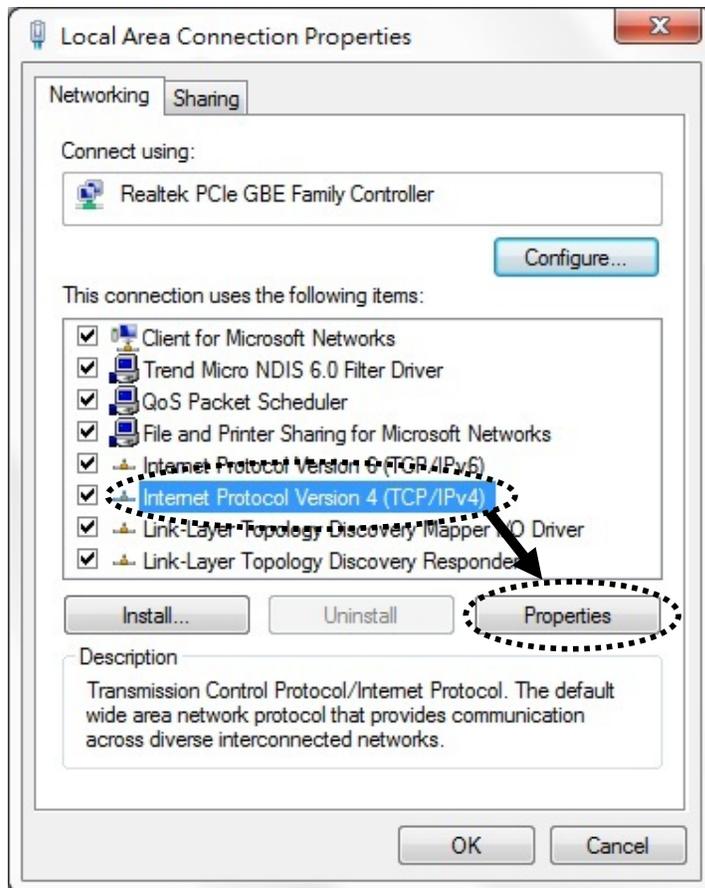
2. Select 'Obtain an IP address automatically' and 'Obtain DNS server address automatically', then click 'OK'.
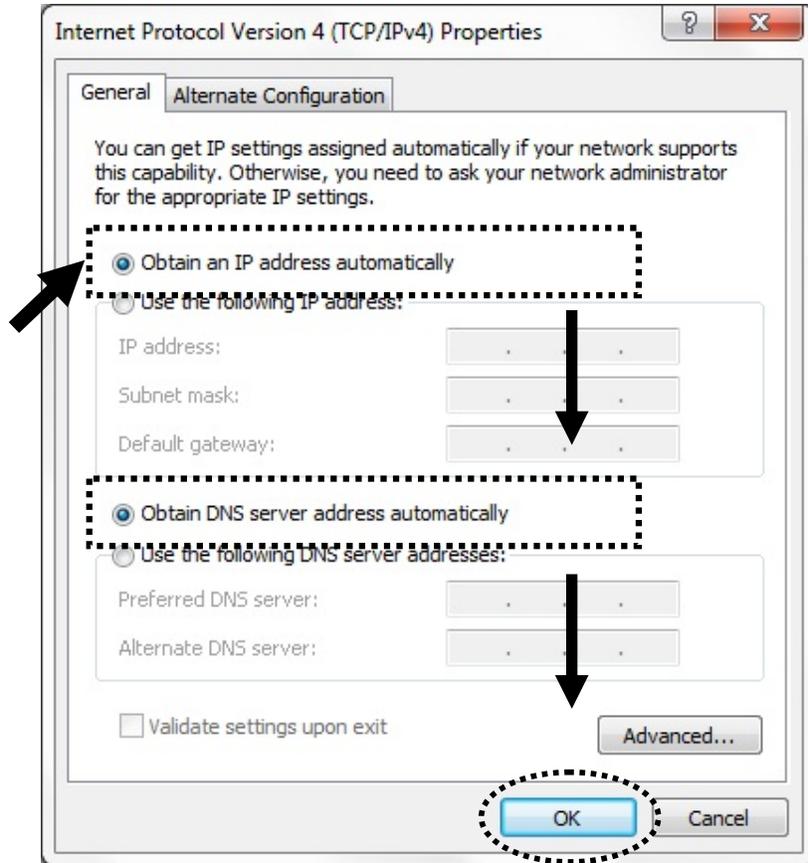
3.2.5 Windows 8 IP address setup:

1. Right-click 'Start' button (it should be located in the lower-left corner of your computer screen), then click 'Control Panel'. Click **Network and Sharing Center**, and then click **Change adapter settings.** Right-click **Ethernet,** then select **'Properties'.** When **Ethernet Properties** window appears, select 'Internet Protocol Version 4 (TCP / IPv4), and then click 'Properties'.
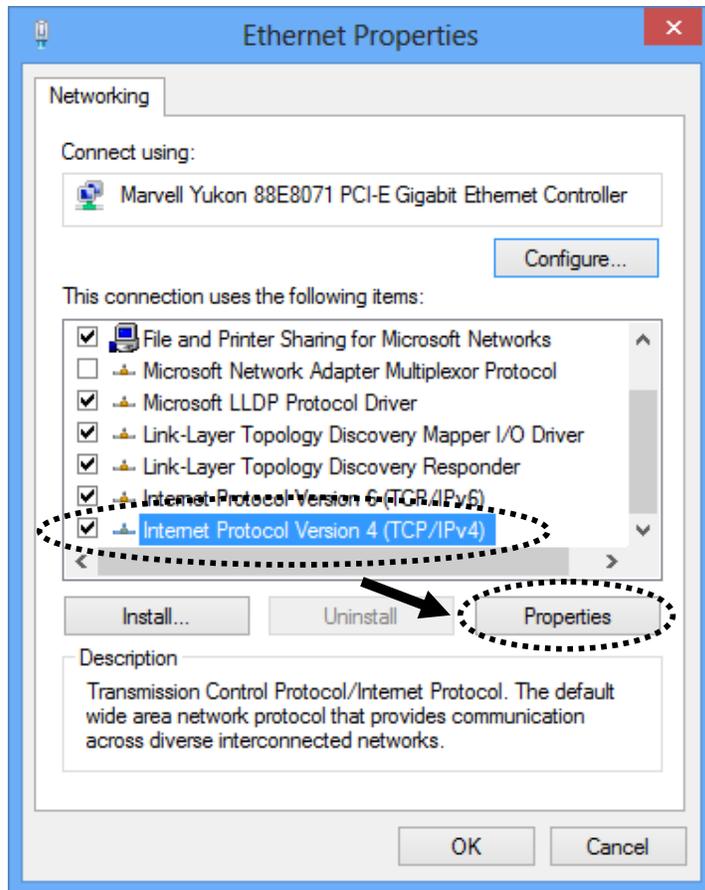
2. Select 'Obtain an IP address automatically' and 'Obtain DNS server address automatically', then click 'OK'.
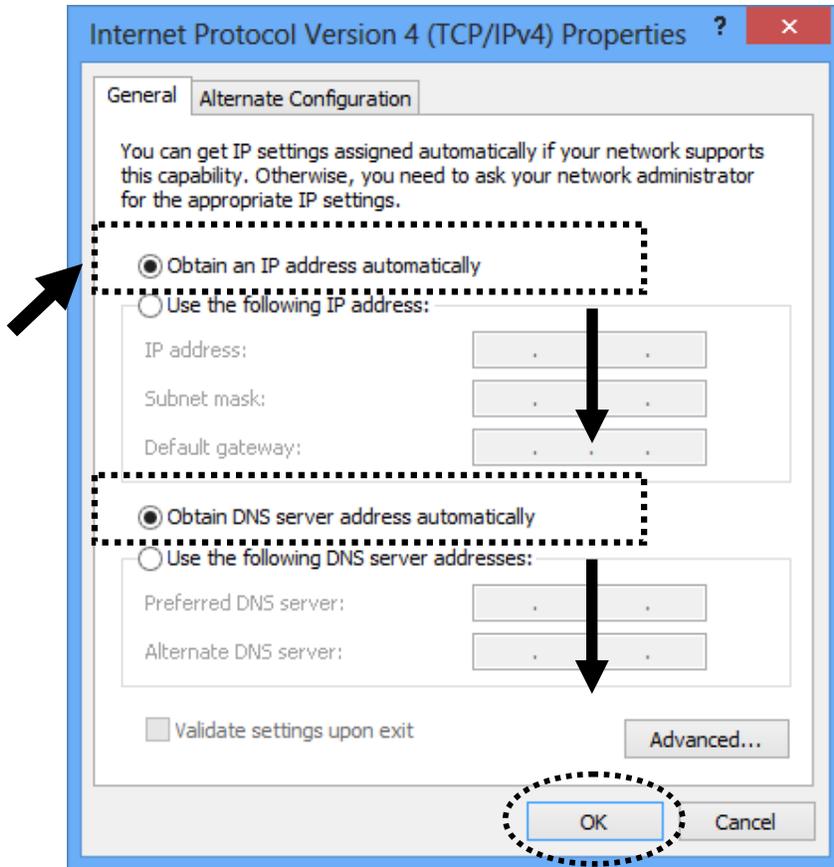
3.2.6 Router IP address lookup

After the IP address setup is complete, please click 'Start' -> 'Run' at the bottom-left corner of your desktop screen.

Input 'cmd', and then click 'OK'
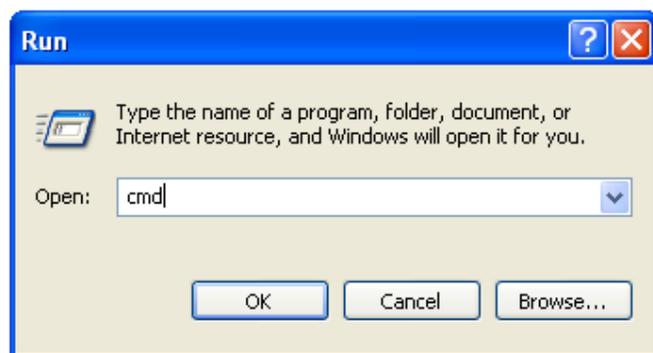
Input 'ipconfig', then press 'Enter' key. Please check the IP address following the 'Default Gateway' (In this example, the IP address of the router is 192.168.1.1; please note that this value may be different).

NOTE: If the IP address of the Gateway is not displayed, or the address followed by 'IP Address' begins with '169', please recheck network connection between your computer and router and / or go to the beginning of this chapter to recheck every step of the network setup procedure.

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3. Connect the X650's management interface by web browser

After your computer has obtained an IP address from router, please start your web browser and input the IP address of the X650 in the address bar (192.168.1.1). The following message should be shown:

Please input user name and password in their respective fields (default user name is 'admin', and default password is '1234') and then press 'OK' button, and you will see the web management interface of this router:
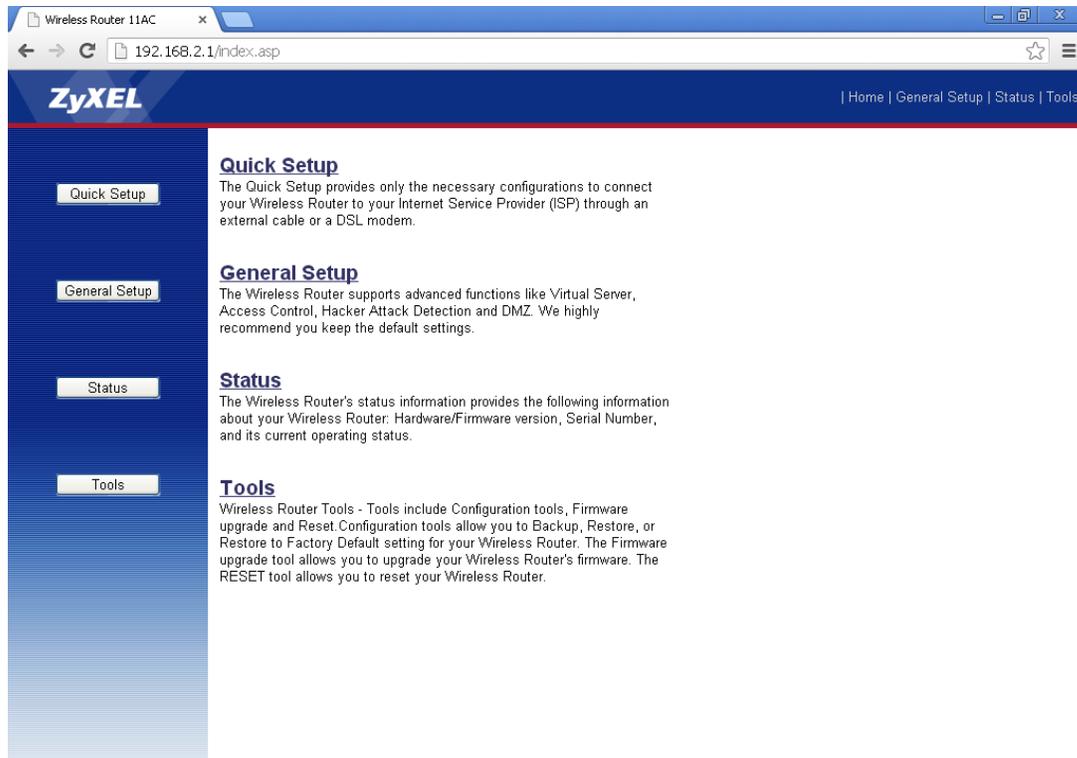
NOTE: If you can't see the web management interface and you are being prompted to input user name and password again, it means you did not input username and password correctly. Please retype user name and password again. If you are certain the user name and password you typed are correct, please go to '10.2 Troubleshooting' to perform a factory reset and set the password back to default value.

TIP: This page shows the four major setting categories: Quick Setup, General Setup, Status, and Tools. You can find the shortcut that leads to these setting categories at the upper-right corner of every page and you can jump to another category instantly by clicking its link without having to go back to the first page.

4 Using 'Quick Setup'

The X650 provides a 'Quick Setup' procedure that helps you complete all the requirements you need to access the Internet in a very short time. Please follow these instructions to complete the 'Quick Setup':

Please go to Quick Setup menu by clicking 'Quick Setup' button.
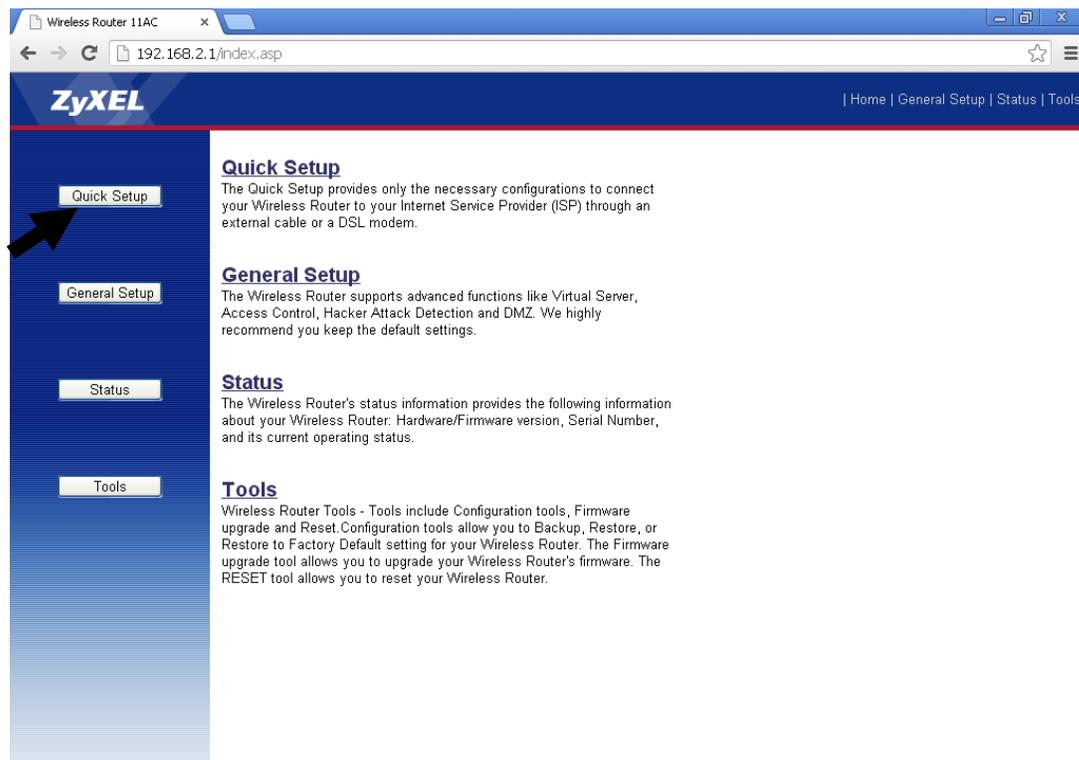
And the following message will be displayed:

1. Set Time Zone

Time Zone

Set the time zone of the Wireless Router. This information is used for log entries and firewall settings.

Time Zone :	(GMT+00:00)Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London ☑ **1**
Time Server Address :	59.124.196.83 **2**
Daylight Savings :	☐ Enable Time From January ☑ 1 ☑ To January ☑ 1 ☑ **3**

NEXT **4**

Here are descriptions of each setup item:

Time Zone (1):	*Please press ☑ button, a drop-down list will be shown, and you can choose the time zone of your location.*
Time Server Address (2):	*Input the IP address / host name of time server here*
Daylight Savings(3):	*If the country you live in uses daylight savings, please check 'Enable Function' box, and choose the duration of daylight saving.*

After you finish with all settings, please click 'Next' (4) button.

NOTE: There are several time servers available on the internet:

129.6.15.28 (time-a.nist.gov)
132.163.4.101 (time-a.timefreq.bldrdoc.gov)
131.107.1.10 (time-nw.nist.gov)

If you find that the router time is incorrect, try another time server.

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2. Set Broadband Type

Please choose the broadband (Internet connection) type you're using from this page. There are six types of Internet connections; they are:

Cable Modem	- Please go to section 4.1
Fixed-IP xDSL	- Please go to section 4.2
PPPoE xDSL	- Please go to section 4.3
PPTP xDSL	- Please go to section 4.4
L2TP xDSL	- Please go to section 4.5
Telstra Big Pond	- Please go to section 4.6

If you are not sure, please contact your Internet service provider. An incorrect Internet connection type will cause connection problems and will not allow you to connect to the Internet.

If you want to return to a previous step, please press the 'Back' button on the bottom of this page.

NOTE: Some service providers use 'DHCP' (Dynamic Host Configuration Protocol) to assign an IP address to you. In this case, you can choose 'Cable Modem' as the Internet connection type even if you are using another connection type like xDSL. Also, some cable modems use PPPoE and you can choose 'PPPoE xDSL' for these cable modem connections even if you are using a cable modem.

4.1 Setup procedure for 'Cable Modem':

Here are descriptions of each setup item:

Host Name (1):	*Please input the host name of your computer (this is optional and only required if your service provider asks you to do so.*
MAC address (2):	*Please input the MAC address of your computer here if your service provider only permits computers with certain MAC addresses to access internet. If you are using the computer you used to connect to the Internet via a cable modem, you can simply press the 'Clone Mac address' button to fill the MAC address field with the MAC address of your computer.*

After you finish with all settings, please click the 'OK' (3) button; if you want to return to the previous menu, click 'Back'.

4.2 Setup procedure for 'Fixed-IP xDSL':

Static IP

Enter the IP Address, Subnet Mask, Gateway IP Address and DNS IP Address provided to you by your ISP in the appropriate fields.

IP Address :	172.1.1.1	1
Subnet Mask :	255.255.0.0	2
DNS Address :		3
Default Gateway :	172.1.1.254	4
	BACK OK	5

Here are descriptions of each setup item:

IP Address (1):	*Please input the IP address assigned by your service provider.*
Subnet Mask (2):	*Please input the subnet mask assigned by your service provider*
DNS Address (3):	*Please input the IP address of the DNS server provided by your service provider.*
Default Gateway (4):	*Please input the IP address of the DNS server provided by your service provider.*

You must use the addresses provided by your Internet service provider; an incorrect setting value will cause connection problems.

When you finish with all settings, press 'OK' (5); if you want return to the previous menu, click 'Back'.

NOTE: You can choose this Internet connection method if your service provider assigns a fixed IP address (also know as static address) to you instead of using DHCP or PPPoE protocol. Please contact your service provider for further information.

4.3 Setup procedure for 'PPPoE xDSL':

PPPoE

Enter the User Name and Password required by your ISP in the appropriate fields. If your ISP has provided you with a "Service Name" enter it in the Service Name field, otherwise, leave it blank.

User Name :		1
Password :		2
Service Name :		3
MTU :	1392 (512<=MTU<=1492)	4
Connection Type :	Continuous ▼ Connect Disconnect	5
Idle Time Out :	10 (1-1000 Minute)	6

BACK   OK

Here are descriptions of each setup item: 7

User Name (1):   *Please input user name assigned by your Internet service provider here.*

Password (2):   *Please input the password assigned by your Internet service provider here.*

Service Name (3):   *Please give a name to this Internet service (this is optional)*

MTU (4):   *Please input the MTU value of your network connection here. If you don't know, you can use the default value.*

Connection   *Please select the type of Internet connection*
Type (5):   *you wish to use (detailed explanation listed below).*

Idle Time Out (6): *Please input idle time out, (detailed explanation listed below).*

When you finish with all settings, please click 'OK' (7); if you want to return

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to the previous menu, click 'Back'.

> **MTU - Please use default MTU value if you do not know what it is or ask your service provider for the proper value.**
>
> **Connection Type - There are 3 options: 'Continuous' - keeps Internet connection alive, 'Connect on Demand' - only connects to Internet when there is a connection attempt, and 'Manual' - only connects to Internet when 'Connect' button on this page is pressed, and disconnects when 'Disconnect' button is pressed.**
>
> **Idle Time Out: Specify the amount of time you want to pass before the X650 shuts down the Internet connection after no Internet activity is detected. This option is only available when connection type is 'Connect on Demand'.**

4.4 Setup procedure for 'PPTP xDSL':

PPTP xDSL requires two types of settings: WAN interface setting (setup IP address) and PPTP setting (PPTP user name and password). Here we start from the WAN interface setting:

Select how you prefer to obtain the IP address from your service provider here. You can choose 'Obtain an IP address automatically' (equivalent to DHCP; please refer to 'Cable Modem' section above), or 'Use the following IP

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address' (i.e. static IP address).

WAN interface settings must be correctly set, or the Internet connection will fail even if the PPTP settings are correct. Please contact your Internet service provider if you do not know what you should place in these fields.

Now please go to the PPTP settings section:

Here are descriptions of each setup item:

User Name (1):	*Please input the user ID (user name) assigned by your Internet service provider here.*
Password (2):	*Please input the password assigned by your Internet service provider here.*
PPTP Gateway (3):	*Please input the IP address of the PPTP gateway assigned by your Internet service provider here.*
Connection ID (4):	*Please input the connection ID here (this is optional and you can leave it blank).*
MTU (5):	*Please input the MTU value of your network connection here. If you do not know, you can use the default value.*
BEZEQ-ISRAEL (6):	*Setting item 'BEZEQ-ISRAEL' is only required if you are using the service provided by BEZEQ network in*

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Connection	*Please select the type of Internet connection you*
type (7):	*wish to use (please refer to last section for detailed*
	descriptions).
Idle Time	*Please input the idle time out of Internet connection*
Out (8):	*you wish to use (refer to last section for detailed*
	descriptions).

When you finish with all settings, please click 'OK' (9); if you want to return to the previous menu, click 'Back'.

4.5 Setup procedure for 'L2TP xDSL':

L2TP is another popular connection method for xDSL and other Internet connection types, and all required setting items are the same as with PPTP connection.

Like PPTP, there are two types of required settings; we will start from 'WAN Interface Settings':

Please select how you would prefer to obtain the IP address from your service

provider here. You can choose 'Obtain an IP address automatically' (equal to DHCP, please refer to 'Cable Modem' section above), or 'Use the following IP address' (equal to static IP address, please refer to 'PPPoE xDSL' section above).

WAN interface settings must be correctly set, or the Internet connection will fail even if the PPTP settings are correct. Please contact your Internet service provider if you do not know what you should place in these fields.

Now please go to the L2TP settings section:

Here are descriptions of each setup item:

User Name (1):	*Please the input user ID (user name) assigned by your Internet service provider here.*
Password (2):	*Please input the password assigned by your Internet service provider here.*
L2TP Gateway (3):	*Please input the IP address of the PPTP gateway assigned by your Internet service provider here.*
MTU (4):	*Please input the MTU value of your network connection here (If you do not know, you can use the default value).*
Connection type (5):	*Please select the type of Internet connection you wish to use (please refer to last section for detailed descriptions).*

Idle Time	*Please input the idle time out of Internet*
Out (6):	*connection you wish to use (refer to last section for*
	detailed descriptions).

When you finish with all settings, please click 'OK (7); if you want to return to the previous menu, click 'Back'.

4.6 Setup procedure for 'Telstra Big Pond':

This setting only works if you are using Telstra big pond's network service in Australia. You need to input:

User Name (1):	*Please input the user name assigned by Telstra.*
Password (2):	*Please input the password assigned by Telstra.*
Assign login	*Check this box to choose the correct login*
server manually (3):	*server by yourself.*
Server IP Address(4):	*Please input the IP address of the login server here.*

When you finish with all settings, click 'OK (5); if you want to return to the previous menu, click 'Back'.

When all settings are finished, you will see the following message displayed on your web browser:

Save settings successfully!

Please press APPLY button to restart the system to make the changes take effect.

APPLY

Please click the 'Apply' button to prepare to restart the X650, and you will see this message:

System Restarting! Please wait for a while !

OK

Please wait for about 40 seconds, then click the 'OK!' button. You will be back to the router management interface again and the router will be ready with new settings.

5 Basic Setup

In this chapter, you will learn how to change the time zone, password, and remote management settings of the X650. Please start your web browser and log on to the router web management interface, then click the 'General Setup' button on the left or click the 'General Setup' link at the upper-right corner of the web management interface.
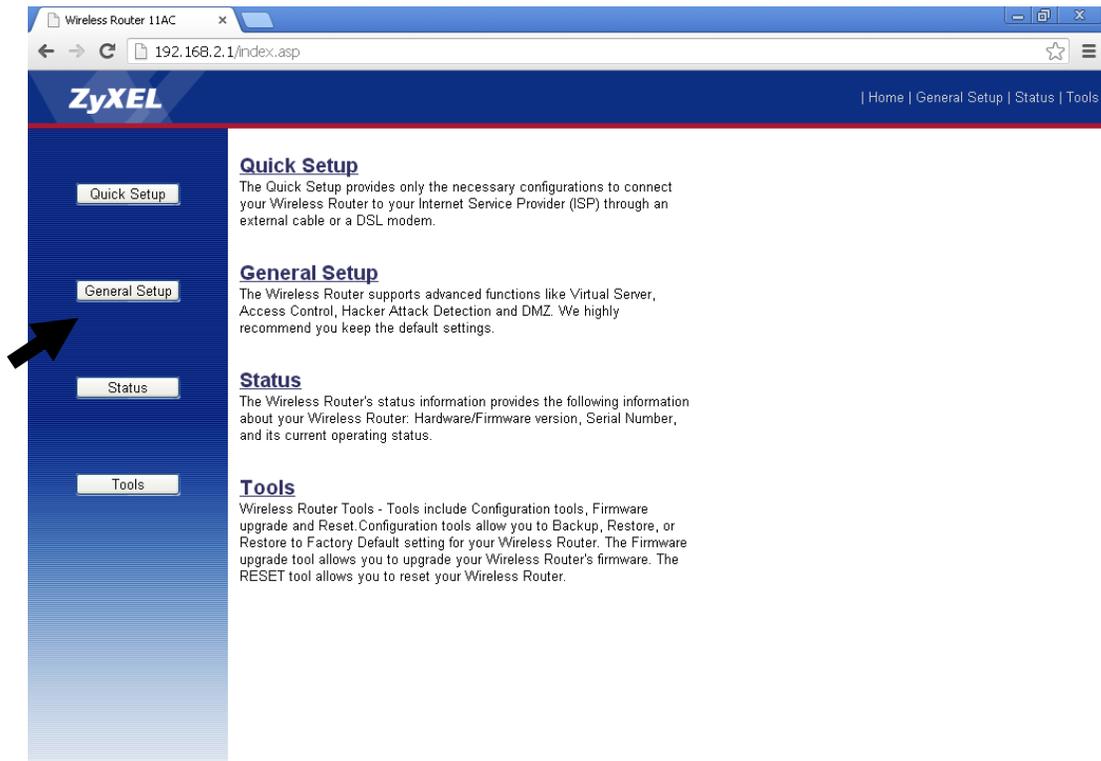
5.1 Time zone and time auto-synchronization

Please click 'System' on the left of the web management interface menu, then click 'Time Zone', and the following message will be displayed on your web browser:

Please select the correct time zone from the 'Time Zone' drop-down list, and input the IP address or host name of the time server. If you want to enable the daylight savings setting, please check the 'Enable' box and set the duration of the daylight setting. When you finish, click 'Apply'. You will see the following message displayed on your web browser:

Press 'Continue' to save the settings changes made and return to the web management interface; press 'Apply' to save the settings made and restart the router so the settings will take effect after it reboots.

NOTE: You can refer to the instructions given in the last chapter ('Using Quick Setup') for detailed descriptions of time zone settings.

5.2 Change management password

The default password of this router is 1234 and it is displayed on the login prompt when accessed from the web browser. There is a security risk if you do not change the default password, since everyone can see it. This is very risky when you have the wireless function enabled.

To change the password, please follow these instructions:

Please click 'System' on the left of web management interface menu, then click 'Password Settings', and the following message will be displayed on your web browser:

Current Password :		1
New Password :		2
Confirm Password :		3

APPLY   CANCEL

Here are descriptions of each setup item:

Current Password (1):	*Please input current password here.*
New Password (2):	*Please input new password here.*
Confirmed Password (3):	*Please input new password here again.*

When you finish, click 'Apply'. If you want to keep original password unchanged, click 'Cancel'.

If the password you typed in 'New Password' (2) and 'Confirmed Password' (3) field are not the same, you will see the following message:
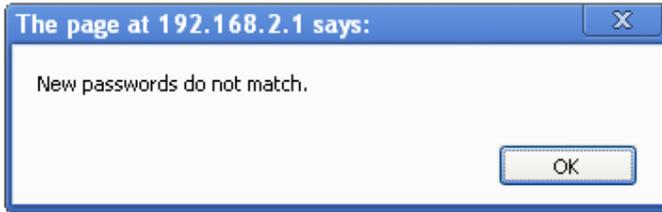
Please retype the new password again when you see above message.

If you see the following message:

It means the content in 'Current Password' field is wrong; please click 'OK' to return to the previous menu and try to input the current password again.

If the current and new passwords are correctly entered, after you click 'Apply' you will be prompted to input your new password:

Please use your new password to enter web management interface again, and you should be able to login with the new password.

5.3 Remote Management

This router does not allow management access from the Internet to prevent possible security risks (especially when you have defined a weak password or did not the change default password). However, you can still manage this router from a specific IP address by enabling the 'Remote Management' Function.

To do so, please follow these instructions:

Please click 'System' on the left of the web management interface menu, then click 'Remote Management', and the following screen will be displayed on your web browser:

Host Address	Port	Enable
0.0.0.0 **1**	8080 **2**	☐ **3**

APPLY   CANCEL

4

Here are descriptions of each setup item:

Host Address (1):	*Input the IP address of the remote host you wish to use to initiate management access.*
Port (2):	*You can define the port number this router should expect an incoming request from. If you're providing a web service (default port number is 80), you should try to use another port number. You can use the default port setting '8080' or something like '32245' or '1429'. (Any integer between 1 and 65534)*
Enable (3):	*Select the field to start the configuration.*

When you finish with all settings, click 'Apply' (4), and you will see the

following message displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

| CONTINUE | APPLY |

Press 'Continue' to save the settings changes made and return to the web management interface; press 'Apply' to save the settings changes made, restart the router, and have the settings take effect after it reboots.

NOTE: When you want to manage this router from another computer on the Internet, you have to input the IP address and port number of this router. If your Internet service provider assigns you a static IP address, it will not be a problem; but if the IP address your service provider assigns to you will vary every time you establish an internet connection, this will be a problem.

Please ask your service provider to give you a static IP address or use dynamic IP to host name mapping services like DDNS. Please refer to chapter 6.8 'DDNS client' for details.

NOTE: The default port number the web browser will use is '80'. If the 'Port' setting in this page is not '80', you have to assign the port number in the address bar of your web browser manually. For example, if the IP address of this router is 1.2.3.4, and the port number you set is 8888, you have to input the following address in the address bar of your web browser:

http://1.2.3.4:8888

6 Setup Internet Connection (WAN Setup)

Internet connection setup can be completed by using the 'Quick Setup' menu described in chapter 4. However, you can setup WAN connections up by using the WAN configuration menu. You can also set advanced functions like DDNS (Dynamic DNS) here.

To begin configuration, please follow these instructions:

Please click 'WAN' menu on the left of the web management interface, and the following message will be displayed on your web browser:

Please select an Internet connection method that corresponds the type of connection you are using. You can either click the connection method on the left (1) or right (2). If you select the connection method on the right, please click the 'More Configuration' button after the method is selected.

Dynamic IP	- Please go to section 6.1
Static IP	- Please go to section 6.2
PPPoE	- Please go to section 6.3
PPTP	- Please go to section 6.4
L2TP	- Please go to section 6.5
Telstra Big Pond	- Please go to section 6.6
DNS	- Please go to section 6.7
DDNS	- Please go to section 6.8
WISP	- Please go to section 6.9

6.1 Setup procedure for 'Dynamic IP':

Dynamic IP

The Host Name is optional, but may be required by some Service Providers. The default MAC Address is set to the WAN physical interface on the Wireless Router. If required by your Service Provider, you can use the 'Clone MAC Address' button to copy the MAC Address of the Network Interface Card installed in your PC and replace the WAN MAC Address with this MAC Address.

Host Name :	1
MAC Address : 0019B963E0E4 Clone MAC	2

APPLY   CANCEL

3

Here are descriptions of each setup item:

Host Name (1):   *Please input host name of your computer (this is optional, and only necessary if required by your service provider)*

MAC Address (2):   *Please input the MAC address of your computer if your service provider only permits computers with certain MAC addresses to access internet. If you're using the computer you used to connect to the Internet via a cable modem, you can simply press the 'Clone Mac address' button to fill in the MAC address field with the MAC address of your computer.*

After you finish with all settings, please click 'Apply' (3); if you want to remove any value you entered, please click 'Cancel'.

After you click 'Apply', the following message will be displayed on your web browser:

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Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

CONTINUE   APPLY

Please click 'Continue' to return to the previous setup menu and continue router setup, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

6.2 Setup procedure for 'Static IP':

Static IP

If your Service Provider has assigned a Fixed IP address; enter the assigned IP Address, Subnet Mask and the Gateway IP Address provided.

IP Address :	172.1.1.1	1
Subnet Mask :	255.255.0.0	2
Default Gateway :	172.1.1.254	3

APPLY   CANCEL
4

Here are descriptions of each setup item:

IP Address(1):   *Please input the IP address assigned by your service provider.*

Subnet Mask (2):   *Please input the subnet mask assigned by your service provider*

Default Gateway (3):   *Please input the IP address of your DNS server provided by your service provider.*

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After you finish with all settings, please click 'Apply' (4) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to previous setup menu and continue setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait for about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.3 Setup procedure for 'PPPoE':

PPPoE

Enter the PPPoE User Name and Password assigned by your Service Provider. The Service Name is normally optional, but may be required by some Service Providers. Enter a Idle Time (in minutes) to define a maximum period of time for which the Internet connection is maintained during inactivity. If the connection is inactive for longer than the Maximum Idle Time, then the connection will be dropped. You can enable the Connect on Demand option to automatically re-establish the connection as soon as you attempt to access the Internet again. If your Internet Service Provider requires the use of PPPoE, enter the information below.

User Name :	[ ]	1
Password :	[ ]	2
Service Name :	[ ]	3
MTU :	1392 (512<=MTU<=1492)	4
Connection Type :	Continuous ⌄ Connect Disconnect	5
Idle Time Out :	10 (1-1000 Minute)	6

[APPLY]   [CANCEL]

7

Here are descriptions of each setup item:

User Name (1):	*Please input the user name assigned by your Internet service provider here.*
Password (2):	*Please input the password assigned by your Internet service provider here.*
Service Name (3):	*Please give a name to this Internet service (this is optional).*
MTU (4):	*Please input the MTU value of your network connection here (If you do not know it, you can use the default value).*
Connection Type (5):	*Please select the type of Internet connection you wish to use.*
	Continuous – The connection will be kept on at all times. If the connection is interrupted, the router will re-connect automatically.
	Connect On-Demand – Only connect when you want to surf the Internet. "Idle Time Out" is set to stop the connection when network traffic is not sending or receiving after a certain amount of time.
	Manual – After you have selected this option, you will see the "Connect" button and "Disconnect" button; click "'Connect" and the router will connect to the ISP. If you want to stop the connection, please click the "Disconnect" button.
Idle Time Out (6):	*If you have set the connection type to "Connect-On-Demand", please input the idle time out.*

After you finish with all settings, please click 'Apply' (7) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE] [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.4 Setup procedure for 'PPTP':

PPTP requires two types of settings: WAN interface setting (setup IP address) and PPTP setting (PPTP user name and password). Here we start with the WAN interface setting:

- **WAN Interface Settings**
  - ⊙ Obtain an IP Address Automatically

Host Name :	
MAC Address :	0019B963E0E4 [Clone MAC]

  - ○ Use The Following IP Address

IP Address :	0.0.0.0
Subnet Mask :	0.0.0.0
Default Gateway :	0.0.0.0

Select the way you obtain an IP address from your service provider here. You can choose 'Obtain an IP address automatically' (equal to DHCP, please refer to 'Cable Modem' section above), or 'Use the following IP address' (i.e. static IP address)

WAN interface settings must be correctly set or the Internet connection will fail, even if PPTP settings are correct. Please contact your Internet service provider if you do not know what you should place in these fields.

Now please go to the PPTP settings section:

Here are descriptions of each setup item:

User Name (1):   *Please input the user ID (user name) assigned by your Internet service provider here.*

Password (2):   *Please input the password assigned by your Internet service provider here.*

PPTP Gateway (3):   *Please input the PPTP gateway IP address assigned by your Internet service provider here.*

Connection ID (4):   *Please input the connection ID here (this is optional and you can leave it blank)*

MTU (5):   *Please input the MTU value of your network connection here. (If you do not know it, you can use the default value.)*

BEZEQ-ISRAEL (6): If you are connecting to the BEZEQ network in Israel, please enable this function.

Connection type (7):   *Please select the type of Internet connection you wish to use (please refer to section 6.3 for detailed descriptions)*

Idle Time Out (8):   *Please input the idle time out of Internet connection you wish to use (refer to section 6.3 for detailed descriptions).*

When you finish with all settings, please click 'Apply' (9) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.5 Setup procedure for 'L2TP':

Here are descriptions of each setup item:

User ID (1):	*Please input the user ID (user name) assigned by your Internet service provider here.*
Password (2):	*Please input the password assigned by your Internet service provider here.*
L2TP Gateway (3):	*Please input the PPTP gateway IP address assigned by your Internet service provider here.*
MTU (4):	*Please input the MTU value of your network connection here. (If you do not know it, you can use the default value).*
Connection type (5):	*Please select the type of Internet connection you wish to use (please refer to section 6.3 for detailed descriptions.*
Idle Time Out (6):	*Please input the idle time out of Internet connection you wish to use (refer to section 6.3 for detailed descriptions).*

When you finish with all settings, please click 'Apply' (7) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE] [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.6 Setup procedure for 'Telstra Big Pond':

Telstra Big Pond 🦘

If your Internet service is provided by Telstra Big Pond in Australia, you will need to enter your information below, This information is provided by Teistra BigPond.

User Name :	[ ]	1
Password :	[ ]	2

☐ Assign login server manually 3

| Server IP Address : | 0.0.0.0 | 4 |

[APPLY] [CANCEL]
5

This setting only works if you are using Telstra big pond's network service in Australia. You need to input:

User Name (1):   *Please input the user name assigned by Telstra.*

Password (2):   *Please input the password assigned by Telstra.*

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Assign login   *Check this box to choose login server yourself.*
server manually (3):

Server IP Address (4):Please input the IP address of login server here.

When you finish with all settings, click 'Apply' (5) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

CONTINUE   APPLY

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.7 Setup procedure for 'DNS':

If you select '*Dynamic IP*' or '*PPPoE*' as your Internet connection method, at least one DNS server's IP address should be assigned automatically. However, if you have a preferred DNS server or your service provider did not assign the IP address of the DNS server for any reason, you can input the IP address of the DNS server here.

Here are descriptions of each setup item:

DNS Address (1):   *Please input the IP address of DNS server provided by your service provider.*

Secondary   *Please input the IP address of another DNS*
DNS Address (2):   *server provided by your service provider (this is optional).*

NOTE: Only IP addresses can be entered here; *DO NOT* use the hostname of DNS server! (i.e. only numeric characters and dots are accepted)

10.20.30.40…………………………………………………………………… Correct

After you finish with all settings, please click 'Apply' (3) button and the following message will be displayed on your web browser:

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings

take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.8 Setup procedure for 'DDNS':

DDNS (Dynamic DNS) is an IP-to-Hostname mapping service for Internet users who do not have a static (fixed) IP address. It will be a problem when such a user wants to provide services to other users on Internet, because their IP address will vary every time they are connected to the Internet and other users will not be able to know which IP address they are using at any given time.

This router supports DDNS service of several service providers, for example:

DynDNS (http://www.dyndns.org)
TZO (http://www.tzo.com)

Please go to one of the DDNS service provider's webpages listed above, and get a free DDNS account by following the instructions given on their webpage.

DDNS

DDNS (DynamicDNS) allows users to map the static domain name to a dynamic IP address. You must get a account, password and your static domain name from the DDNS service providers. Our products have DDNS support for www.dyndns.org and www.tzo.com now.

Dynamic DNS :	○ Enable ⊙ Disable	1
Provider :	DynDNS ▽	2
Domain Name :		3
Account :		4
Password / Key :		5

APPLY   CANCEL
6

Here are descriptions of each setup item:

Dynamic DNS (1):	*If you want to enable DDNS function, please select 'Enabled'; otherwise please select 'Disabled'.*
Provider (2):	*Select your DDNS service provider here.*
Domain Name (3):	*Input the domain name you obtained from DDNS service provider.*
Account / E-Mail (4):	*Input account or email of DDNS registration.*
Password / Key (5):	*Input DDNS service password or key.*

After you finish with all settings, please click 'Apply' (6) button and the following message will be displayed on your web browser:

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

6.9 Setup procedure for 'WISP':

If your network service is provided through a wireless network, please select this mode. After you have connected the X650 to the access point of your service provider wirelessly, please setup the WAN connection type on the WAN page.

WISP

In this mode, all ethernet ports are bridged together and the wireless client will connect to ISP access point. The NAT is enabled and PCs in ethernet ports share the same IP to ISP through wireless LAN. You must set the wireless to client mode first and connect to the ISP AP in Site-Survey page. The connection type can be setup in WAN page by using PPPOE, DHCP client, PPTP client or static IP.

◯ Disable ◉ Enable **1**

- **Basic Settings**

SSID :		**2**
Site Survey :	◉ 2.4G ◯ 5G [Site Survey]	**3**
	4 **5**	

- **Security Settings**

| Encryption : | Disable ▾ | **6** |

[APPLY]   [CANCEL]

7

Here are descriptions of each setup item:

Disable/Enable/ Enable (Station Mode Only) (1):	*There are three selections for disabling or enabling wireless ISP functions.*
	Disable: disable this function.
	Enable: enable this function and the X650 can also act as an access point and allow wireless clients to attach to it for WAN access service. **Note: In this mode, if you are informed by your wireless ISP that the wireless settings of the access point have been changed, please use this page for matching the settings.**
SSID (2):	*This is the name of your wireless network. Input the SSID name that your wireless ISP provides to you.*

Channel Number (3): This is the radio frequency used to transmit and receive the wireless signal. Wireless devices in the same network should follow the same settings. Select the channel designated by your wireless ISP.

Wireless Band (4): Check with your Wireless ISP service provider whether it is the 2.4GHz or the 5GHz wireless band that is used for the network and then select the wireless band here.

Site Survey (5): Click 'Select Site Survey' button, then a "Wireless Site Survey Table" will pop up. It will list all available access points nearby. Select the access point designated by your wireless ISP in the table and the X650 will join the wireless network through this access point.

Security Setting (6): If the access point enables wireless security, you have to follow the same settings in order to utilize the access point. Click to set security settings for this connection (Please go to section '8.3 Wireless Security' for detailed instructions).

After you finish with all settings, please click 'Apply' (7) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved

values, please click the 'Cancel' button.

7 Wired LAN Configurations

Before all computers using a wired Ethernet connection (i.e. those computers that connect to this router's LAN ports 1 through 4 by Ethernet cable) can communicate with each other and access internet, they must have a valid IP address.

There are two ways to assign IP addresses to computers: static IP address (set the IP address for every computer manually), and dynamic IP address (IP address of computers will be assigned by router automatically. It's recommended for most of computers to use dynamic IP address as it saves a lot of time on setting IP addresses for every computer, especially when there are a lot of computers in your network; for servers and network devices that provide services to other computers and users that come from the Internet, static IP address should be used so that other computers can locate the server.

Suggestions on IP address numbering plan:

If you have no idea how to define an IP address plan for your network, here are some suggestions.

1. **A valid IP address has 4 fields: a, b, c, and d; for most home and company users, it's suggested to use 192.168.c.d, where c is an integer between 0 and 254, and d is an integer between 1 and 254. This router is capable to work with up to 253 clients, so you can set 'd' field of the router IP address as 1 or 254 (or any number between 1 and 254), and pick a number between 0 and 254 for field 'c'.**
2. **In most cases, you should use '255.255.255.0' as your subnet mask, which allows up to 253 clients (this also utilizes the X650's capability of working with up to 253 clients).**
3. **For all servers and network devices that provide services to other people (like Internet service, print service, and file service), they should use static IP address. Give each of them a unique number between 1 and 253, and maintain a list, so that everyone can locate those servers easily.**
4. **For computers that are not dedicated to providing specific services to others, they should use dynamic IP address.**

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If you do not understand the descriptions listed above, don't worry! We will provide recommended setup values below.

Please follow these instructions to set wired LAN parameters:

Please click 'LAN' menu on the left of the web management interface; there are three setup groups here: 'LAN IP', 'DHCP Server', and 'Static DHCP Leases Table'. Here are the setup instructions for each of them:

7.1 LAN IP section:

Here are descriptions of each setup item:

IP address (1):	*Please input the IP address of this router.*
Subnet Mask (2):	*Please input subnet mask for this network.*
802.1d Spanning Tree (3):	*If you wish to activate 802.1d spanning tree function, select 'Enabled' for setup item '802.1d Spanning Tree', or set it to 'Disabled'*
DHCP Server (4):	*If you want to activate DHCP server function of this router, select 'Enabled', or set it to 'Disabled'.*

Recommended Value if you don't know what to place in field:

IP Address: 192.168.1.1
Subnet Mask: 255.255.255.0
802.1d Spanning Tree: Disabled
DHCP Server: Enabled

7.2 DHCP Server:

These settings are only available when 'DHCP Server' in 'LAN IP' section is 'Enabled'; here are descriptions of each setup item:

Lease Time (1):   *Please choose a lease time (the duration of time that every computer can keep a specific IP address) of every IP address assigned by this router from a dropdown menu.*

Start IP (2):   *Please input the start IP address of the IP range.*

End IP (3):   *Please input the end IP address of the IP range.*

Domain Name (4): *If you wish, you can also input the domain name for your network (This is optional).*

Recommended Value if you don't know what to place in fields:

Lease Time: Two Weeks (or 'Forever', if you have less than 20 computers)
Start IP: 192.168.1.100
End IP: 192.168.1.200
Domain Name: (leave it blank)

NOTE:
1. The number of the last field ('d' field) of 'End IP' must be greater than 'Start IP', and cannot be identical to router's IP address.
2. The former three fields of IP address of 'Start IP', 'End IP', and 'IP Address of 'LAN IP' section ('a', 'b', and 'c' field) should be the same.
3. These settings will affect wireless clients too.

7.3 Static DHCP Leases Table:

This function allows you to assign a static IP address to a specific computer forever, so you do not have to set the IP address for a computer and still enjoy the benefits of using a DHCP server. A maximum of 16 static IP addresses can be assigned here.

(If you set 'Lease Time' to 'forever' in the 'DHCP Server' section, you can also assign an IP address to a specific computer permanently; however, you will not be able to assign a certain IP address to a specific computer since IP addresses are be assigned in random order this way).

Here are descriptions of each setup item:

Enable Static DHCP Leases (1):	*Check this box to enable this function, otherwise uncheck it to disable this function.*
MAC Address (2):	*Input the MAC address of the computer or network device (total of 12 characters, with characters ranging from 0 to 9, and from a to f, like '001122aabbcc')*
IP address (3):	*Input the IP address you want to assign to this computer or network device*
'Add' (4):	*After you inputted the MAC address and IP address pair, click this button to add the pair to the static DHCP leases table.*

If you want to remove all of the characters you just entered, click 'Clear'. After you clicked 'Add', the MAC address and IP address mapping will be

added to the 'Static DHCP Leases Table' section.

If you want to delete a specific item, please check the 'Select' box of a MAC address and IP address mapping (1), then click 'Delete' button (2); if you want to delete all mappings, click 'Delete All' (3).

After you finish all LAN settings, please click 'Apply' button on this page. After you click 'Apply', the following message will be displayed on your web browser:

Please click 'Continue' to return to previous setup menu and continue router setup, or click 'Apply' to reboot the router so that settings will take effect (Please wait about 40 seconds for router to reboot).

8 Wireless LAN Configurations

If your computer, PDA, game console, or other network device is equipped with wireless network interface, you can use the wireless function of the X650 to connect them to Internet and share resources with other computers that have a wired-LAN connection. You can also use the built-in security functions to protect your network from being invaded by malicious intruders.

This router supports both 2.4GHz and 5GHz wireless bands simultaneously; the wireless settings for both wireless bands are almost the same. The following sections will highlight the differences between these two selections.

Go to 'General Setup' page and select '2.4GHz Wireless' or '5GHz Wireless' to configure the wireless settings for the different wireless radio types.
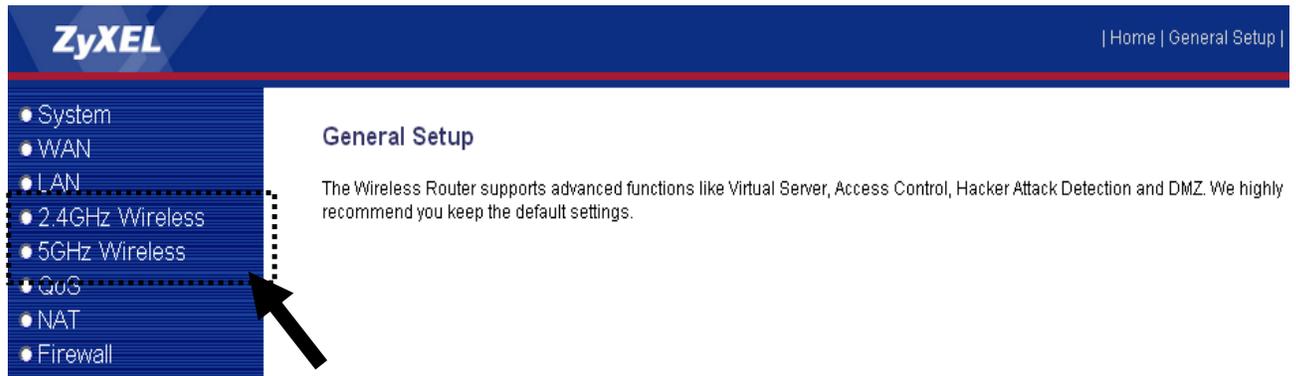
Please follow these instructions to set wireless parameters:

Please click '2.4GHz Wireless' or '5GHz Wireless' menu on the left of the web management interface and the following message will be displayed on your web browser. You must enable wireless function of this router, or the wireless interface of this router will not function. Please select 'Enable' (1), then click 'Apply' (2) button.

If you want to disable wireless function, please switch hardware button to

turn off wireless radio at rear panel of device.

Wireless

The Wireless Router can be quickly configured as a wireless access point for roaming clients by setting the access identifier and channel number. It also supports data encryption and client filtering.

Wireless Module : ⊙ Enable ○ Disable

1

[APPLY]   2

After you click 'Apply'(2), the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings take effect (Please wait about 40 seconds for router to reboot).

8.1 Basic Wireless Settings

Please click '2.4GHz Wireless' or '5GHz Wireless' menu on the left of the web management interface, then click 'Basic Settings', and the following message will be displayed on your web browser:

2.4GHz Wireless

Basic Settings

This page allows you to define ESSID, and Channel for the wireless connection. These parameters are used for the wireless stations to connect to the Access Point.

Mode :	Access Point
Band :	2.4 GHz (B+G+N)
SSID :	default
Channel Number :	7
Associated Clients :	Show Active Clients

APPLY   CANCEL

5GHz Wireless

Basic Settings

This page allows you to define ESSID, and Channel for the wireless connection. These parameters are used for the wireless stations to connect to the Access Point.

Mode :	Access Point
Band :	5 GHz (A+N+AC)
SSID :	default
Channel Number :	36
Associated Clients :	Show Active Clients

APPLY   CANCEL

The X650 can work in 6 different modes:

1) *Access Point*: Standard wireless AP .

2) *Station-Infrastructure*: Configure the X650 to work with an Ethernet device (such as a TV, Game player, HDD&DVD) to enable the Ethernet device to be a wireless station.

3) *AP Bridge-Point to Point*: Connect the X650 with another wireless router to expand the scope of your network.

4) *AP Bridge-Point to Multi-Point*: Connect the X650 with up to four other wireless routers to expand the scope of your network.

5) *AP Bridge-WDS*: Connect the X650 with up to four WDS-capable wireless routers to expand the scope of your network.

6) *Universal Repeater*: The X650 can act as Station and AP at the same time. It can use its Station function to connect to a Root AP and use its AP function to service all wireless stations within its coverage.

> **NOTE: For 'AP Bridge-Point to Point' and 'AP Bridge-Point to Multi-Point' mode, wireless router is operated in wireless bridge dedicated mode –   this means that the X650 is only being used to expand the scope of network and no wireless clients will be accepted. If you want to use your wireless router to expand the scope of network and also accept wireless clients, please select 'AP Bridge-WDS' or 'Universal Repeater' mode.**

Please select a proper operation mode you want to use from 'Mode' dropdown menu (1), and continue on with other operation mode specific settings:

      Access Point   - Please go to section 8.1.1
      Station-Infrastructure   - Please go to section 8.1.2
      AP Bridge-Point to Point   - Please go to section 8.1.3
      AP Bridge-Point to Multi-Point - Please go to section 8.1.4
      AP Bridge-WDS   - Please go to section 8.1.5
      Universal Repeater   - Please go to section 8.1.6

8.1.1 Setup procedure for 'Access Point':

Please select the radio band you want to use from the 'Band' dropdown menu (2), and the following message will be displayed:

2.4GHz Access Point Settings

Basic Settings

This page allows you to define ESSID, and Channel for the wireless connection. These parameters are used for the wireless stations to connect to the Access Point.

Mode :	Access Point	1
Band :	2.4 GHz (B+G+N)	2
SSID :	default	3
Channel Number :	7	4
Associated Clients :	Show Active Clients	5

APPLY   CANCEL

5GHz Access Point Settings

Basic Settings

This page allows you to define ESSID, and Channel for the wireless connection. These parameters are used for the wireless stations to connect to the Access Point.

Mode :	Access Point	1
Band :	5 GHz (A+N+AC)	2
SSID :	default	3
Channel Number :	36	4
Associated Clients :	Show Active Clients	5

APPLY   CANCEL

Here are descriptions of each setup item:

Band (2):   *Please select the radio band from one of following options:*

          2.4GHz Band
          2.4 GHz (B): this mode only allows 802.11b wireless network clients to connect to X650 (maximum transfer rate 11Mbps).
          2.4 GHz (N): this mode only allows 802.11n wireless network clients to connect to X650 (maximum transfer rate 300Mbps).

2.4 GHz (B+G): this mode only allows 802.11b and 802.11g wireless network clients to connect to X650 (maximum transfer rate 11Mbps for 802.11b clients, and maximum 54Mbps for 802.11g clients).

2.4 GHz (G): this mode only allows 802.11g wireless network clients to connect to X650 (maximum transfer rate 54Mbps).

2.4 GHz (B+G+N): this mode allows 802.11b, 802.11g, and 802.11n wireless network clients to connect to X650 (maximum transfer rate 11Mbps for 802.11b clients, maximum 54Mbps for 802.11g clients, and maximum 300Mbps for 802.11n clients).

5GHz Band
5GHz (A): this mode allows 802.11a wireless network clients to connect to X650 (maximum transfer rate 54Mbps for 802.11a clients).

5GHz (N): this mode allows 802.11n wireless network clients to connect to X650 (maximum transfer rate 300Mbps for 802.11n clients).

5GHz (A+N): this mode allows 802.11a and 802.11n wireless network clients to connect to X650 (maximum transfer rate 54Mbps for 802.11a clients, and maximum 300Mbps for 802.11n clients).

5GHz (AC): this mode allows 802.11ac wireless network clients to connect to X650 (maximum transfer rate 867Mbps for 802.11ac clients).

5GHz (N+AC): this mode allows 802.11n and 802.11ac wireless network clients to connect to X650 (maximum transfer rate 300Mbps for 802.11n clients, and maximum 867Mbps for 802.11ac clients).

5GHz (A+N+AC): this mode allows 802.11a, 802.11n and 802.11ac wireless network clients to connect to X650 (maximum transfer rate 54Mbps for 802.11a clients, maximum 300Mbps for 802.11n clients, and maximum 867Mbps for 802.11ac clients).

NOTE: For 802.11n/11ac mode: The router is operating in a 2T2R Spatial Multiplexing MIMO configuration.

SSID (3):   *This is the name of the wireless router. You can type any alphanumerical characters here (maximum 32 characters). SSID is used to identify your own wireless router from others when there are other wireless routers in the same area. Default SSID is 'default', it's recommended to change default SSID value to one that is meaningful to you, like myhome, office_room1, etc.*

Channel Number (4): *Please select a channel from the dropdown list of 'Channel Number'. You can choose any channel number you want and almost all wireless clients can locate the channel you are using automatically without any problem. However, it is still useful to remember the channel number you use as some wireless clients support manual channel number select, and this would help in certain scenarios when there is a radio communication problem.*

The available channel numbers for the following bands are:

2.4GHz Band
The available channel numbers are 1 to 13 for European countries, 1 to 11 for USA.

> *5GHz Band*
> *The available channel numbers are 36 to 140 (36~ 48, 52~64, 100~ 140) for European countries, and 36 to 165 (36~48, 149~165) for USA.*

Associated Clients (5): Click 'Show Active Clients' button and an "Active Wireless Client Table" will pop up. Here you can see the status of all active wireless stations connected to the access point.

NOTE: If you don't have a special reason to limit the type of allowed wireless client, it is recommended to choose '2.4GHz (B+G+N) and 5GHz (A+N+AC) to maximize wireless client compatibility.

TIPS: You can try to change the channel number to another one if you think the data transfer rate is too slow. There could be some other wireless routers using the same channel, which will disturb the radio communication between the wireless client and the X650.

8.1.2 Setup procedure for 'Station-Infrastructure':

In this mode, you can connect the router to an Ethernet device (such as TV, Game player, HDD&DVD) and enable the Ethernet device to be a wireless station and join to a wireless network through an access point or AP router.

2.4GHz Station (Infrastructure) Settings

Mode :	Station (Infrastructure)	1
Band :	2.4 GHz (B+G+N)	2
SSID :	default	3
Site Survey :	Site Survey	4

APPLY   CANCEL

5GHz Station (Infrastructure) Settings

Mode :	Station (Infrastructure)	1
Band :	5 GHz (A+N+AC)	2
SSID :	default	3
Site Survey :	Site Survey	4

APPLY   CANCEL

Here are descriptions of each setup item:

Band (2):	*Select the band you want to use.*
SSID (3):	*This is the name of the wireless network. You can type the SSID of the network you would like to connect to here.*
Site Survey (4):	*When you use the X650 as a wireless station for Ethernet network devices to have wireless capability, you have to associate it with a working access point. Click 'Select Site Survey' button, then a "Wireless Site Survey Table" will pop up. It will list all available access points nearby. You can select an access point from the table and it will join wireless LAN through this access point.*

8.1.3 Setup procedure for 'AP Bridge-Point to Point':

In this mode, you can connect the X650 with another to combine two access points and expand the scope of your wireless network, and all clients (wired only – AP will not accept wireless clients in this mode) of the two wireless routers will think they are on the same physical network. This function is very convenient when you need to connect two networks between two buildings. Here are instructions on how to connect two wireless routers together:

2.4GHz AP Bridge (Point to Point) Settings

Mode :	AP Bridge (Point to Point)	1
Band :	2.4 GHz (B+G+N)	2
Channel Number :	7	3
MAC Address 1 :	000000000000	4
Security Settings :	Security Settings	5

APPLY   CANCEL

5GHz AP Bridge (Point to Point) Settings

Mode :	AP Bridge (Point to Point)	1
Band :	5 GHz (A+N+AC)	2
Channel Number :	36	3
MAC Address 1 :	000000000000	4
Security Settings :	Security Settings	5

APPLY   CANCEL

NOTE: Two wireless routers must use the same mode, band, channel number, and security setting!

Here are descriptions of each setup item:

Band (2):	*Select the band you want to use (two wireless routers must use the same settings).*
Channel Number (3):	*Select the channel you want to use (two wireless routers must use the same settings).*
MAC address 1(4):	*Input the MAC address of another wireless router.*
Security Settings (5):	*Click to set security for this connection (Please go to section '8.3 Wireless Security' for detailed instructions).*

8.1.4 Setup procedure for 'AP Bridge-Point to Multi-Point':

In this mode, you can connect your X650 with at least four other wireless routers to expand the scope of wireless network, and all clients (wired only – AP will not accept wireless clients in this mode) of the two routers will think they are on the same physical network.

2.4GHz AP Bridge (Point to Multi-Point) Settings

Mode :	AP Bridge (Point to Multi-Point) ⌄	1
Band :	2.4 GHz (B+G+N) ⌄	2
Channel Number :	7 ⌄	3
MAC Address 1 :	000000000000	4
MAC Address 2 :	000000000000	5
MAC Address 3 :	000000000000	6
MAC Address 4 :	000000000000	7
Security Settings :	Security Settings	8

APPLY   CANCEL

5GHz AP Bridge (Point to Multi-Point) Settings

Here are descriptions of each setup item:

Band (2):	*Select the band you want to use (all the wireless routers must use the same settings).*
Channel Number (3):	*Select the channel you want to use (all the wireless routers must use the same settings).*
MAC address 1 to 4 (4 - 7):	*Input the MAC address(es) of other wireless router(s).*
Security Setting (8):	*Click to set security settings for this connection (Please go to section '8.3 Wireless Security' for detailed instructions).*

8.1.5 Setup procedure for 'AP Bridge – WDS'

In this mode, you can expand the scope of network by combining up to four other access points together while still allowing every access point to accept wireless clients.

NOTE: For WDS mode, the output signal nature is the same as that of normal AP mode.

2.4GHz AP Bridge (WDS) Settings

Mode :	AP Bridge (WDS)	1
Band :	2.4 GHz (B+G+N)	2
SSID :	default	3
Channel Number :	7	4
Associated Clients :	Show Active Clients	5
MAC Address 1 :	000000000000	6
MAC Address 2 :	000000000000	7
MAC Address 3 :	000000000000	8
MAC Address 4 :	000000000000	9
Security Settings :	Security Settings	10

APPLY   CANCEL

5GHz AP Bridge (WDS) Settings

Mode :	AP Bridge (WDS)	1
Band :	5 GHz (A+N+AC)	2
SSID :	default	3
Channel Number :	36	4
Associated Clients :	Show Active Clients	5
MAC Address 1 :	000000000000	6
MAC Address 2 :	000000000000	7
MAC Address 3 :	000000000000	8
MAC Address 4 :	000000000000	9
Security Settings :	Security Settings	10

APPLY   CANCEL

Here are descriptions of each setup item:

Band (2):   *Select the band you want to use (all the wireless routers must use the same settings).*

SSID (3): Input the SSID of your wireless router (the setting should be the same with other wireless routers for the convenience of roaming).

Channel Number (4): Select the channel you want to use (all the wireless routers must use the same settings).

Associated Clients (5): Click 'Show Active Clients' button, then an "Active Wireless Client Table" will pop up. Here you can see the status of all active wireless stations connected to the access point.

MAC address 1 to 4 (6 - 9): Input the MAC address of other wireless routers.

Security Setting (10): Click to set security settings for this connection (Please go to section '8.3 Wireless Security' for detailed instructions).

8.1.6 Setup procedure for 'Universal Repeater'

In this mode, the X650 can act as a wireless repeater; it can be a Station and AP at the same time. It can use its Station function to connect to a Root AP and use its AP function to service all wireless stations within its coverage.

NOTE: For Repeater Mode, this router will demodulate the received signal, checking if this signal is noise for the operating network, then have the signal modulated and amplified again. The output power of this mode is the same as that of WDS and normal AP mode.

2.4GHz Universal Repeater Settings

5GHz Universal Repeater Settings

Here are descriptions of each setup item:

Band (2):	*Select the band you want to use (all the wireless routers must use the same settings).*
SSID (3):	*This is the name of the wireless router. You can type any alphanumerical characters here (maximum 32 characters). SSID is used to differentiate your wireless router from others when there are other wireless routers in the area. Default SSID is 'default'; it is recommended to change the default ESSID value to one that is meaningful to you, like myhome, office_room1, etc.*
Channel Number (4):	*Select the channel you want to use (all the wireless clients must use the same settings).*

Associated Clients (5): Click 'Show Active Clients' button, then an "Active Wireless Client Table" will pop up. You can see the status of all active wireless stations connected to the access point.

Root AP SSID (6): In 'Universal Repeater' mode, this device can act as a station and connect to a Root AP. You should assign the SSID of the Root AP here or click the 'Select Site Survey' button to choose a Root AP.

Site Survey (7): Click 'Select Site Survey' button, then a "Wireless Site Survey Table" will pop up. It will list all available access points nearby. You can select an access point from the table and have the X650 join wireless LAN through this access point.

After you finish the wireless settings, please click 'Apply' button, after you click 'Apply', the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

    [CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with router setup, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

8.2 Advanced Wireless Settings

This router provides some advanced control of wireless parameters; if you want to configure these settings, please click '2.4GHz Wireless' or '5GHz Wireless' menu on the left of web management interface, then click 'Advanced

Settings', and the following message will be displayed on your web browser:

2.4GHz Advanced Settings

Set the time zone of the Wireless Router. This information is used for log entries and firewall settings.

Fragment Threshold :	2346 (256-2346)	1
RTS Threshold :	2347 (0-2347)	2
Beacon Interval :	100 (20-1024 ms)	3
DTIM Period :	3 (1-10)	4
Data Rate :	Auto	5
N Data Rate :	Auto	6
Channel Width :	○ Auto 20/40 MHZ ◉ 20 MHZ	7
Preamble Type :	◉ Short Preamble ○ Long Preamble	8
Broadcast Essid :	◉ Enable ○ Disable	9
CTS Protect :	◉ Auto ○ Always ○ None	10
Tx Power:	100 %	11
WMM :	◉ Enable ○ Disable	12

APPLY   CANCEL

13

5GHz Advanced Settings

Set the time zone of the Wireless Router. This information is used for log entries and firewall settings.

Fragment Threshold :	2346 (256-2346)
RTS Threshold :	2347 (0-2347)
Beacon Interval :	100 (20-1024 ms)
DTIM Period :	3 (1-10)
Data Rate :	Auto
N Data Rate :	Auto
Channel Width :	○ 20/40/80 MHZ ○ 20/40 MHZ ◉ 20 MHZ
Preamble Type :	◉ Short Preamble ○ Long Preamble
Broadcast Essid :	◉ Enable ○ Disable
CTS Protect :	◉ Auto ○ Always ○ None
Tx Power:	100 %
WMM :	◉ Enable ○ Disable

APPLY   CANCEL

Here are descriptions of each setup item:

Fragment Threshold (1):	*Set the Fragment threshold of wireless radio.* **Do not modify default value if you do not know correct value (default value is 2346).**
RTS Threshold (2):	*Set the RTS threshold of wireless radio.* **Do not modify default value if you do not know correct value (default value is 2347).**
Beacon Interval (3):	*Set the beacon interval of wireless radio.* **Do not modify default value if you do not know correct value (default value is 100).**
DTIM Period (4):	*Set the DTIM period of wireless radio.* **Do not modify default value if you do not know correct value (default value is 3).**
Data Rate (5):	*Set the wireless data transfer rate to a certain value. Since most wireless devices will negotiate with each other and pick a proper data transfer rate automatically,* **it is not necessary to change this value unless you know what will happen after modification.**
N Data Rate (6):	*Same as above, but only for 802.11n & 802.11ac clients.*
Channel Width (7):	*Set channel width of wireless radio.* **You can modify default value if you know what channel width you need (default setting is 'and20 MHz').**
Preamble Type (8):	*Set the type of preamble,* **do not modify default value if you do not know correct value (default setting is 'Short Preamble').**
Broadcast ESSID (9):	*Decide if the wireless router will broadcast its own ESSID or not. You can hide the ESSID of your wireless router (set the option to 'Disable') so only people who know the ESSID of your wireless router can connect to it.*

CTS Protect (10):   *Enabling this setting will reduce the chance of radio signal collisions between 802.11b and 802.11g/n wireless access points. It is recommended to set this option to 'Auto' or 'Always'. However, if you set to 'None', your wireless router should still be able to work fine.*

Tx Power (11):   *You can set the output power of wireless radio. Unless you are using this wireless router in a really big space, you may not have to set output power to 100%. **This will enhance security (far away malicious / unknown users will not be able to reach your wireless router).***

WMM (12):   *The short form of Wi-Fi MultiMedia; it will enhance the data transfer performance of multimedia contents when they are being transferred over wireless network. **If you do not know what it is / are not sure if you need it, it is safest to set this option to 'Enable'.***

After you finish these wireless settings, please click 'Apply' button, and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to previous setup menu and continue with router setup, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

8.3 Wireless Security

It is very important to set wireless security settings properly! If you do not, hackers and malicious users can reach your network and valuable data without your consent and cause serious network security problems.

To set wireless security settings, Please click '2.4GHz Wireless' or '5GHz Wireless' menu on the left of the web management interface, then click 'Security Settings', then follow these instructions to set wireless security settings:

Please select an encryption method from 'Encryption' dropdown menu, there are four options:

8.3.1 Disable wireless security

When you select this mode, data encryption is disabled and every wireless device in proximity will be able to connect your wireless router if no other security measure is enabled (like MAC address access control [see section 8.4] or disable ESSID broadcast).

Only use this option when you want to allow anyone to use your wireless router and you do not care if someone reads the data you transfer over the network without your consent.

8.3.2 WEP - Wired Equivalent Privacy

When you select this mode, the X650 will use WEP encryption, and the following setup menu will be shown on your web browser:

Here are descriptions of each setup item:

Key Length (2):	*There are two types of WEP key length: 64-bit and 128-bit. Using '128-bit' is safer than '64-bit', but will also reduce some data transfer performance.*
Key Format (3):	*There are two types of key format: ASCII and Hex. When you select a key format, the number of characters of key will be displayed. For example, if you select '64-bit' as a key length, and 'Hex' as key format, you will see the message at the right of 'Key Format' is 'Hex (10 characters), which means the length of the WEP key is 10 characters.*
Default Tx Key (4):	*You can set up to four sets of WEP keys, and you can decide which key is being used by default here. **If you do not know which one you should use, select 'Key 1'.***
Encryption Key 1 to 4 (5-8):	*Input WEP key characters here (the number of characters must be the same as the number displayed in the 'Key Format' field. You can use any alphanumerical characters (0-9, a-z, and A-Z) if you select 'ASCII' key*

format, and if you select 'Hex' as key format, you can use characters 0-9, a-f, and A-F. You must enter at least one encryption key here, and if you entered multiple WEP keys, they should not be the same as each other.

Enable 802.1x
Authentication (9):

IEEE 802.1x is an authentication protocol. Every user must use a valid account to login to this wireless router before accessing the wireless LAN. The authentication is processed by a RADIUS server. This mode only authenticates users by IEEE 802.1x, but it does not encrypt the data during communication. If there is a RADIUS server in your environment, please enable this function. Check this box and another sub-menu will appear:

RADIUS Server
IP address (11):

Please input the IP address of radius server here

RADIUS Server
Port (12):

Please input the port number of radius server here.

RADIUS Server
Password (13):

Please input the port number of radius password here.

TIPS: Some examples of WEP key
(Do not use these examples; use one of your own!):

    ASCII (5 characters): pilot   phone   23561   2Hyux #@xmL
    ASCII (13 characters): digitalFAMILY   82Jh26xHy3m&n
    Hex (10 characters): 287d2aa732   1152dabc85
    Hex (26 characters): 9284bcda8427c9e036f7abcd84

To improve security level, do not use words that can be found in a dictionary or are too easy to remember! ('pilot' and 'phone' listed above are bad examples; just intended to show you how a WEP key looks). Wireless clients will remember the WEP key, so you only have to input the WEP key on the wireless client once, and it is worth it to use complicated WEP keys to improve security level.

After you finish with WEP settings, please click 'Apply' button (10) and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue on with setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

8.3.3 Wi-Fi Protected Access (WPA):

When you select this mode, the wireless router will use WPA encryption and the following setup menu will be shown on your web browser:

Here are descriptions of each setup item:

WPA Unicast Cipher Suite (2):	*Please select a type of WPA cipher suite.* *Available options are: WPA (TKIP), WPA2 (AES), and WPA2 Mixed. You can select one of them, but you have to make sure your wireless client supports the cipher you selected.*
Pre-shared Key Format (3):	*Select the type of pre-shared key; you can select Passphrase (8 or more alphanumerical characters, up to 63), or Hex (64 characters of 0-9, and a-f).*
Pre-shared Key (4):	*Please input the WPA passphrase here. It is not recommended to use a word that can be found in a dictionary for security reasons.*

After you finish with WPA Pre-shared key settings, please click 'Apply' button (5) and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE] [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with setup procedures, or click 'Apply' to reboot the router so that settings take effect (Please wait about 40 seconds for router to reboot).

> **NOTE: Some wireless clients (especially those manufactured before 2003) only support WEP or WPA (TKIP) cipher. A driver upgrade would be needed for those clients to use WPA and WPA2 encryption.**

8.3.4 WPA RADIUS:

If you have a RADIUS server, this router can work with it to provide safer wireless authentication.

Encryption :	WPA RADIUS	1
WPA Unicast Cipher Suite :	⦿ WPA(TKIP) ◯ WPA2(AES) ◯ WPA2 Mixed 2	
RADIUS Server IP Address :		3
RADIUS Server Port :	1812 4	
RADIUS Server Password :		5
	[APPLY] [CANCEL]	
	6	

Here are descriptions of each setup item:

WPA Unicast Cipher Suite (2):	*Please select a type of WPA cipher suite.* *Available options are: WPA (TKIP), WPA2 (AES), and*

> *WPA2 Mixed. You can select any of them, but you have to make sure your wireless client supports the cipher you selected.*

RADIUS Server IP address (3):	*Please input the IP address of your Radius authentication server here.*
RADIUS Server Port (4):	*Please input the port number of your Radius authentication server here (**Default setting is 1812**).*
RADIUS Server Password (5):	*Please input the password of your Radius authentication server here.*

After you finish with all settings, please click 'Apply' (6) button and the following message will be displayed on your web browser:

```
Save setting successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the
system for changes to take effect


   [ Continue ]      [ Apply ]
```
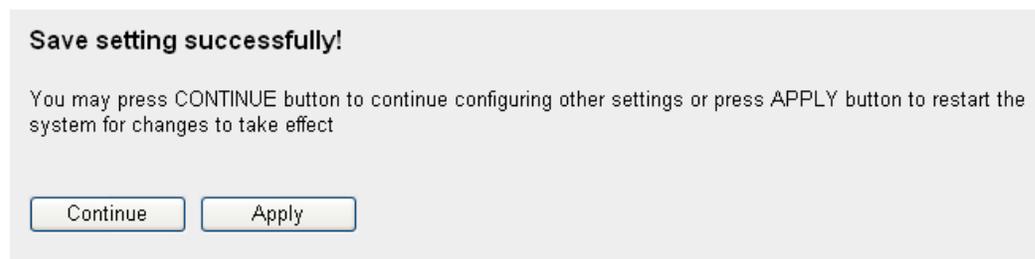
Please click 'Continue' to return to previous the setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so that settings will take effect (Please wait about 40 seconds for router to reboot).

8.4 Wireless Access Control

This function will help you prevent unauthorized users from connecting to your wireless router; only wireless devices with the MAC address you assigned here can gain access to your wireless router. You can use this function

with other security measures described in previous sections to create a safer wireless environment.

Up to 20 MAC addresses can be assigned by using this function. Please click '2.4GHz Wireless' or '5GHz Wireless' menu on the left of the web management interface, then click 'Access Control', and the following message will be displayed on your web browser:

All allowed MAC addresses will be displayed in 'MAC Address Filtering Table' (1).

Here are descriptions of each setup item:

Delete Selected (2):   If you want to delete a specific MAC address entry, check the 'select' box of the MAC address you want to delete, then click the 'Delete Selected' button. (You can select more than one MAC address).

Delete All (3):   If you want to delete all MAC addresses listed here, please click 'Delete All' button.

Enable   To enforce MAC address filtering,
Access Control (4):   you have to check 'Enable Wireless Access Control'. When this item is unchecked, wireless router will not

enforce MAC address filtering of wireless clients.

MAC Address (5):	*Input the MAC address of your wireless devices here, dash (-) or colon (:) are not required. (i.e. If the MAC address label of your wireless device indicates 'aa-bb-cc-dd-ee-ff' or 'aa:bb:cc:dd:ee:ff', just input 'aabbccddeeff'.*
Comment (6):	*You can input any text here as the comment of this MAC address, such as 'Rita NB'. You can input up to 16 alphanumerical characters here. (This is optional and you can leave it blank; however, it is recommended you use this field to write a comment for every MAC address as a memory aid.*
Add (7):	*Click 'Add' button to add the MAC address and associated comment to the MAC address filtering table.*
Clear (8):	*Click 'Clear' to remove the value you inputted in the MAC address and comment field.*

After you finish with all settings, please click 'Apply' (9) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE] [APPLY]

Please click 'Continue' to return to the previous setup menu and to continue with other setup procedures, or click 'Apply' to reboot the router so the settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page to their previously-saved values, please click the 'Cancel' button.

8.5 Wi-Fi Protected Setup (WPS)

Wi-Fi Protected Setup (WPS) is the simplest way to build a connection between wireless network clients and the X650. You do not have to select encryption mode and input a long encryption passphrase every time you need to setup a wireless client; you only have to press a button on the wireless client and the X650, and the WPS will do the rest for you.

The X650 supports two types of WPS: Push-Button Configuration (PBC), and PIN code. If you want to use PBC, you have to push a specific button on the wireless client to start WPS mode and switch the X650 to WPS mode as well. You can push the Reset/WPS button of the X650 or click the 'Start PBC' button in the web configuration interface to do this; if you want to use a PIN code, you have to know the PIN code of the wireless client and switch it to WPS mode, then provide the PIN code of the wireless client you wish to connect to this wireless router. The detailed instructions are listed follow:

Please click the '2.4GHz Wireless' or '5GHz Wireless' menu on the left of the web management interface, then click 'WPS', and the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Enable WPS (1):   *Check this box to enable WPS function, uncheck it to disable WPS.*

WPS Information (2):WPS-related system information will be displayed here:

WPS Status: If the wireless security (encryption) function of this wireless router is properly set, you will see 'Configured' message here. If wireless security function has not been set, you will see 'unConfigured' message.

PinCode Self: This is the WPS PIN code of this wireless router. This code is useful when you need to build a wireless connection by WPS with other WPS-enabled wireless devices.

SSID: The SSID of this wireless router will be displayed here.

Authentication Mode: The wireless security authentication mode of this wireless router will be displayed here. If you do not enable the security function of the wireless router before WPS is activated, the router will auto set the security to WPA (AES) and generate a set of passphrase keys for WPS connection.

Passphrase Key: The wireless security key of the router will be displayed here.

Config Mode (3):   *There are 'Registrar' and 'Enrollee' modes for the WPS connection. When 'Registrar' is enabled, the wireless clients will follow the router's wireless settings for WPS connection. When 'Enrollee' mode is enabled, the router will follow the wireless settings of the wireless client for WPS connection.*

Configure	*Click 'Start PBC' to start Push-Button style WPS*
by Push Button (4):	*setup procedure. This wireless router will wait for WPS requests from wireless clients for 2 minutes. The 'WLAN' LED on the wireless router will be steadily on for 2 minutes when this wireless router is waiting for incoming WPS requests.*
Configure	*Please input the PIN code of the wireless client you*
by client	*wish to connect to, and click 'Start PIN' button.*
PinCode (5):	*The 'WLAN' LED on the wireless router will be steadily on when this wireless router is waiting for incoming WPS requests.*

8.6 Security Tips for Wireless Network

Here are some quick tips to help you improve the security level of your wireless network:

1. Never use simple words (like school, apple or computer) as a WEP encryption or WPA passphrase.

2. A complicated (the combination of number, alphabet, even symbol, and long enough) WEP key and WPA passphrase is much safer than simple and short ones. Remember that the wireless client can keep the key or passphrase for you, so you only have to input the complicated key or passphrase once. It is not too difficult, but will greatly improve your security level.

3. You can hide the ESSID of this router by setting the 'Broadcast ESSID' option to 'Disable'. Your wireless router will not be found by other people in proximity if they are just using the AP scanning function of their wireless client, and this can reduce the chance of being intruded.

4. Use 'Access Control' function described in section 8.4 so that people who

are not in your list will not be able to connect to your network.

9 Advanced Functions

9.1 Quality of Service (QoS)

Quality of service provides an efficient way for computers on the network to share internet bandwidth with a promised quality of internet service. Without QoS, all computers and devices on the network will compete with each other for internet bandwidth, and some applications that require guaranteed bandwidth (like video streaming and network telephone) will be affected; therefore an unpleasing result will occur, like the interruption of video / audio transfer.

With this function, you can limit maximum bandwidth or give a guaranteed bandwidth to a specific computer, avoiding said unpleasing result from happening.

9.1.1 Basic QoS Settings

Please follow these instructions to set QoS parameters:

Please click 'QoS' menu on the left of the web management interface and the following message will be displayed on your web browser:

Here are descriptions of each setting:

Enable QoS (1):	*Check this box to enable QoS function; unselect this box if you do not want to enforce QoS bandwidth limitations.*
Total Download Bandwidth (2):	*You can set the limit of total download bandwidth in kbits. To disable download bandwidth limitation, input '0' here.*
Total Upload Bandwidth (3):	*You can set the limit of total upload bandwidth in kbits. To disable upload bandwidth limitation, input '0' here.*
Current QoS Table (4):	*All existing QoS rules will be displayed here.*
Add (5):	*Click 'add' button to add a new QoS rule, see section 9.1.2 'Add a new QoS rule' below.*
Edit (6):	*If you want to modify the content of a specific rule, please check the 'select' box of the rule you want to edit, then click 'Edit' button. **Only one rule should be selected at a time!** If you did not select a rule before clicking 'Edit' button, you will be prompted to add a new rule.*
Delete (7):	*You can delete selected rules by clicking this*

*button. You can select one or more rules to delete by checking the 'select' box of the rule(s). **If the QoS table is empty, this button will be grayed out and you will not be able to click on it.***

Delete All (8):   *By clicking this button, you can delete all rules currently in the QoS table. **If the QoS table is empty, this button will be grayed out and unable to be clicked.***

Move Up (9):   *You can pull up the priority of the QoS rule you selected by clicking this button.*

Move Down (10):   *You can lower the priority of the QoS rule you selected by clicking this button.*

After you finish with all settings, please click 'Apply' (11) button and the following message will be displayed on your web browser:

Please click 'Continue' to return to the previous setup menu and to continue with other setup procedures, or click 'Apply' to reboot the router so the settings take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings in this page to their previously-saved values, please click the 'Cancel' button.

9.1.2 Add a new QoS rule

After you click the 'Add' button in QoS menu, the following message will

appear:

Here are descriptions of each setup item:

Rule Name (a):   *Please give a name to this QoS rule (up to 15 alphanumerical characters)*

Bandwidth (b):   *Set the bandwidth limitation of this QoS rule. You have to select the data direction of this rule (Upload or Download), and the speed of bandwidth limitation in Kbps, then select the type of QoS: 'guarantee' (guaranteed usable bandwidth for this rule) or 'max' (set the maximum bandwidth for the application allowed by this rule).*

Local IP Address (c):   *Specify the local (source) IP address that will be affected by this rule. Please input the starting IP address in the left field, and input the end of the IP address in the right field to define a range of IP addresses, or just input the IP address in the left field to define a single IP address.*

Local Port Range (d):   *Please input the range of local (source) port numbers that will be affected by this rule. If you want to apply this rule on port 80 to 90, please input '80-90'; if you want to apply this rule on a single port, just input the port number, like '80'.*

Remote IP	*Specify the remote (destination) IP address*
Address: (e):	*that will be affected by this rule. Please input the starting IP address in the left field, and input the end IP address in the right field to define a range of IP addresses, or just input the IP address in the left field to define a single IP address.*
Remote Port	*Please input the range of remote (destination)*
Range (f):	*port numbers that will be affected by this rule. If you want to apply this rule to ports 80 through 90, please input '80-90'; if you want to apply this rule on a single port, just input the port number, like '80'. If the remote (destination) IP address and /or port number is universal, just leave it blank.*
Traffic Type (g):	*Please select the traffic type of this rule; available options are None, SMTP, HTTP, POP3, and FTP. You can select a specific traffic type for this rule; if you want to make this rule an IP address based rule (apply the limitation on all traffics from / to the specified IP address / port number), select 'None'.*
Protocol (h):	*Please select the protocol type of this rule; available options are TCP and UDP. If you do not know what protocol your application uses, please try 'TCP' first, and switch to 'UDP' if this rule does not seem to work.*

After you finish with all settings, please click the 'save' button (i), and you will be brought back to the previous menu (the rule you just set will appear in current QoS table); if you did something wrong, you will get an error message when you click the 'Save' button. Please correct your input by following the instructions given in the error message.

If you want to erase all of the values you just entered, click 'Reset'.

9.2 Network Address Translation (NAT)

Network address translations solve the problem of sharing a single IP address with multiple computers. Without NAT, all computers must be assigned with a valid Internet IP address to connect to the Internet, but Internet service providers only provide a few IP addresses to each user. Therefore it is necessary to use NAT technology to share a single Internet IP address with multiple computers on a local network, so that everyone can get connected to the Internet.

Please follow these instructions to set NAT parameters:

9.2.1 Basic NAT Settings (Enable or disable NAT function)

Please click 'NAT' menu on the left of the web management interface, and the following message will be displayed on your web browser:

NAT 🔧

NAT (Network Address Translation) allows multiple users at your local site to access the Internet through a single Public IP Address or multiple Public IP Addresses. NAT provides Firewall protection from hacker attacks and has the flexibility to allow you to map Private IP Addresses to Public IP Addresses for key services such as the Web or FTP.

NAT Module : ◉ Enable ○ Disable
             1
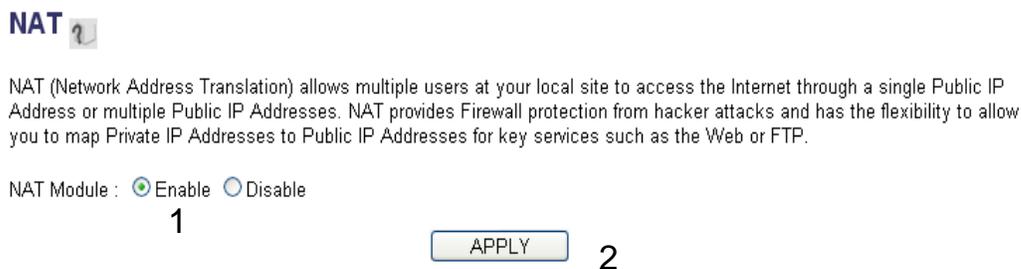
[APPLY] 2

To enable NAT function, please select 'Enable' for 'Enable NAT module function' (1); to disable, please select 'Disable'.

After you made the selection, please click 'Apply' button (2) and the following message will be displayed on your web browser:

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Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings take effect (Please wait about 40 seconds for router to reboot).

9.2.2 Port Forwarding

This function allows you to redirect a single port or consecutive ports of Internet IP addresses to the same port of the local network IP address. The port number(s) of Internet IP address and private IP address (the IP address on local network) must be the same. If the port number of Internet IP address and private IP address is different, please use the 'Virtual Server' function, described in the next section.

Please click 'NAT' menu on the left of the web management interface, then click 'Port Forwarding', and the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Enable Port Forwarding (1):	*Check this box to enable port mapping, and uncheck this box to disable port mapping.*
Private IP (2):	*Input the IP address of the computer on local network that provides internet service.*
Computer Name (3):	*Pull down the menu and all the computers connected to the X650 will be listed here. You can easily select the computer name without checking the IP address of the computer.*
Type (4):	*Select the type of connection, TCP or UDP. If you are not sure, please select 'Both'.*
Port Range (5):	*Input the starting port number in the left field, and input the ending port number in the right field. If you only want to redirect a single port number, simply place the port number in the left field.*
Comment (6):	*Please input any text to describe this mapping, up to 16 alphanumerical characters.*
Add (7):	*Add the mapping to port forwarding table.*
Reset (8):	*Remove all inputted values.*
Port Forwarding Table (9):	*All existing port forwarding mappings will be displayed here.*
Delete (10):	*Please select a type of port forwarding mapping by clicking the 'Select' box of the mapping, then click 'Delete Selected' button to remove the mapping. If there is no existing mapping, this button will be grayed out.*
Delete All (11):	*Delete all mappings in virtual server table.*

After you finish with all settings, please click 'Apply' (13) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page to their previously-saved values, please click the 'Cancel' button.

9.2.3 Virtual Server

This function allows you to redirect a port on Internet IP address (on WAN port) to a specified port of an IP address on local network, so you can setup an Internet service on the computer through local network, without exposing it on Internet directly. You can also build many sets of port redirection, to provide multiple types of Internet services on different local computers via a single Internet IP address.

Please click 'NAT' menu on the left of the web management interface, then click 'Virtual Server', and the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Enable Virtual
Server (1):

Check this box to enable virtual server, and uncheck this box to disable virtual server.

Private IP (2):

Input the IP address of the computer that provides Internet service.

Computer Name (3):

Pull down the menu and all the computers connected to the router will be listed here. You can easily select the computer name without checking the IP address of the computer.

Private Port (4):

Input the port number of the IP address that provides Internet service.

Type (5):

Select the type of connection, TCP or UDP. If you are not sure, please select 'Both'.

Public Port (6):

Please select the port number of Internet IP address that will be redirected to the port number of local IP address defined above.

Comment (7):

Please input any text to describe this mapping (up to 16 alphanumerical characters).

Add (8):

Add the mapping to virtual server table.

Reset (9):   *Remove all inputted values.*

Virtual Server   *All existing virtual server mappings will be*
Table (10):   *displayed here.*

Delete (11):   *Please select a virtual server mapping by clicking*
                      the 'Select' box of the mapping, then click 'Delete
                      Selected' button to remove the mapping. If there is no
                      existing mapping, this button will be grayed out.

Delete All (12):   *Delete all mappings in virtual server table.*

Reset (13):   *Unselect all mappings.*

After you finish with all settings, please click 'Apply' (14) button and the
following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make
the changes take effect.

    [CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with
other setup procedures, or click 'Apply' to reboot the router so the settings will
take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to previously-saved values,
please click the 'Cancel' button.

9.2.4 Port Mapping for Special Applications

Some applications require more than one connection at a time; these applications will not work with simple NAT rules. In order to make these applications work, you can use this function to let these applications work.

Here are descriptions of each setup item:

Enable (1):	*Check this box to enable special applications and uncheck this box to disable virtual server.*
IP Address (2):	*Input the IP address of the computer you want to open the ports.*
Computer Name (3):	*Pull down the menu and all the computers connected to the router will be listed here. You can easily to select the computer name without checking its IP address.*
TCP Port to Open (4):	*This is the outgoing (Outbound) range of TCP port numbers for this particular application.*
UDP Port to Open (5):	*This is the outgoing (Outbound) range of UDP port numbers for this particular application.*
Comment (6):	*The description of this setting.*

Popula Applications (7):   *This section lists the more popular applications that require multiple connections. Select an application from the Popular Applications selection and click 'Add' to save the setting to 'Current Trigger-Port Table.'*

Add (8):   *Add the setting to the 'Current Trigger-Port Table.'*

Reset (9):   *Click 'Reset' to clear all above settings and set up again.*

Current Trigger-Port (10):   *All the settings for the special applications will be listed here. If you want to remove some Special Application settings from the " Current Trigger-Port Table", select the Special Application settings you want to remove in the table and then click "Delete Selected". If you want remove all Special Appliacation settings from the table, just click "Delete All" button. Clicking "Reset" will clear your current selections.*

Delete (11):   *Please select a special application by clicking the 'Select' box of the mapping, then click 'Delete Selected' button to remove the setting. If there is no setting here, this button will be grayed out.*

Delete All (12):   *Delete all settings in trigger port table.*

Reset (13):   *Unselect all settings.*

Note: Only one LAN client can use a particular special application at a time.

After you finish with all settings, please click 'Apply' (14) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE] [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

9.2.5 UPnP Setting

This function enables network auto-configuration for peer-to-peer communications; with this function, network devices will be able to communicate with other devices directly and learn information about other devices. Many network devices and applications rely on UPnP function nowadays.

Please click 'NAT' menu on the left of the web management interface, then click 'UPnP', and the following message will be displayed on your web browser:

There is only one option on this page; please select 'Enable' or 'Disable' to enable or disable UPnP function, then click 'Apply' button, and the following message will be displayed on your web browser:

Please click 'Continue' to return to a previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings n this page back to their previously-saved values, please click the 'Cancel' button.

9.2.6 ALG Settings

Application Layer Gateway (ALG) is a special function of this router. It includes many preset routing rules for numerous applications that require special support. With these supports, those applications will be able to work with NAT architecture.

Please click the 'NAT' menu on the left of the web management interface, then click 'ALG Settings', and the following message will be displayed on your web browser:

ALG Settings

Below are applications that need router's special support to make them work under the NAT. You can select applications that you are using.

Enable	Name	Comment
☑	FTP	Support for FTP.
☑	H323	Support for H323/netmeeting.
☑	IPsec	Support for IPsec passthrough
☑	PPTP	Support for PPTP passthrough.
☑	L2TP	Support for L2TP passthrough.
☑	SIP	Support for SIP.

APPLY   CANCEL

There are many applications listed here. Please check the box of the applications you need special support for, and then click the 'Apply' button and the following message will be displayed on your web browser:

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Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

9.3 Firewall

Apart from NAT, this router also provides a firewall function to block malicious intruders from accessing your local network computers. These functions include inbound attack prevention and block outbound traffics (such as blocking URLs that have pre-defined keywords).

Please follow these instructions to enable or disable firewall function:

Please click 'Firewall' menu on the left of the web management interface, and the following message will be displayed on your web browser:

Firewall

The Wireless Router provides extensive firewall protection by restricting connection parameters, thus limiting the risk of hacker attack, and defending against a wide array of common attacks. However, for applications that require unrestricted access to the Internet, you can configure a specific client/server as a Demilitarized Zone (DMZ).

Firewall Module : ○ Enable ● Disable

[APPLY]

Please select 'Enable' or 'Disable' to enable or disable firewall function of this router, then click 'Apply' button, and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

CONTINUE   APPLY

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

9.3.1 Access Control

This function allows or denies computers with a specific MAC address from connecting to the network; it can also allow or deny computers with a specific IP address, protocol, or port.

Please click 'Firewall' menu on the left of the web management interface, then click 'Access Control', and the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Enable MAC Filtering (1):	*Check this box to enable MAC address based filtering, and please select 'Deny' or 'Allow' to decide the behavior of MAC filtering table. If you select deny, all MAC addresses listed in filtering table will be denied from connecting to the network; if you select allow, only MAC addresses listed in filtering table will be able to connect to the network, rejecting all other network devices.*
Client PC MAC address (2):	*Please input the MAC address of computer or network device here, dash (-) or colon (:) are not required (i.e. If the MAC address label of your wireless device indicates 'aa-bb-cc-dd-ee-ff' or 'aa:bb:cc:dd:ee:ff', just input 'aabbccddeeff'.*
Computer Name (3):	*Pull down the menu and all the computers connected to the X650 will be listed here. You can easily select the computer name without checking the IP address of the computer.*
Comment (4):	*You can input any text here as the comment of this MAC address, like 'ROOM 2A Computer' or anything. You can input up to 16 alphanumerical characters here. This is optional and you can leave it blank, however, it is*

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recommended to use this field to write a comment for every MAC address as a memory aid.

Add (5):   Click 'Add' button to add the MAC address and associated comment to the MAC address filtering table.

Reset (6):   Remove all inputted values.

Current MAC Filtering Table (7):   All existing MAC addresses in filtering table will be listed here.

Delete (8):   If you want to delete a specific MAC address entry, check the 'select' box of the MAC address you want to delete, then click 'Delete Selected' button. (You can select more than one MAC address).

Delete All (9):   If you want to delete all MAC addresses listed here, please click 'Delete All' button.

Reset (10):   You can also click 'Reset' button to unselect all MAC addresses.

Enable IP Filtering (11):   Check this box to enable IP address based filtering, and please select 'Deny' or 'Allow' to decide the behavior of IP filtering table. If you select deny, all IP addresses listed in filtering table will be denied from connecting to the network; if you select allow, only IP addresses listed in filtering table will be able to connect to the network, rejecting all other network devices.

IP Filtering Table (12):   All existing IP addresses in filtering table will be listed here.

Add PC (13):   Click this button to add a new IP address to IP filtering table (up to 20 IP addresses can be added).

Delete (14):   If you want to delete a specific IP address entry,

> *check the 'select' box of the IP address you want to delete,*
> *then click 'Delete Selected' button. (You can select more*
> *than one IP address).*

Delete All (15):   *If you want to delete all IP addresses listed here, please*
                             click 'Delete All' button.

After you finish with all settings, please click 'Apply' (16) button and the
following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make
the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with
other setup procedures, or click 'Apply' to reboot the router so the settings will
take effect (Please wait about 40 seconds for router to reboot).
If you want to reset all settings on this page back to their previously-saved
values, please click 'Cancel' button.

After button is clicked, the following message will be displayed on your web
browser:

Client PC Description :		a
Client PC IP address :	-	b

Client PC Service :

Service Name	Detail Description	Select
WWW	HTTP, TCP Port 80, 3128, 8000, 8080, 8081	☐
E-mail Sending	SMTP, TCP Port 25	☐
News Forums	NNTP, TCP Port 119	☐
E-mail Receiving	POP3, TCP Port 110	☐
Secure HTTP	HTTPS, TCP Port 443	☐
File Transfer	FTP, TCP Port 21	☐
MSN Messenger	TCP Port 1863	☐
Telnet Service	TCP Port 23	☐
AIM	AOL Instant Messenger, TCP Port 5190	☐
NetMeeting	H.323, TCP Port 389,522,1503,1720,1731	☐
DNS	UDP Port 53	☐
SNMP	UDP Port 161, 162	☐
VPN-PPTP	TCP Port 1723	☐
VPN-L2TP	UDP Port 1701	☐
TCP	All TCP Port	☐
UDP	All UDP Port	☐

c

User Define Service		
Protocol:	Both ⌄	d
Port Range:		e

[Add] [Reset]

f

Here are descriptions of each setup item:

Client PC Description (a):	*Please input any text to describe this IP address (up to 16 alphanumerical characters).*
Client PC IP address (b):	*Please input the starting IP address in the left field, and input the end IP address in the right field to define a range of IP addresses, or just input the IP address in the left field to define a single IP address.*

Client PC	*Please check all services you want to allow or*
Service (c):	*deny this IP address to use (you can check multiple*
	services).
Protocol (d):	*If the service you need is not listed above, you can create*
	a new service on your own. Please select TCP or UDP; if
	you are not sure, please select 'Both'.
Port Range (e):	*Please input the port range of the new service here. If*
	you want to specify port 80 to 90, please input '80-90'; if
	you want to apply this rule on a single port, just input the
	port number (i.e. '80').
Add (f):	*When you finish with all settings, please click 'Add' to*
	save settings, and you will be brought back to the
	previous menu, and the rule you just set will appear in
	the current IP filtering table.

If you want to remove all settings on this page, click the 'Reset' button.

9.3.2 URL Blocking

If you want to prevent local network computers from accessing certain websites (like pornography, violence, or anything else you want to block), you can use this function to stop computers in local network from accessing the sites you defined here.

This function is useful for parents and company managers.

Please follow these instructions to set URL blocking parameters:
Please click 'Firewall' menu on the left of the web management interface, then click 'URL Blocking', and the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Enable URL Blocking (1):	*Check this box to enforce URL Blocking; uncheck it to disable URL Blocking.*
URL/Keyword (2):	*Input the URL (host name or IP address of website, like http://www.blocked-site.com or http://11.22.33.44), or a keyword contained in the URL (like pornography, cartoons, stocks, etc.).*
Add (3):	*Click 'Add' button to add the URL / keyword to the URL / Keyword to filtering table.*
Reset (4):	*Click 'Reset' to remove the value you inputted in the URL/Keyword field.*
Current URL Blocking Table (5):	*All existing URL/Keywords in filtering table will be listed here.*
Delete (6):	*If you want to delete a specific URL/Keyword entry, check the 'select' box of the MAC address you want to delete, then click 'Delete Selected' button. (You can select more than one MAC address).*
Delete All (7):	*If you want to delete all URLs/Keywords listed here, please click 'Delete All' button.*

Reset (8):   *You can also click 'Reset' button to unselect all*
                          URLs/Keywords.

After you finish with all settings, please click 'Apply' (9) button, and the
following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with
other setup procedures, or click 'Apply' to reboot the router so the settings will
take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved
values, please click the 'Cancel' button.

9.3.3 DoS Attack Prevention

Denial of Service (DoS) is a common attack measure, transmitting a great
amount of data or requests to your Internet IP address and server, making the
Internet very slow and possibly stopping the server from responding because it
is not capable of handling so much traffic.

The X650 has a built-in DoS attack prevention mechanism; when you activate
it, the router will stop the DoS attack for you.

Please follow these instructions to set DoS prevention parameters:

Please click 'Firewall' menu on the left of the web management interface, then
click 'DoS', and the following message will be displayed on your web

browser:

Here are descriptions of each setup item:

Ping of Death (1):   *Ping of Death is a special packet, and it will cause certain computers to stop responding. Check this box and the router will filter this kind of packet out.*

Discard Ping   *Ping is a common and useful tool to know*
From WAN (2):   *the connection status of a specified remote network device, but some malicious intruders will try to fill your network bandwidth with a lot of PING request data packets to make your internet connection become very slow, even unusable. Check this box and the router will ignore all inbound PING requests (but when you activate this function, you will not be able to ping your own router from Internet either).*

Port Scan (3):   *Some malicious intruder may try to use a 'port scanner' to know how many ports of your Internet IP address are open and they can collect a lot of valuable information by doing so. Check this box and the router will block all traffics trying to scan your Internet IP address.*

Sync Flood (4):   *This is another kind of attack, which uses a lot of fake connection requests to consume the memory of your server and try to make your server become unusable. Check this box and the router will filter out this kind of*

traffic.

Advanced Settings (5):	*Click this button and you can set the advanced settings of the DoS prevention method listed above (please see section 9.3.3.1 'DoS – Advanced Settings' below).*

After you finish with all settings, please click 'Apply' (6) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

9.3.3.1 DoS - Advanced Settings

When you click the 'Advanced Settings' button in the DoS menu, the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Ping of Death (a):	*Set the threshold of when this DoS prevention mechanism will be activated. Please check the box of Ping of Death, and input the frequency of threshold (how many packets per second, minute, or hour); you can also input the 'Burst' value, which means when this number of 'Ping of Death' packet is received in very short time, this DoS prevention mechanism will be activated.*
Discard Ping From WAN (b):	*Check the box to activate this DoS prevention mechanism.*
Port Scan (c):	*Many kinds of port scan methods are listed here; please check one or more DoS attack methods you want to prevent.*
Sync Flood (d):	*Like Ping of Death, you can set the threshold of when this DoS prevention mechanism will be activated.*

After you finish with all settings, please click 'Apply' (e) button and the following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make the changes take effect.

[CONTINUE]   [APPLY]

Please click 'Continue' to return to the previous setup menu and continue with other setup procedures, or click 'Apply' to reboot the router so the settings will take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved values, please click the 'Cancel' button.

9.3.4 Demilitarized Zone (DMZ)

Demilitarized Zone (DMZ) refers to a special area in your local network. All computers in this area use private IP addresses, too. But these private IP addresses are mapped to a certain Internet IP address, so that other people on Internet can fully access those computers in DMZ.

Please follow these instructions to set DMZ parameters:

Please click 'Firewall' menu on the left of the web management interface, then click 'DMZ', and the following message will be displayed on your web browser:

Here are descriptions of each setup item:

Enable DMZ (1):	*Check this box to enable DMZ function, uncheck this box to disable DMZ function.*
Public IP address (2):	*You can select 'Dynamic IP' or 'Static IP' here. If you select 'Dynamic IP', you have to select an Internet connection session from the dropdown menu; if you select 'Static IP', please input the IP address that you want to map to a specific private IP address.*
Client PC IP address (3):	*Please input the private IP address that the Internet IP address will be mapped to.*
Computer Name (4):	*Pull down the menu and all the computers connected to the router will be listed here. You can easily select the computer name without checking the IP address of the computer.*
Add (5):	*Click 'Add' button to add the public IP address and associated private IP address to the DMZ table.*
Reset (6):	*Click 'Clear' to remove the value you inputted in Public IP address and Client PC IP address field.*

Current　　　　　　　*All existing public IP address and private IP*
DMZ Table (7):　　　*address mapping will be displayed here.*

Delete (8):　　　　　*If you want to delete a specific DMZ entry, check*
　　　　　　　　　　　the 'select' box of the DMZ entry you want to delete, then
　　　　　　　　　　　click 'Delete Selected' button. (You can select more than
　　　　　　　　　　　one DMZ entry).

Delete All (9):　　　*If you want to delete all DMZ entries listed here, please*
　　　　　　　　　　　click 'Delete All' button.

Reset (10):　　　　　*You can also click 'Reset' button to unselect all DMZ*
　　　　　　　　　　　entries.

After you finish with all settings, please click 'Apply' (11) button and the
following message will be displayed on your web browser:

Save settings successfully!

You may press CONTINUE button to continue configuring other settings or press APPLY button to restart the system to make
the changes take effect.

[CONTINUE]　　[APPLY]

Please click 'Continue' to return to the previous setup menu and continue with
other setup procedures, or click 'Apply' to reboot the router so the settings will
take effect (Please wait about 40 seconds for router to reboot).

If you want to reset all settings on this page back to their previously-saved
values, please click the 'Cancel' button.

9.4 System Status

The functions described here will provide you with the system related information. To enter system status menu, please click either the 'Status' link located at the upper-right corner of the web management interface, or click the 'Status' button in the main menu.
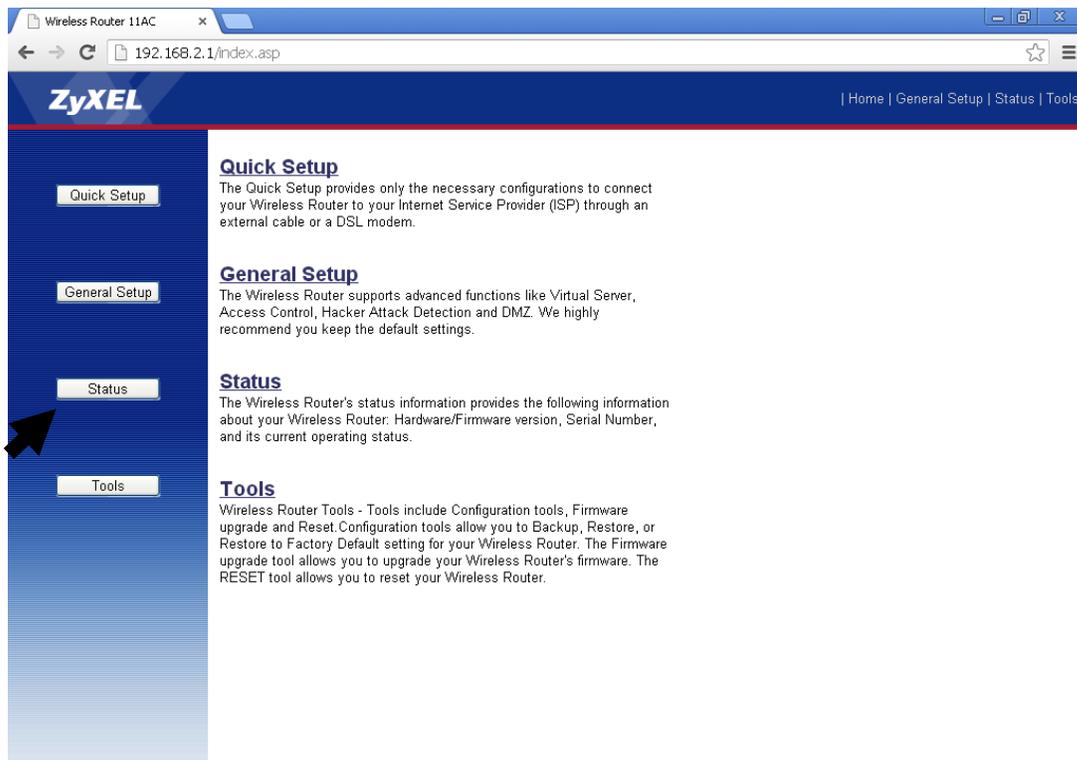
9.4.1 System information and firmware version

You can use this function to find the system information and firmware version of this router.

Please click 'Status' link located in the upper-right corner of the web management interface, and the following message will be displayed on your web browser

Status

The Wireless Router's status information provides the following information about your Wireless Router: Hardware/Firmware version, Serial Number, and its current operating status.

System

Model :	X650
Up Time :	0day:0h:20m:3s
Hardware Version :	Rev. A
Boot Code Version :	1.0
Runtime Code Version :	1.00

NOTE: Information displayed here may vary.

9.4.2 Internet Connection Status

You can use this function to find the status of your current Internet connection.

Please click 'Internet Connection' menu on the left of the web management interface, and the following message will be displayed on your web browser:

Internet Connection

View the current internet connection status and related information.

Attain IP Protocol :	Dynamic IP connect
IP Address :	192.168.128.119
Subnet Mask :	255.255.254.0
Default Gateway :	192.168.129.254
MAC Address :	00:E0:4C:81:96:C9
Primary DNS :	192.168.129.50
Secondary DNS :	192.168.129.1

This information will vary depending on the connection status.

9.4.3 Device Status

You can use this function to find the status of your router.

Please click 'Device Status' menu on the left of the web management interface, and the following message will be displayed on your web browser:

Device Status

View the current setting status of this device.

Wireless Configuration

2.4GHz Wireless :	Enable
Mode :	Access Point
ESSID :	MoiFi2.4
Channel Number :	7
Security :	Disable
MAC Address :	00:E0:4C:81:97:D1

5GHz Wireless :	Enable
Mode :	Access Point
ESSID :	MoiFi
Channel Number :	36
Security :	Disable
MAC Address :	00:E0:4C:81:97:C1

LAN Configuration

IP Address :	192.168.2.1
Subnet Mask :	255.255.255.0
DHCP Server :	Enable
MAC Address :	00:E0:4C:81:97:C1

This information will vary depending on the device status.
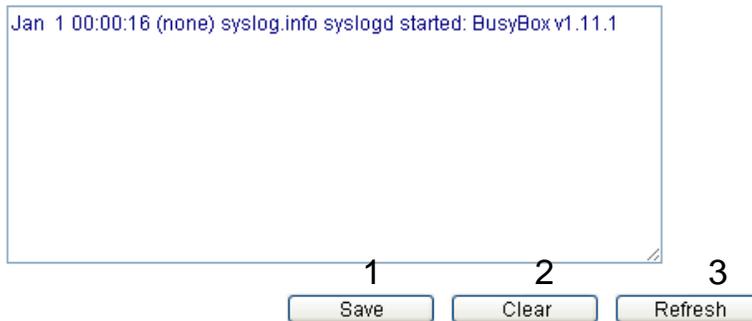
9.4.4 System Log

All important system events are logged. You can use this function to check the event log of your router.

Please click 'System Log' menu on the left of the web management interface,

and the following message will be displayed on your web browser:

The system events will be displayed on this page; here are descriptions of each button:

Save (1):	*Save current event log to a text file.*
Clear (2):	*Delete all event logs displayed here.*
Refresh (3):	*Refresh the event log display.*

9.4.5 Security Log

All information about network and system security is kept here, and you can use this function to check the security event log of your router.

Please click 'Security Log' menu on the left of the web management interface,

and the following message will be displayed on your web browser:

The system events will be displayed in this page; here are descriptions of each button:

Save (1):	*Save current event log to a text file.*
Clear (2):	*Delete all event logs displayed here.*
Refresh (3):	*Refresh the event log display.*

9.4.6 Active DHCP client list

If you are using the DHCP server function of this router, you can use this function to check all active DHCP leases issued by this router.

Please click 'Active DHCP client' menu on the left of the web management interface, and the following message will be displayed on your web browser:

All information about active DHCP leases issued by this router will be displayed here. You can click 'Refresh' button to display the latest information.

9.4.7 Statistics

You can use this function to check the statistics of the wireless, LAN, and WAN interface of this router.

Please click 'Statistics' menu on the left of the web management interface, and the following message will be displayed on your web browser:

Statistics

This page shows the packet counters for transmission and reception regarding to networks.

2.4GHz Wireless LAN	Packets Sent	6988
	Packets Received	183401
5GHz Wireless LAN	Packets Sent	768
	Packets Received	63667
Ethernet LAN	Packets Sent	9855
	Packets Received	8769
Ethernet WAN	Packets Sent	8303
	Packets Received	2555002

Refresh

You can click 'Refresh' button to display latest information.

9.5 System Tools

The functions described here will provide you system tools for the all the settings backup/restore, firmware upgrades and resetting of the router to default settings. To enter the system status menu, please either click 'Tools' link located at the upper-right corner of the web management interface, or click the 'Tools' button in the main menu.
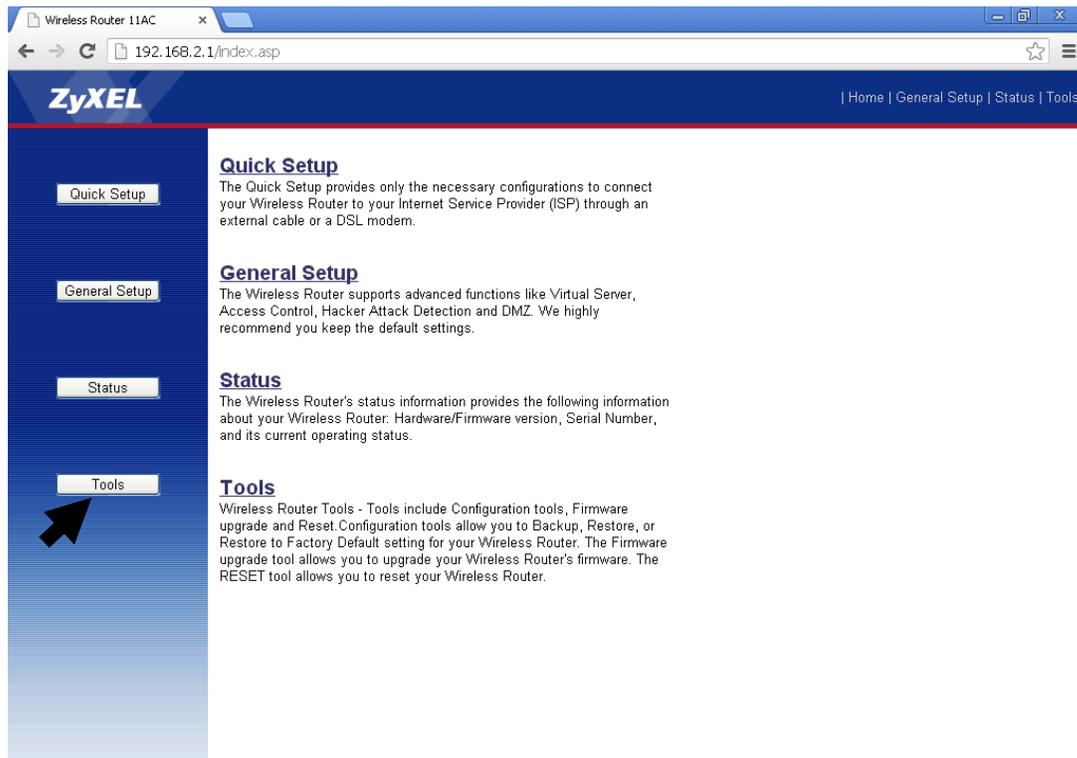
9.5.1 Configuration Backup and Restore

You can backup all configurations of this router to a file, so that you can make several copies of the router configuration for security purposes.

To backup or restore router configuration, please follow these instructions:

Please click 'Tools' located at the upper-right corner of the web management interface, then click 'Configuration Tools' on the left of the web management interface, and the following message will be displayed on your web browser:


Here are descriptions of each button:

Backup Settings (1):	*Press 'Save' button, and you will be prompted to download the configuration as a file (default filename is 'config.bin'; you can save it as another filename for different versions, and keep it in a safe place).*
Restore Settings (2):	*Press 'Browse' to choose a previously-saved configuration file from your computer, and then click 'Upload' to transfer the configuration file to router. After the configuration is uploaded, the router's configuration will be replaced by the file you just uploaded.*
Restore to Factory Default (3):	*Click this button to remove all settings you made and restore the configuration of this router back to factory default settings.*

9.5.2 Firmware Upgrade

The system software used by this router is called 'firmware', just like any applications on your computer, when you replace the old application with a new one; your computer will be equipped with a new function. You can also use this firmware upgrade function to add new functions to your router, or even fix the bugs of this router.

To upgrade firmware, please follow these instructions:

Please click 'Tool' located at the upper-right corner of the web management interface, then click 'Firmware Upgrade' on the left of the web management interface, and the following message will be displayed on your web browser:

This tool allows you to upgrade the Wireless Router's system firmware. Enter the path and name of the upgrade file and then click the APPLY button below. You will be prompted to confirm the upgrade.

The system will automatically reboot the router after you finished the firmware upgrade process. If you don't complete the firmware upgrade process in the "next" step, you have to reboot the router.

NEXT

Please click 'Next', and the following message will be displayed:

Firmware Upgrade

This tool allows you to upgrade the Wireless Router's system firmware. Enter the path and name of the upgrade file and then click the APPLY button below. You will be prompted to confirm the upgrade.

Choose File | No file chosen

APPLY   CANCEL

Click 'Browse' button first and you will be prompted to provide the filename of the firmware upgrade file. Please download the latest firmware file from our website, and use it to upgrade your router.

After a firmware upgrade file is selected, click 'Apply' button, and the router

will start the firmware upgrade procedure automatically. The procedure may take several minutes, so please be patient.

> **NOTE: Never interrupt the upgrade procedure by closing the web browser or physically disconnecting your computer from router. If the firmware you uploaded is corrupt, the firmware upgrade will fail, and you may have to return this router to the dealer of purchase to ask for help. (Warranty is voided if you interrupt the upgrade procedure).**

9.5.3 System Reset

If you think the network performance is bad, or you found the behavior of the router to be strange, you can perform a router reset and sometimes it will solve the problem.

To do so, please click 'Tool' located at the upper-right corner of the web management interface, then click 'Reset' on the left of the web management interface, and the following message will be displayed on your web browser:

Reset

In the event that the system stops responding correctly or stops functioning, you can perform a Reboot. Your settings will not be changed. To perform the reboot, click on the APPLY button below. You will be asked to confirm your decision. The Reboot will be complete when the LED Power light stops blinking.

[APPLY]

Please click 'Apply' to reset your router, and be patient as it will be available again after a few minutes.

10 Appendix

10.1 Hardware Specifications

CPU: Realtek RTL8197D

RF: Realtek RTL8192CE + RTL8812AR

Gigabit Switch: Realtek RTL8367R-VB

Flash: 4MB

DDR2 RAM: 64MB

WAN Port: 10/100/1000M Port x 1

LAN Ports: 10/100/1000M Port x 4

Antenna: 3dBi Dual Band Dipole Antenna x 2 (2T2R MIMO configuration)

Power: DC 5V/2A Switching Power Adapter

Dimension: 32(H) x 180(W) x 138(D) mm

Temperature: 32~104°F (0 ~ 40°C)

Humidity: 10-90% (Non Condensing)

Certification: CE/FCC

10.2 Troubleshooting

If you find that the X650 is working improperly or has stopped responding to you, do not panic! Before you contact your dealer of purchase for help, please read through this troubleshooting section first. Some problems can be solved by you within a very short time!

Scenario	Solution
Router is not responding to me when I want to access it by web browser	a. Please check the connection of the power cord and network cable of this router. All cords and cables should be correctly and firmly inserted into the router. b. If all the LEDs on this router are off, please check the status of the A/C power adapter, and make sure it is correctly powered. c. You must use the same IP address section the router uses. d. Are you using a MAC or IP address filter? Try to connect the router by another computer and see if it works; if not, please restore your router to factory default settings (press 'reset' button for over 10 seconds). e. Set your computer to obtain an IP address automatically (DHCP), and see if your computer can get an IP address. f. If you did a firmware upgrade and this happens, contact your dealer of purchase for help. g. If all above solutions do not work, contact the dealer of purchase for help.
Cannot get connected to Internet	a. Go to 'Status' -> 'Internet Connection' menu, and check Internet connection status. b. Please be patient, sometimes the Internet is just that slow. c. If you connected a computer to Internet

	directly before, try to do that again, and check if you can get connected to the Internet with your computer directly attached to the device provided by your Internet service provider.
	d. Check PPPoE / L2TP / PPTP user ID and password again.
	e. Call your Internet service provider and check if there is something wrong with their service.
	f. If you just cannot connect to one or more website(s), but you can still use other internet services, please check URL/Keyword filter.
	g. Try to reset the router and try again later.
	h. Reset the device provided by your Internet service provider.
	i. Try to use IP address instead of hostname. If you can use IP address to communicate with a remote server, but cannot use hostname, please check DNS setting.
I cannot locate my router by my wireless client	a. 'Broadcast ESSID' set to off?
	b. Secure both antennas properly.
	c. Are you too far from your router? Try to get closer.
	d. Please remember that you have to input ESSID on your wireless client manually, if ESSID broadcast is disabled.
File download is very slow or breaks frequently	a. Are you using QoS function? Try to disable it and try again.
	b. Internet is slow sometimes, be patient.
	c. Try to reset the router and see if it works better after that.
	d. Try to know what computers do on your local network. If someone is transferring big files, other people will think the Internet is really slow.
	e. If this has never happened before, call your

	Internet service provider to see if there is something wrong with their network.
I cannot log onto web management interface: password is wrong	a. Make sure you are connecting to the correct IP address of the router! b. Password is case-sensitive. Make sure the 'Caps Lock' is not activated. c. If you forget the password, do a hard reset.
Router became hot	a. This is not a malfunction if you can keep your hand on the router's case. b. If you smell something strange or see smoke coming out from router or A/C power adapter, please disconnect the router and A/C power adapter from utility power (make sure it is safe before you do this!), and call your dealer of purchase for help.

10.3 Glossary

Default Gateway (Router): Every non-router IP device needs to configure a default gateway's IP address. When the device sends out an IP packet and the destination is not on the same network, the device has to send the packet to its default gateway, which will then send it out towards the destination.

DHCP: DHCP stands for Dynamic Host Configuration Protocol. This protocol automatically gives every computer on your home network an IP address.

DNS Server IP Address: DNS stands for Domain Name System, which allows Internet servers to have a domain name (such as www.Broadbandrouter.com) and one or more IP addresses (such as 192.34.45.8). A DNS server keeps a database of Internet servers and their respective domain names and IP addresses, so that when a domain name is requested (as in typing "Broadbandrouter.com" into your Internet browser), the user is sent to the proper IP address. The DNS server IP address used by the computers on your home network is the location of the DNS server your ISP has assigned to you.

DSL Modem: DSL stands for Digital Subscriber Line. A DSL modem uses your existing phone lines to transmit data at high speeds.

Ethernet: A standard for computer networks. Ethernet networks are connected by special cables and hubs, and move data around at up to 10/100 million bits per second (Mbps).

Idle Timeout: Idle Timeout is designed so that after there is no traffic to the Internet for a pre-configured amount of time, the connection will automatically be disconnected.

IP Address and Network (Subnet) Mask: IP stands for Internet Protocol. An IP address consists of a series of four numbers separated by periods that identify a single, unique Internet computer host in an IP network. Example: 192.168.1.1. It consists of 2 portions: the IP network address and the host identifier.

The IP address is a 32-bit binary pattern that can be represented as four cascaded decimal numbers separated by "." Example: aaa.aaa.aaa.aaa, where each "aaa" can be anything from 000 to 255, or as four cascaded binary numbers separated by "." such as: bbbbbbbb.bbbbbbbb.bbbbbbbb.bbbbbbbb, where each "b" can either be 0 or 1.
A network mask is also a 32-bit binary pattern, and consists of consecutive leading

1's followed by consecutive trailing 0's, such as 11111111.11111111.11111111.00000000. Therefore, sometimes a network mask can also be described simply as "x" number of leading 1's.

When both are represented side by side in their binary forms, all bits in the IP address that correspond to 1's in the network mask become part of the IP network address, and the remaining bits correspond to the host ID.

For example, if the IP address for a device is, in its binary form, 11011001.10110000.10010000.00000111, and if its network mask is, 11111111.11111111.11110000.00000000
It means the device's network address is 11011001.10110000.10010000.00000000, and its host ID is 00000000.00000000.00000000.00000111. This is a convenient and efficient method for routers to direct IP packets to their destinations.

ISP Gateway Address: (see ISP for definition). The ISP Gateway Address is an IP address for the Internet router located at the ISP's office.

ISP: ISP stands for Internet Service Provider. An ISP is a business that provides connectivity to the Internet for individuals, businesses, or organizations.

LAN: LAN stands for Local Area Network. A LAN is a group of computers and devices connected together in a relatively small area (such as a house or an office). Your home network is considered a LAN.

MAC Address: MAC stands for Media Access Control. A MAC address is the hardware address of a device connected to a network. The MAC address is a unique identifier for a device with an Ethernet interface. It is comprised of two parts: 3 bytes of data that correspond to the Manufacturer ID (unique for each manufacturer) and 3 bytes that are often used as the product's serial number.

NAT: NAT stands for Network Address Translation. This process allows all of the computers on your home network to use a single IP address. Using the X650's NAT capability, you can access the Internet from multiple computers on your home network without having to purchase additional IP addresses from your ISP.

Port: Network clients (LAN PC) use port numbers to distinguish between different network applications/protocols. Below is a list of common applications and protocols/port numbers:

Application	Protocol	Port Number
Telnet	TCP	23
FTP	TCP	21
SMTP	TCP	25
POP3	TCP	110
H.323	TCP	1720
SNMP	UCP	161
SNMP Trap	UDP	162
HTTP	TCP	80
PPTP	TCP	1723
PC Anywhere	TCP	5631
PC Anywhere	UDP	5632

PPPoE: PPPoE stands for Point-to-Point Protocol over Ethernet. Point-to-Point Protocol is a secure data transmission method originally created for dial-up connections; PPPoE is for Ethernet connections. PPPoE relies on two widely accepted standards, Ethernet and the Point-to-Point Protocol. It is a communications protocol for transmitting information over Ethernet between different manufacturers

Protocol: A protocol is a set of rules for interaction agreed upon between multiple parties so that when they interface with each other based on such a protocol, the interpretation of their behavior is well defined and can be made objectively and without any confusion or misunderstandings.

Router: A router is an intelligent network device that forwards packets between different networks based on network layer address information such as IP addresses.

Subnet Mask: A subnet mask, which may be a part of the TCP/IP information provided by your ISP, is a set of four numbers (e.g. 255.255.255.0) configured like an IP address. It is used to create IP address numbers used only within a particular network (as opposed to valid IP address numbers recognized by the Internet, which must be assigned by InterNIC).

TCP/IP, UDP: TCP/IP stands for Transmission Control Protocol/Internet Protocol (TCP/IP) and UDP stands for Unreliable Datagram Protocol (UDP). TCP/IP is the standard protocol for data transmission over the Internet. Both TCP and UDP are transport layer protocols. TCP

performs proper error detection and error recovery, reliably. UDP on the other hand is not reliable. They both run on top of the IP (Internet Protocol), a network layer protocol.

WAN: WAN stands for Wide Area Network. A WAN is a network that connects computers located in geographically separate areas (e.g. different buildings, cities, countries). The Internet is a wide area network.

Web-based management Graphical User Interface (GUI): Many devices support a graphical user interface that is based on the web browser. This means the user can use a familiar Netscape or Microsoft Internet Explorer to control/configure or monitor the device being managed.