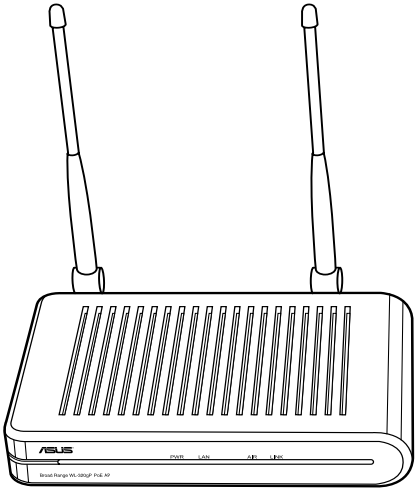
802.11g PoE Access Point

WL-320gP

(For 802.11g and 802.11b Wireless Clients)



User's Manual

E2803 / Oct 2006

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Table of Contents

About this user guide

Notational conventions

- Acronyms are defined the first time they appear in the text.
- The ASUS WL-320gP is referred to as the "ASUS 802.11g WLAN AP".

Typographical conventions

- **Boldface** type text is used for items you select from menus and drop-down lists, and commands you type when prompted by the program. These items could either be enclosed in < > (open and close brackets) or " " (open & close quotations). **Boldface** type text is also used for emphasis.

Symbols

This document uses the following icons to call your attention to specific instructions or explanations.

Note: Provides clarification or non-essential information on the current topic.

Definition: Explains terms or acronyms that may be unfamiliar to many readers. These terms are also included in the Glossary.

Warning: Provides messages of high importance, including messages relating to personal safety or system integrity.

1. Introduction

1.1 Welcome!

Thank you for purchasing the ASUS WL-320gP Wireless Access Point!

The ASUS WL-320gP Wireless Access Point incorporates 802.11g OFDM technology designs, which enables fastest 54Mbps IEEE 802.11g wireless transmission and keep compatibility with existing IEEE 802.11b devices. With Afterburner technology, you will get great performance enhancement than standard IEEE 802.11g. All the packets over the air are protected by the strongest wireless security protocol - WiFi Protected Access version 2 (WPA2).

1.2 Package contents

Check the following items in your WL-320gP package. Contact your dealer if any of the item is missing or damaged.

- WL-320gP WLAN Access Point x1
- Quick Start Guide x1
- Power adapter x1 (5 Volts DC, 2 Amp)
- Support CD x1 (utilities and user's manual)
- RJ-45 Ethernet cable x1 (straight-through)
- 5dBi dipole antenna x2

1.3 Technical Specifications

HARDWARE	
Ethernet interface	1 x RJ45 for 10/100 BaseT with auto cross-over function (MDI/MDI-X) Support IEEE 802.3af Power Over Ethernet (PoE)
Antenna	External two dipole 5dBi antenna with Reverse-SMA antenna connector; Supports antenna diversity
Output power	20dBm(FCC regulation) or 15dBm (CE regulation) in b/g mode with 1.5dB tolerance
Power adapter	AC Input: 100V~240V (50~60HZ) DC Output: 5V with max. 2 A current
Receive Sensitivity	B MODE (-97dBm@1Mbps,-96dBm@2Mbps,-95dBm@5.5Mbps,-92dBm@11Mbps) G MODE (-94dBm@6Mbps,-93dBm@9Mbps,-91dBm@12Mbps,-90dBm@18Mbps, -86dBm@24Mbps,-83dBm@36Mbps,-77dBm@48Mbps,-74dBm@54Mbps)
LED	PWR, LAN, AIR (WiFi transmission), LINK (WiFi Association)
	Wireless Association: • On: client associated (AP/Gateway/Bridge/Repeater mode), or associated to AP with strong signal (Client mode, RSSI >= -65 dBm) • Flashing: (Client mode) < -89 dbm On:200ms, Off:1000ms >= -89 dbm < -83 dbm On:200ms, Off:800ms >= -83 dbm < -77 dbm On:200ms, Off:600ms >= -77 dbm < -71 dbm On:200ms, Off:400ms >= -71 dbm < -65 dbm On:200ms, Off:200ms • Off: client not associated (AP/Gateway/Bridge/Repeater mode), or not associate to AP (Client mode)
Size	165 mm x 110 mm x 30 mm (LxWxH) excluding the external antenna
Operating Frequency	2.4 - 2.5 GHz
Modulation	OFDM, CCK, DQPSK, DBPSK
Data rate	802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11b: 1, 2, 5.5, 11Mbps
Operation channels	11 for N. America, 14 Japan, 13 Europe (ETSI)
	3 (non-overlapping)
Range	Indoor 130ft (40m), outdoor (LOS, Light-Of-Sight) 2000ft (600m) at 11Mbps Indoor 80ft (25m), outdoor (LOS, Light-Of-Sight) 500ft (150m) at 54Mbps The range may vary by different environment

SOFTWARE	
Management	• Operation mode: AP, Client, Bridge, Repeater, Gateway • Multiple SSID and VLAN • Guest SSID • Site Survey (MAC, SSID, Security, Channel and RSSI) • SNMP version 3.0 • DHCP server, DHCP client • DNS Proxy, Automatic IP, PPPoE, PPTP login client support, Static IP, Big Pond login client support • Static Route, NTP support, UPnP, DDNS • Save/restore configuration files • Upgrades via web browser • Firmware restoration
Security	**Firewall:** • NAT and SPI (Stateful Packet Inspection), DoS attack prevention, intrusion detection including logging Built a firewall for Internet traffic protection and another one for wireless LAN • Virtual DMZ **Filtering:** • Port, IP address, protocol and URL Keyword **Logging:** • Dropped packet, Accepted packet, Both Type, security event, Syslog **Encryption:** • 64/128-bit WEP • WPA-PSK TKIP/AES, WPA2-PSK TKIP/AES, WPA TKIP/AES, WPA2 TKIP/AES **Authentication:** • MAC address, 802.1x RADIUS (TLS, TTLS, PEAP)
Utilities	**Device Discovery:** Discover all ASUS AP/Gateway in network and help user to invoke Web Configuration page. **Firmware Restoration:** Restore firmware while system enters rescue mode. **Uninstall Utilities:** Unistall ASUS WL-320gP Wireless AP Utilities.

1.4 Wireless Performance

This section provides the user with ideas for how to improve the performance of a ASUS WLAN network.

1.4.1 Site Topography

For optimal performance, locate wireless mobile clients and the ASUS AP s away from transformers, heavy-duty motors, fluorescent lights, microwave ovens, refrigerators, and other industrial equipment. Signal loss can occur when metal, concrete, walls or floors block transmission. Locate the ASUS AP s in open areas or add the ASUS AP s as needed to improve coverage.

Microwave ovens operate in the same frequency band as the ASUS AP . Therefore, if you use a microwave within range of the ASUS AP you may notice network performance degradation. However, both your microwave and your the ASUS AP will continue to function.

1.4.2 Range

Every environment is unique with different obstacles, barriers, materials, etc. and, therefore, it is difficult to determine the exact range that will be achieved without testing. However, has developed some guidelines to estimate the range that users will see when the product is installed in their facility, but there are no hard and fast specifications.

Radio signals may reflect off of some obstacles or be absorbed by others depending on their construction. For example, with two 802.11b radios, you may achieve up to 1000' in open space outdoors where two devices have a line of sight, meaning they see each other with no obstacles. However, the same two units may only achieve up to 300' of range when used indoors.

By default, the ASUS AP will automatically adjust the data rate to maintain a usable radio connection. Therefore, a client that is close to the ASUS AP may operate at higher speeds while a client that is on the fringe of coverage may operate at lower speeds. As mentioned earlier, you can configure the data rates that the ASUS AP will use. If you limit the range of data rates available to the ASUS AP, you may reduce the effective wireless range of the WLAN coverage.

1.4.3 Roaming Between ASUS APs

If there are multiple ASUS APs on the network, then a wireless mobile client may seamlessly roam from one ASUS AP to another.

Each ASUS AP creates its own wireless cell or coverage area. This is also known as a Basic Service Set (BSS). Any wireless mobile client can communicate with a particular ASUS AP if it is within the ASUS AP's coverage area.

If the cells of multiple ASUS APs overlap, then the wireless mobile client may switch from one ASUS AP to another as it travels throughout the facility. During the hand-off from one ASUS AP to another, the wireless mobile client maintains an uninterrupted connection to the network. This is known as "roaming."

Multiple ASUS APs connected to a common Ethernet network form an Extended Service Set (ESS). All members of an Extended Service Set are configured with an ID, known as the SSID or ESSID. Wireless mobile clients must be configured with the same SSID as the ASUS APs on the network; a client can only roam between ASUS APs that share the same SSID.

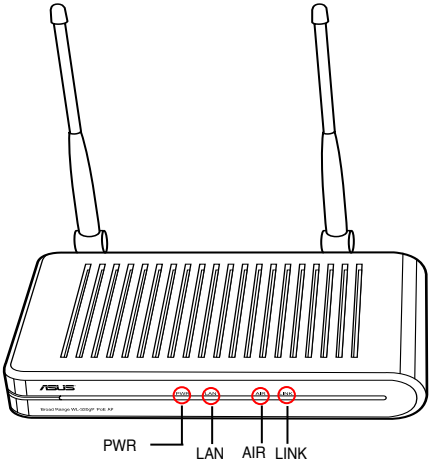
1.4.4 Roaming Guidelines

- An ASUS WLAN Card can only roam between APs of the same type.
- All ASUS APs must have the same SSID.
- All computers with ASUS WLAN Cards must have the same SSID as the Access Points that they will roam between.
- If WEP encryption is enabled, then all ASUS APs and client adapters must use the same encryption level and WEP Key(s) to communicate.
- The ASUS APs' cells must overlap to ensure that there are no gaps in coverage and to ensure that the roaming client will always have a connection available.
- ASUS APs that use the same Channel should be installed as far away from each other as possible to reduce potential interference.
- It is strongly recommended that you perform a site survey using the utility provided with the ASUS WLAN Card to determine the best location for each ASUS AP in the facility.

1.5 Getting to Know the WL-320gP

1.5.1 Front panel features

The ASUS WL-320gP Access Point includes LED indicators which show the system, LAN, wireless network, and link status.



PWR (Power)

OFF:	No power or performing boot sequence
ON:	System ready
Blinking:	Firmware upgrade failed

LAN (Ethernet Network)

OFF:	No power
ON:	Physical connection to an Ethernet network
Blinking:	Transmitting or receiving data (through Ethernet cable)

AIR (Wireless Network)

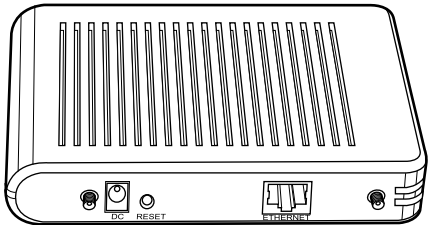
OFF:	No power
ON:	Wireless function ready
Blinking:	Transmitting or receiving data (through wireless)

LINK (Link Status)

Operation Mode	AP/Repeater/Bridge/ Gateway	Client
OFF	Client not associated	Not associated to AP
ON	Client associated	Associated to AP with strong signal
Blinking quickly	--	Associated to AP with better signal
Blinking slowly	--	Associated to AP with weak signal

1.5.2 Rear panel features

The rear panel contains the Ethernet, the DC port, and the Reset button.



Label	Description
ETHERNET	The Ethernet port connects to an Ethernet device such as to a switch (either Power over Ethernet support or not) or to a router.
RESET	Press the Reset button to restore to factory default settings.
DC	The DC port connects to the power adapter This port will not be used if using Power over Ethernet switch or injector.

2. Installation

This chapter describes the installation procedure for the ASUS 802.11g AP and includes a description of the LEDs found on the unit.

2.1 Installation Procedure

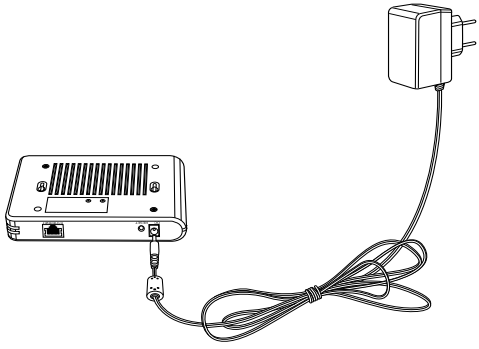
Follow these steps to install the ASUS 802.11g WLAN AP.

1. Determine the best location for the ASUS 802.11g WLAN AP. Keep in mind the following considerations:
   - The length of the Ethernet cable that connects the Access Point to the network must not exceed 100 meters.
   - For standard placement, try to place the Access Point on a flat, sturdy surface as far from the ground as possible, such as on top of a desk or bookcase, keeping clear of metal obstructions and away from direct sunlight.
   - For external antenna mounting, install the external antennas so that they are clear of obstructions; refer to the documentation that came with the antennas for mounting and installation instructions.
   - Try to centrally locate the Access Point or its antennas so that it will provide coverage to all of the wireless mobile devices in the area.
   - Use only the power supply that came with this unit. Other power supplies may fit but the voltage and power may not be compatible.

Note: It is the responsibility of the installer and users of the ASUS 802.11g AP to guarantee that the antenna is operated at least 20 centimeters from any person. This is necessary to insure that the product is operated in accordance with the RF Guidelines for Human Exposure which have been adopted by the Federal Communications Commission.

2. Place the Access Point in the desired location. Wall mounting is also possible for the Access Point. Refer to the section entitled “Wall Mounting Option” on the next page for details.
3. Attach one end of an RJ-45 Ethernet cable to the Access Point and attach the other end to the RJ-45 10Base-T port of a network hub, switch, router, or patch panel (possibly on a wall).

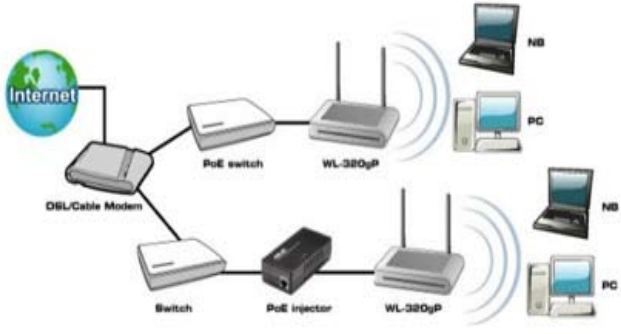
4. Attach one end of the AC power adapter, included in the product package, to the back of the ASUS 802.11g AP and the other end to a power outlet.



Note: Use the Access Point only with the power adapter supplied in the product package. Using another power supply may damage the Access Point.

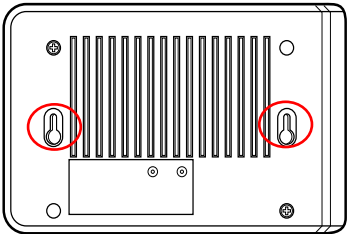
The Power LED on the front of the Access Point will light up when the unit is powered ON. In addition, the green Link LED will turn ON to indicate that the Access Point has a physical Ethernet network connection.

5. Install Power over Ethernet. Attach one end of the Power over Ethernet switch or injector to the ETHERNET port at the back of WL-320gP. After the POWER LED at the front panel lights up, the WL-320gP is ready to go.



2.2 Wall Mounting Option

The ASUS WL-320gP Access Point is designed to sit on a raised flat surface like a file cabinet or a book shelf. The unit may also be converted for mounting to a wall or ceiling.



Follow these steps to mount the ASUS 802.11g WLAN AP to a wall:

1. Look on the underside for the two mounting hooks.
2. Mark two upper holes in a flat surface.
3. Tighten two screws until only 1/4" is showing.
4. Latch the hooks of the ASUS WL-320gP onto the screws.

Note: Readjust the screws if you cannot latch the Access Point onto the screws or if it is too loose.

3. Software Configuration

3.1 Configuring the ASUS 802.11g AP

The ASUS 802.11g AP can be configured to meet various usage scenarios. Some of the factory default settings may suit your usage; however, others may need changing. Prior to using the ASUS 802.11g AP, you must check the basic settings to guarantee it will work in your environment.

Configuring the ASUS 802.11g AP is done through a web browser. You need a Notebook PC or desktop PC connected to the ASUS 802.11g AP (either directly or through a hub) and running a web browser as a configuration terminal. The connection can be wired or wireless. For the wireless connection, you need an IEEE 802.11g/b compatible device, e.g. ASUS WLAN Card, installed in your Notebook PC. You should also disable WEP and set the SSID to "default" for your wireless LAN device.

If you want to configure the ASUS 802.11g AP or want to access the Internet through the ASUS 802.11g AP, TCP/IP settings must be correct. Normally, the TCP/IP setting should be on the IP subnet of the ASUS 802.11g AP.

Note: Changing TCP/IP settings may require rebooting your PC. When rebooting, the ASUS 802.11g AP should be switched ON and in the ready state.

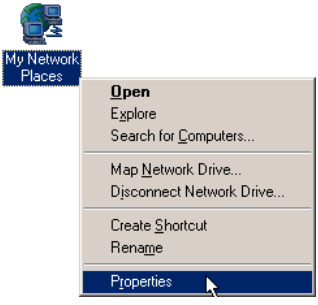
Advanced IP Settings

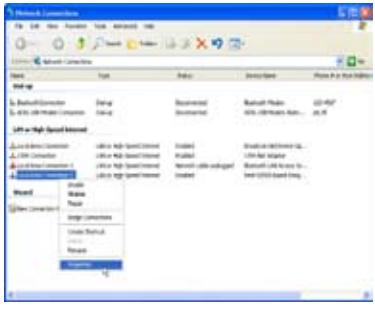
If you want to set your IP address manually, the following default settings of the ASUS 802.11g AP should be known:

- IP address 192.168.1.1
- Subnet Mask 255.255.255.0.

If you set your computer's IP manually, it needs to be on the same segment. For example:

- IP address 192.168.1.xxx (xxx can be any number between 2 and 254 that is not used by another device)
- Subnet Mask 255.255.255.0 (same as the ASUS 802.11g AP)
- Gateway 192.168.1.1 (this is the ASUS 802.11g AP IP address)
- DNS 192.168.1.1 (ASUS 802.11g AP IP address or your own).

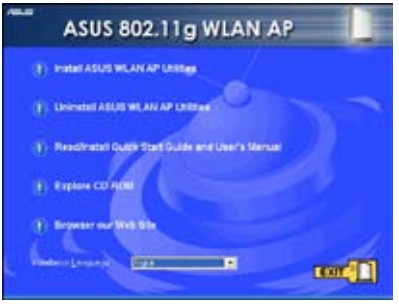




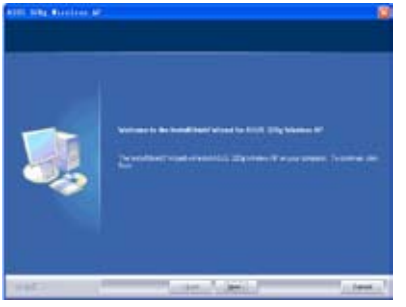
3.2 ASUS WLAN Utilities

Installing the Utility

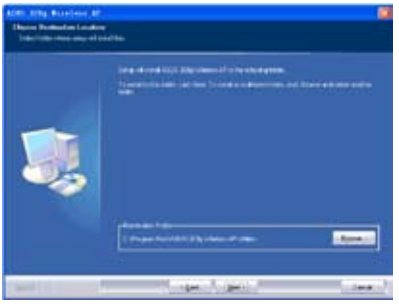
Follow these steps to install the ASUS WLAN Utilities in Microsoft® Windows. Insert the support CD. Double-click setup.exe (in the root of the support CD) if your autorun has been disabled.



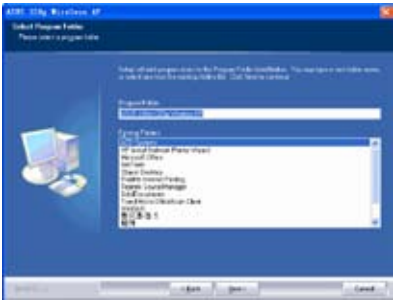
(1) Click **Install...Utilities.**



(2) Click **Next** after reading the welcome screen.



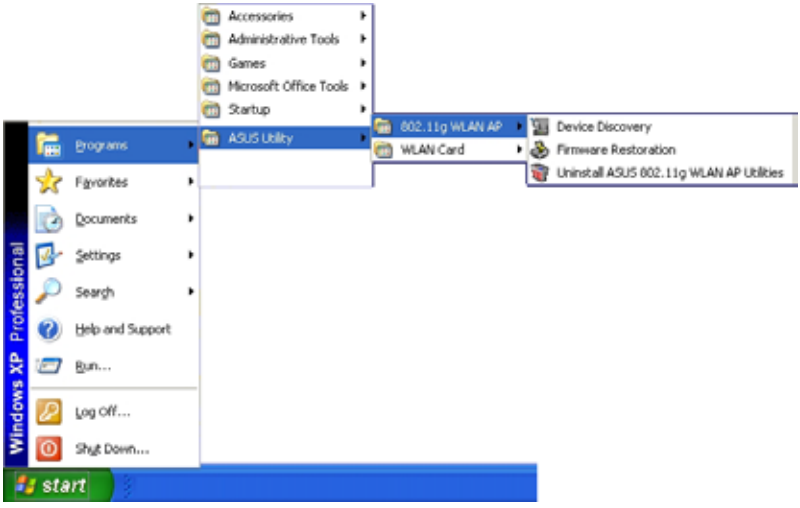
(3) Click **Next** to accept the default destination folder or click **Browse** to specify another path.



(4) Click **Next** to accept the default program folder or enter another name.

(5) Click **Finish** when setup is complete.

After installation, you can launch the utilities through the Start menu.



Wired Ethernet Connection

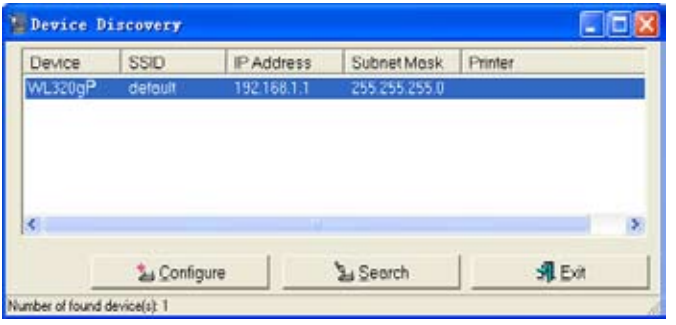
Besides using a network hub, you can also connect a LAN cable from your computer to the ASUS 802.11g AP using either a straight or crossover cable because the ASUS 802.11g AP has auto-crossover capability.

Wireless Connection

If you are using a Notebook PC with a wireless adapter, you can connect to the ASUS WLAN Web Manager without a wired Ethernet connection. Just make sure your TCP/IP settings are set correctly.

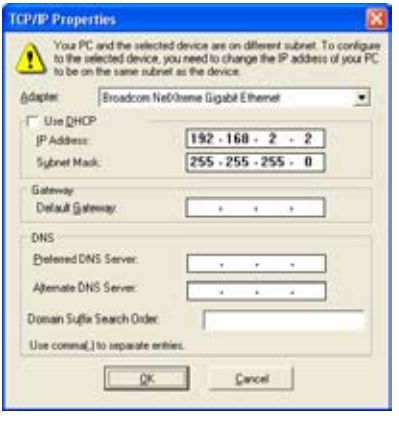
Device Discovery

Run the ASUS WLAN **Device Discovery** from the **Start** menu and click **Config** on the device.



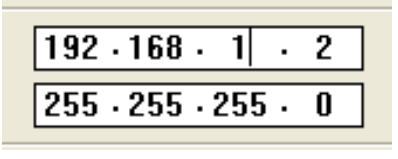
Manually Entering the Address

You can also open your PC's web browser and enter the IP address of the ASUS 802.11g AP : **http://192.168.1.1**



(This is the wrong setting.)

If your computer's IP is not on the same subnet as the ASUS 802.11g AP (192.168.1.X), you will be asked to change it. The IP address can be any number from 2 to 254 that is not used by another device. Gateway is not required.

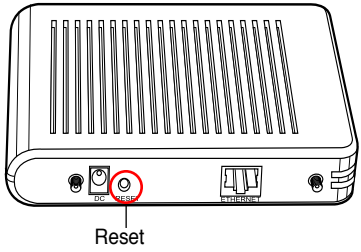


(This is the correct setting.)

Note: You can also change your TCP/IP settings through Windows network properties as shown earlier.

Restart your Windows if you are asked to.

Note: If you cannot find any the ASUS 802.11g APs due to a problem in the IP settings, push and hold the "Restore" button on the ASUS 802.11g AP over five seconds to restore factory default settings.



User Name and Password

Once connected, a window will ask for the User name and Password in order to log in. The factory default values are "**admin**" and "**admin**".

Home Page

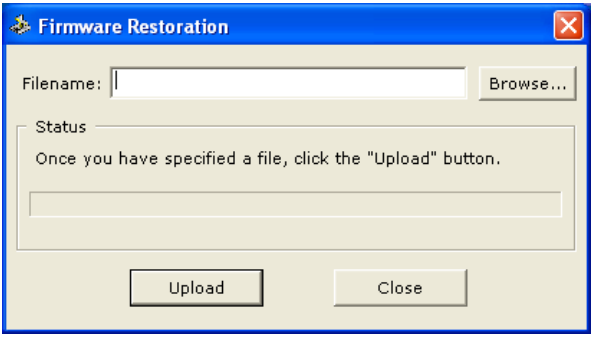
After logging in, you will see the ASUS 802.11g AP home page. The default pages will be for the Access Point mode. Router and Home Gateway modes are described later in this manual.

3.3 Firmware Restoration

The Firmware Restoration utility is an emergency rescue tool that can automatically search out an ASUS 802.11g AP that has failed during a firmware upload and re-upload a firmware that you specify. A failed firmware upgrade will cause the ASUS 802.11g AP to enter a failure mode, waiting for the Firmware Restoration utility to find and upload a new firmware. The process takes about 3 to 4 minutes.

Note: This is not a firmware upgrade utility and cannot be used on a working ASUS 802.11g AP . Normal firmware upgrades must be done through the web manager.

The Firmware Restoration utility is launched from the Windows Start menu.



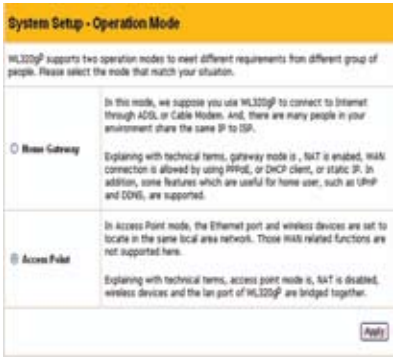
Using a Hub

If you have problems uploading a firmware while using a network hub, try connecting your computer directly to the LAN port. Either 10Base-T or 100Base-TX connections can be used.

3.4 Operation Mode

This chapter gives information on the operation modes of the ASUS WL-320gP Access Point.

The ASUS 802.11g AP supports five operation modes (AP, Gateway, Bridge, URE and Station) to meet different requirements from different groups of people. WL-320gP can be setup as Bridge, URE and Station either in AP mode or Gateway mode. You can change operation modes in Quick Setup or **Wireless -> Advanced**.



Home Gateway

In this mode, we suppose you use the Ethernet port to connect to Internet through ADSL or Cable Modem. And, there are many people in your environment share the same IP to ISP.

Technically, gateway mode is , NAT is enabled, WAN connection is allowed by using PPPoE, or DHCP client, or static IP. In addition, some features which are useful for home user, such as UPnP and DDNS, are supported.

Access Point

In Access Point mode, Ethernet port and wireless devices are set to locate in the same local area network. Those WAN related functions are not supported here.

Technically, access point mode is, NAT is disabled, one wan port and four LAN ports are bridged together.

By default, the ASUS 802.11g AP operates in Access Point mode.

1) Bridge Mode (WDS)

Wireless bridge, also known as Wireless Distribution System or WDS, allows you to connect to one or many Access Points.

Access Point

AP Mode configures the ASUS 802.11g AP for a specific purpose. By default, the ASUS 802.11g AP is set to serve as an "Access Point" where a wireless mobile client can connect wirelessly to a wired Ethernet network.

WDS Only

With WDS, the ASUS 802.11g AP can only communicate with other Access Points.

Hybrid

Hybrid allows you to use the ASUS 802.11g AP both as an access point and as a wireless bridge.

Channel

Both Access Points in Wireless Bridge mode must be set to the same channel.

Connect to APs in Remote Bridge List (Yes/No)

Select Yes to connect to access points in the remote bridge list.

Allow anonymous? (Yes/No)

Select Yes to allow users without accounts to connect. 2) Client Mode (Station)

Note: If "Connect to APs in Remote Bridge List" and "Allow Anonymous" are both set to "No", it means that this AP will not connect with other APs and therefore the AP mode setting will return to "AP Only".

2) Client Mode (Station)

Wireless client(Station) mode allows WL-320gP works as performance wireless client card as long as the device supports wired connection(with Ethernet port), like Game console, PC or NB. You need to set up the wireless setting and encryption before association.

Specify the SSID and Encryption of target AP accordingly under Wireless - Interface sub menu then click Finish button to Save and Restore setting. After system restarting, connect the Ethernet cable to WL-320gP ETHERNET port and other device, then WL-320gP will work as wireless client card.

3) Repeater Mode (URE)

Wireless Repeater Mode allows WL-320gP works as range extender. You can set up the wireless setting under Wireless-Interface sub menu(same as Client Mode) the same as root AP then the wireless coverage can be boost.

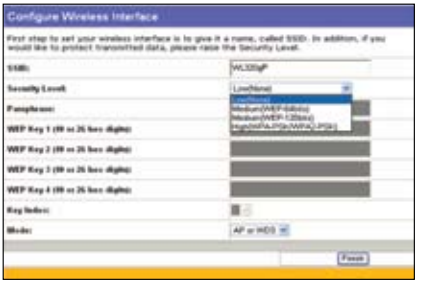
3.5 Quick Setup in AP mode

After you log in, you will see the ASUS 802.11g AP Home Page. The default page will be the Access Point Mode.

1. Click Next to enter the Quick Setup page. Follow the instructions to set up the ASUS Access Point.

2. Set mode to AP or WDS(Bridge), Station(Client) or URE(Repeater).

3. Setting up your wireless interface. Specify to your wireless router an SSID (Service Set Identifier), which is a unique identifier attached to packets sent over WLAN. This identifier emulates a password when a device attempts to communicate with your wireless router via WLAN.

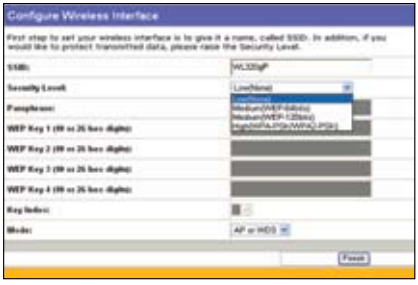


If you want to protect transmitted data, select a Security Level to enable encryption methods.

Medium: Only users with the same WEP key settings can connect to your wireless router and transmit data using 64bits or 128bits WEP key encryption.

High: Only users with the same WPA pre-shared key settings can connect to your wireless router and transmit data using TKIP encryption.

4. Input four sets of WEP keys in the WEP Key fields (10 hexadecimal digits for WEP 64bits, 26 hexadecimal digits for WEP 128bits). You can also let the system generate the keys by inputting a Passphrase. Record the Passphrase and the WEP keys in your notebook, then click Finish.



For example, if we select WEP 64bits encryption mode and input 11111 as the Passphrase, the WEP Keys are generated automatically.

5. Click Save&Restart to restart the wireless router and activate the new settings.

3.6 Quick Setup in Home Gateway Mode

To start quick setup in Gateway mode, click Apply to enter the "Quick Setup" page. Follow the instructions to setup the ASUS 802.11g AP.

1. Click **System Setup -> Operation Mode -> Home Gateway.** In the Home Gateway mode, you will be able to connect to the Internet through ADSL or cable modem.

2. Click **Apply** to enter the Gateway mode.

3. Select your time zone or the closest region. Click **Next** to continue.

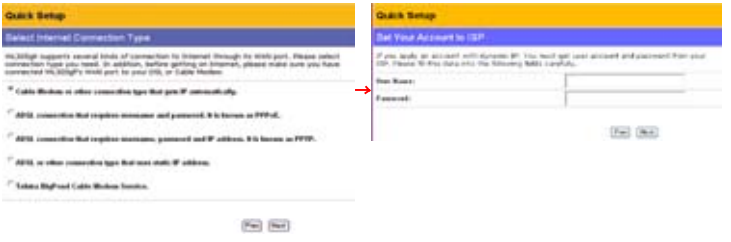
4.. ASUS WL-320gP Access Point supports five types of ISP services—cable, ADSL (PPPoE, PPTP, static IP address), and Telstra BigPond. Since each service has its own protocols and standards, therefore, during the setup process, there are different identity settings demanded by WL-320gP. Select the correct connection type and click **Next** to continue.

Cable User

If you are receiving services from cable or other ISP assigning IP addresses automatically, please select **Cable Modem or other connection that gets IP automatically**. If you are using cable services, your ISP may have provided you with hostname, MAC address, and heartbeat server, if true, please fill these information into the boxes on the setting page; if not, click **Next** to skip this step.

PPPoE User

If you are PPPoE service user, please select the second line. You would be required to input the username and password provided by your ISP.



PPTP User

If you are using PPTP services, you would be asked to input the username,

Static IP User

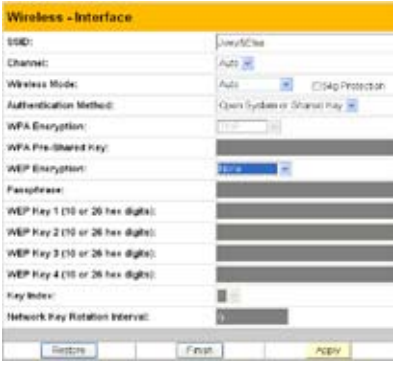
If you are using ADSL or other connection type that uses static IP addresses, please select the fourth line, then input the IP address, subnet mask, and default gateway provided by your ISP. You could choose to specify certain

5. Setting up your wireless interface. To set up your wireless interface, follow the same instructions from 3 to 5 as above Configurating Wireless Interface in Access Point mode on page 26. You can change to AP or WDS(Bridge), Station(Client), or URE(Repeater) accordingly. Click **Save&Restart** to restart the wireless router and activate the new settings.

3.7 Wireless

Click an item on the menu to reveal a submenu. Follow the instructions to set up the ASUS 802.11g AP. Tips are displayed when you move your cursor over an item.

3.7.1 Interface



SSID

The SSID is an identification string of up to 32 ASCII characters that differentiate one ASUS 802.11g AP or Access Point from other manufacturers. The SSID is also referred to as the "ESSID" or "Extended Service Set ID." You can use the default SSID and radio channel unless more than one ASUS 802.11g AP is deployed in the same area. In that case, you should use a different SSID and radio channel for each ASUS 802.11g AP. All ASUS Wireless APs/Routers and ASUS 802.11g/802.11b WLAN client adapters must have the same SSID to allow a wireless mobile client to roam. By default, the SSID is set to "default".

Channel

The 802.11g and 802.11b specifications supports up to 14 overlapping channels for radio communication. To minimize interference, configure each ASUS 802.11g AP to be non-overlapping; select Auto from the Channel drop-down list to enable the system to select a clear channel during boot up as your operating channel.

Ensure that ASUS 802.11g APs sharing the same channel (or channels which are close in number) are as far away from each other as possible, based on the results of your site survey of the facility. There is a site survey utility on the ASUS 802.11g AP setup CD.

Wireless Mode

This field indicates the 802.11g interface mode. Selecting "Auto" allows 802.11g and 802.11b clients to connect to the ASUS 802.11g AP. Selecting "54g Only" maximizes performance, but prevents 802.11b clients from connecting to the ASUS 802.11g AP. If "54g Protection" is checked, G-Mode protection of 11g traffic is enabled automatically in the presence of 11b traffic.

Authentication Method

This field enables you to set different authentication methods which determine different encryption schemes. The relationship between Authentication Method, WPA Encryption, WPA Pre-Shared Key, WEP Encryption, Passphrase, and WEP Keys is listed in the following table. If all your clients support WPA, using "WPA-PSK" is recommended for better security.

Authentication Method	WPA / WEP Encryption	WPA Pre-Shared Key Passphrase	WEP Key 1–4
Open or shared key	None WEP (64 bits) WEP (128 bits)	Not required 1–64 characters 1–64 characters	Not required 10 hex 26 hex
Shared key	WEP (64 bits) WEP (128 bits)	1–64 characters 1–64 characters	10 hex 26 hex
WPA–PSK	TKIP only AES only	8–63 characters 8–63 characters	Not required Not required
WPA	TKIP only AES only	Not required Not required	Not required Not required
Radius with 802.1x	Auto WEP (64 bits) WEP (128 bits)	Not required 1–64 characters 1–64 characters	Not required 10 hex 26 hex

WPA Encryption

When "WPA-PSK" authentication method is used, the newly proposed TKIP (Temporal Key Integrity Protocol) or AES encryption schemes are applied.

WPA Pre-Shared Key

Selecting "TKIP" or "AES" in the WPA Encryption, this field is used as a password to begin the encryption process. Note: 8 to 63 characters are required.

WEP Encryption

Traditional WEP encryption is applied when "Open or Shared Key", "Shared Key" or "Radius with 802.1x" authentication methods are selected.

NOTE: When "WPA" or "WPA-PSK" authentication methods are selected, you still can set WEP encryption for those clients that do not support WPA/WPA-PSK. Please note that Key Index for WEP key is limited to 2 or 3 when both WPA and WEP encryption are supported at the same time.

64/128-bit versus 40/104-bit

The following section explains low-level (64-bit) and high-level (128-bit) WEP Encryption schemes:

64-bit WEP Encryption

64-bit WEP and 40-bit WEP are the same encryption method and can interoperate in a wireless network. This level of WEP encryption uses a 40-bit (10 Hex character) encryption scheme as a secret key, which is set by the user, and a 24-bit "Initialization Vector" scheme, which is not under user control.

Together these two schemes make a 64-bit (40 + 24) encryption scheme. Some vendors refer to this level of WEP as 40-bit and others refer to this as 64-bit. ASUS WLAN products use the term 64-bit when referring to this *lower* level of encryption.

128-bit WEP Encryption

104-bit WEP and 128-bit WEP are the same encryption method and can interoperate on a wireless network. This level of WEP encryption uses a 104-bit (26 Hex character) encryption scheme as a secret key which is set by the user, and a 24-bit "Initialization Vector", which is not under user control.

Together these two schemes make a 128-bit (104 + 24) encryption scheme. Some vendors refer to this level of WEP as 104-bit and others refer to this as 128-bit. ASUS WLAN products use the term 128-bit when referring to this *higher* level of encryption.

Passphrase

Selecting "WEP-64bits" or "WEP-128bits" in the Encryption field generates four WEP keys automatically. A combination of up to 64 letters, numbers, or symbols is required. Alternatively, leave this field blank and type in four WEP keys manually.

WEP-64bit key:	10 hexadecimal digits (0~9, a~f, and A~F)
WEP-128bit key:	26 hexadecimal digits (0~9, a~f, and A~F)

Note: The ASUS WLAN family of products uses the same algorithm to generate WEP keys, eliminating the need for users to remember passwords and to maintain compatibility between products. However, using this method to generate WEP keys is not as secure as manual assignment.

WEP Key

You can set a maximum of four WEP keys. A WEP key is either 10 or 26 hexadecimal digits (0~9, a~f, and A~F) based on whether you select 64bits or 128bits in the WEP pull-down menu. The ASUS 802.11g AP and ALL of its wireless clients MUST have at least the same default key.

Key Index

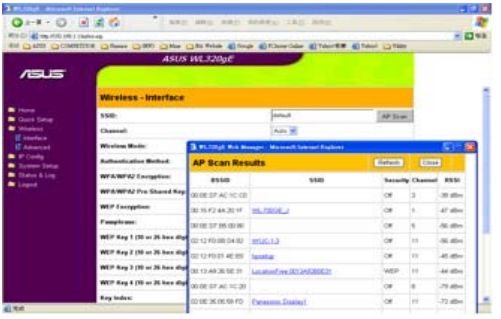
The Default Key field lets you specify which of the four encryption keys you use to transmit data on your wireless LAN. As long as the ASUS 802.11g AP or wireless mobile client with which you are communicating has the same key in the same position, you can use any of the keys as the default key. If the ASUS 802.11g AP and ALL of its wireless clients use the same four WEP keys, select "key rotation" to maximize security. Otherwise, choose one key in common as the default key.

Network Rotation Key Interval

This field specifies the time interval (in seconds) after which a WPA group key is changed. Enter '0' (zero) to indicate that a periodic key-change is not required.

3.7.2 Site Survey(AP SCAN)

Site Survey will help WL-320gP associate appropriate AP while in Station (Client) or URE(Repeater) mode. Make sure WL-320gP in Client or URE mode, click "AP SCAN" button in Wireless -> Interface will pop up a window. AP Scan will collect complete AP around information including MAC, SSID, Security, Channel and RSSI(AP wireless signal strength) value.



3.7.3 Access Control

Pull down menu items:

Disable (no info required)

Accept (need to input information)

Reject (need to input information)

To add security, the ASUS 802.11g AP has the ability to only associate with or not associate with wireless mobile clients that have their MAC address entered into this page.

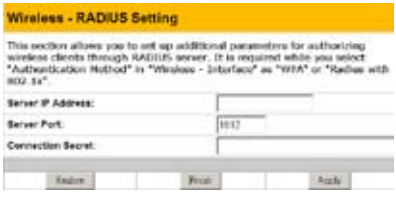
The default setting of "Disable" will allow any wireless mobile client to connect. "Accept" will only allow those entered into this page to connect. "Reject" will prevent those entered into this page from connecting.

Adding a MAC Address

To add a MAC address, enter the 12 hexadecimal characters into the white box next to "MAC Address:" and click the **Add** button. The MAC address will be placed in the control list below. Only a total of 31 MAC addresses can be entered into this page so determine which will be the lesser; those you wish to accept or those you wish to reject and click the appropriate "MAC Access Mode".

Note: Click the "Finish" button to save your new settings and restart the ASUS 802.11g AP or click "Save" and restart later.

3.7.4 RADIUS Setting



This section allows you to set up additional parameters for connection with RADIUS Server. It is required while you select "Authentication Method" as "WPA" or "Radius with 802.1x" in "Wireless – Interface".

Server IP Address - This field specifies the IP address of the RADIUS server to use for 802.1X wireless authentication and dynamic WEP key derivation.

Server Port - This field specifies the UDP port number used by the RADIUS server.

Connection Secret - This field specifies the password used to initialize a RADIUS connection.

Note: Click the "Finish" button to save your new settings and restart the ASUS 802.11g AP or click "Save" and restart later.

3.7.5 Multi-SSID

The Access Point can work with a primary wireless network and up to three Virtual Local Area Networks (VLAN). You must enable Multi-SSID and VLAN first then setup each VLAN property. Each VLAN can work with its own VLAN ID and security level independently.

3.7.6 Advanced

This section allows you to set up additional parameters for the wireless router function. We recommend that you use the default values for all items in this window.

You may also setup operation modes (AP or WDS, Station or URE) here in addition to Quick Setup.

Hide SSID - By default, "No" is selected so that wireless mobile users can see your ASUS 802.11g AP's SSID and join. If "Yes" is selected, your ASUS 802.11g AP will not show in site surveys by wireless mobile clients and they will have to manually enter your ASUS 802.11g AP's SSID. If you want to restrict access to "your" ASUS 802.11g AP , this is a simple way to do it but for security reasons, don't forget to change the SSID to something other than "default".

Set AP Isolated - Selecting Yes to prevent wireless client from communicating with each other.

Data Rate (Mbps) - This field allows you to specify the transmission rate. Leave on "Auto" to maximize performance versus distance.

Basic Rate Set - This field indicates the basic rates that wireless clients must support. Use "1 & 2 Mbps" only when backward compatibility is needed for some older wireless LAN cards with a maximum bit rate of 2Mbps.

Fragmentation Threshold (256-2346) – Fragmentation is used to divide 802.11 frames into smaller pieces (fragments) that are sent separately to the destination. Enable fragmentation by setting a specific packet size threshold. If there is an excessive number of collisions on the WLAN, experiment with different fragmentation values to increase the reliability of frame transmissions. The default value (2346) is recommended for normal use.

RTS Threshold (0-2347) – The RTS/CTS (Request to Send/Clear to Send) function is used to minimize collisions among wireless stations. When RTS/CTS is enabled, the router refrains from sending a data frame until another RTS/CTS handshake is completed. Enable RTS/CTS by setting a specific packet size threshold. The default value (2347) is recommended.

DTIM Interval (1-255) – DTIM (Delivery Traffic Indication Message) is a wireless message used to inform clients in Power Saving Mode when the system should wake up to receive broadcast and multicast messages. Type the time interval in which the system will broadcast a DTIM for clients in Power Saving Mode. The default value (3) is recommended

Beacon Interval (1-65535) – This field indicates the time interval in milliseconds that a system broadcast packet, or beacon, is sent to synchronize the wireless network. The default value (100 milliseconds) is recommended.

Enable Frame Bursting? – This field allows you to enable frame-bursting mode to improve performance with wireless clients that also support frame-bursting.

Radio Power – Radio Power can be set between 1 to 84 but the default value is recommended.

Enable WMM – This field allows you to enable WMM to improve multimedia transmission

Enable WMM No-Acknowledgement – This field allows you to enable WMM No-Acknowledgement

Mode – This field allows you set up different operation modes(AP or WDS, Station or URE) either in AP mode or Gateway mode.

URE – This section allows you set up parameters for URE. This section only works while in URE mode.

SSID – This is the SSID of root AP. WL-320gP can repeat the signal and boost the signal coverage while setting in URE mode.

Other security parameters setting are the same in **Wireless -> Interface**.

3.8 IP Config

Click this item on the menu to reveal a sub menu. Follow the instructions to setup the ASUS 802.11g AP. Tips are given when you move your cursor over each item.

LAN

Selection items:

Yes (no info required)

No (need to input information)

Click **Apply** or **Finish** if you make any changes.

Get IP Automatically

Select Yes (default) or No to get IP address automatically from a DHCP server.

Yes

This parameter determines if the ASUS 802.11g AP will send out a DHCP request during bootup. If you have a DHCP server on the network, set this option so that the ASUS 802.11g AP can receive an automatic IP address assignment.

If you have a DHCP (Dynamic Host Configuration Protocol) server on the network, then the DHCP server will automatically assign the ASUS 802.11g AP an IP address when the ASUS 802.11g AP is powered up. To determine what IP address has been assigned to the ASUS 802.11g AP, review the IP address on the "Status" page available on the "Main Menu".

No

The ASUS 802.11g AP also accepts a static IP address. You may manually configure the IP address and subnet mask on the "IP Config" page. Enter an IP address and a subnet mask in the field provided to assign the ASUS 802.11g AP a static IP address. If you don't know your Gateway setting, leave it empty (not 0.0.0.0).

3.9 NAT Setting(in Home Gateway Mode)

Virtual Server allows you to make services, like WWW, FTP, provided by a server in your local network accessible for outside users. DDNS allows users to export host names to the Internet through a DDNS service provider. Each time your ASUS 802.11g AP connect to the Internet and get an IP address from an ISP, this function will update your IP address to the DDNS service provider automatically, so that any user on the Internet can access your servers through a pre-defined name registered in a DDNS service provider.

Note: Currently, clients connected to DynDNS or TZO are embedded in ASUS 802.11g AP. You can click Free Trial link behind each DDNS service provider to start with a free trial account.

3.10 Internet Firewall(in Home Gateway Mode)

LAN & WAN filter allows you to block specified packets between LAN and WAN in a pre-defined time interval. URL filter allows you to block specific URL access from your local network.

Note: The only Ethernet port in ASUS 802.11g AP is used for WAN connection in "Gateway" mode. If you still hope to configure ASUS 802.11g AP through Ethernet port, please remember to enable "Web Access from WAN" in "Internet Firewall - Basic Config".

3.11 System Setup

Click this item on the menu to reveal a sub menu. Follow the instructions to setup the ASUS 802.11g AP. Tips are given when you move your cursor over each item.

3.11.1 Firmware Upgrade

This page reports the Flash Code (Firmware) version installed in the ASUS 802.11g AP. Periodically, a new Flash Code is available for the ASUS 802.11g APs on ASUS's Web site. You can update the ASUS 802.11g AP's Flash Code using the Firmware Upgrade page under the Advanced Setup menu of the Web Manager. If you are experiencing a problem with your ASUS WLAN equipment, a Technical Support representative may ask you to give your device's Flash Code (Firmware) version.

Note: The firmware upgrade takes approximately 60 to 90 seconds. When the firmware upgrade is completed, you will be directed to the home page.

3.11.2 SNMP (in AP mode)

SNMP is a popular network monitoring and management protocol. It provides network

administrators with the ability to monitor the status of the Access Point and receive

notification of any critical events as they occur on the Access Point. You can setup AP property for SNMP control needed in System Setup-> SNMP webpage then click Save to apply your change.

3.11.3 Setting Management

This function allows you to save current settings to a file, or load settings from a file.

Save As a File

Move your cursor over the **HERE** link on the web page. Then click the right button of mouse and select **Save As...** to save current setting into a file.

Note: When current settings are saved to file, it will be saved to flash as well.

Load From a File

Specify the path of and name of the downloaded file in the **New Setting File** below. Then, click **Upload** to write the file to. It takes a few time to finish the process and then the system will reboot.

New Setting File

Click **Browse** to locate the file.

3.11.4 Factory Default

Restoring Factory Default Settings

Web Manager

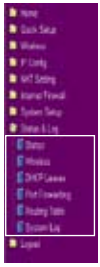
You can reset all settings to their factory defaults through the web manager using the "Factory Default" page in "Advanced Setup". Click the **Restore** button and wait about 30 seconds before trying to access the ASUS 802.11g AP.

Hardware

You can reset all settings to their factory defaults manually by pushing the "Restore" button in a hole on the back of the ASUS 802.11g AP while it is ON. Use a pen or straightened paper clip to hold the "Restore" button depressed over 5 seconds until the power LED on the front of the ASUS 802.11g AP starts blinking.

Note: You will be notified when factory default settings are restored while using the web manager.

3.12 Status & Log



Click this item on the menu to reveal a sub menu. Follow the instructions to setup the ASUS 802.11g AP. Tips are given when you move your cursor over each item.

Status

Wireless

System Up Time

Shows how long the ASUS 802.11g AP has been running since the last bootup.

4. Troubleshooting

The ASUS AP is designed to be very easy to install and operate. However, if you experience difficulties, use the information in this chapter to help diagnose and solve problems. If you cannot resolve a problem, contact Technical Support, as listed on the front of this manual.

Common Problems and Solutions

Problem

The ASUS AP does not power up:

Solution

- Check for faulty ASUS AP power supply by measuring the output voltage with an electrical test meter.
- Check failed AC supply (power outlet)

Problem

Cannot communicate with the ASUS AP through a wired network connection.

Solution

- Verify network configuration by ensuring that there are no duplicate IP addresses. Power down the device in question and ping the assigned IP address of the device. Ensure no other device responds to that address.
- Check that the cables used have proper pin outs and connectors or use another LAN cable.
- Check that the hub, switch, or computer that the ASUS AP is connected and that all devices support 10Mbps speed.

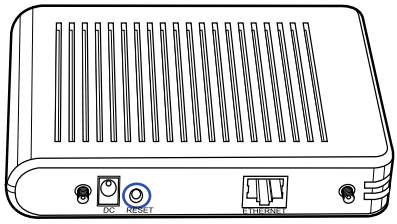
This is what you will see if you connect the ASUS 802.11g AP to a:

	10/100 Mbps Hub	Pure 100 Mbps Hub
Hub LED	ON	OFF
Access Point (Link) LED	ON	ON

So you will not know if the connection is bad from the ASUS AP Link LED alone, you will have to look at the Hub LED if you are not sure what kind of hub the ASUS AP is attached to.

Problem

The ASUS AP Device Discovery still cannot find or connect to the ASUS AP after verifying the IP address and LAN cable, changes cannot be made, or password is lost.



Solution

In case the ASUS AP is inaccessible, you can restore the ASUS AP's factory default settings. Use a straightened paper clip to press the button located in the hole on the back of the ASUS AP and keep it depressed over 5 seconds. The power LED will darken and then light up when reset is successful.

Reset to Defaults

The following are factory default values. These values will be present when you first receive your the ASUS AP , if you push the reset button on the back of the ASUS AP over 5 seconds, or if you restore factory settings through the ASUS AP software.

Name	Default Value
Wireless - Interface	
SSID	default
Channel	6
Encryption (WEP)	None
Broadcast SSID	No
Wireless - Bridge	
AP Mode	Access Point Only
Wireless - Access Control	
MAC Access Mode	Disabled
IP Config - LAN	
IP Address	192.168.1.1
Get IP Address Automatically	Yes
Subnet Mask	255.255.255.0
Gateway	(blank)
System Setup - Password	
Operation Mode	Access Point
User Name	admin
Password	admin

Problem

My ASUS WLAN Card will not associate with the ASUS AP.

Solution

Follow these steps:

1. Make sure that your WLAN Card is of the same specifications as the WLAN Access Point.
2. Try to bring the devices closer together; the ASUS WLAN Card may be out of range of the ASUS AP.
3. Confirm that the ASUS AP and ASUS WLAN Card have the same SSID.
4. Confirm that the ASUS AP and ASUS WLAN Card have the same Encryption settings, if enabled.
5. Confirm that the ASUS AP's Air and Link LEDs are solid green.
6. Confirm that the authorization table includes the MAC address of the ASUS WLAN Card if "Authorization Table" is enabled.
7. Confirm that the operational mode is "Access Point" mode.
8. Confirm that the ASUS AP and ASUS WLAN Card have the same preamble mode.

Problem

The throughput seems slow.

Solution

To achieve maximum throughput, verify that your antennas are well-placed, not behind metal, and do not have too many obstacles between them. If you move the client closer to the ASUS AP and throughput increases, you may want to consider adding a second ASUS AP and implementing roaming.

- Check antenna, connectors and cabling.
- Verify network traffic does not exceed 37% of bandwidth.
- Check to see that the wired network does not exceed 10 broadcast messages per second.
- Verify wired network topology and configuration.

Problem

I cannot find the ASUS APs using the ASUS AP Discovery.

Solution

To configure the ASUS AP through an ASUS WLAN Card, your computer must be in the same subnet of the ASUS AP. You cannot find the ASUS APs with subnet different from your computer within the same gateway. You must change your computer to the same subnet as the ASUS AP. The factory default subnet of the ASUS AP is “192.168.1.1”.

Problem

How do I upgrade the firmware on the ASUS AP?

Solution

Periodically, a new Flash Code is available for the ASUS APs on the ftp site at **ftp://ftp.asus.com**. You can update the ASUS AP’s Flash Code using the software described in this User’s Manual.

5. Appendix

Operating frequency range

The DSSS PHY shall operate in the frequency range of 2.4 GHz to 2.4835 GHz as allocated by regulatory bodies in the USA and Europe or in the 2.471 GHz to 2.497 GHz frequency band as allocated by regulatory authority in Japan.

Number of operating channels

The channel center frequencies and CH ID numbers shall be as shown below. The FCC (US), IC (Canada), and ETSI (Europe) specify operation from 2.4 GHz to 2.4835 GHz. For Japan, operation is specified as 2.471 GHz to 2.497 GHz. France allows operation from 2.4465 GHz to 2.4835 GHz, and Spain allows operation from 2.445 GHz to 2.475 GHz. For each supported regulatory domain, all channels marked with "Yes" shall be supported.

In a multiple cell network topology, overlapping and/or adjacent cells using different channels can operate simultaneously without interference if the distance between the center frequencies is at least 30 MHz. Channel 14 shall be designated specifically for operation in Japan.

DSSS PHY frequency channel plan

		(Regulatory Domains)					
CH ID	Frequency	X'10'	X'20'	X'30'	X'31'	X'32'	X'40'
			FCC	IC		ETSI	
Spain		France	MKK				
1	2412 MHz	Yes	Yes		Yes	-	
	-		Yes				
2	2417 MHz	Yes	Yes		Yes	-	
	-		Yes				
3	2422 MHz	Yes	Yes		Yes	-	
	-		Yes				
4	2427 MHz	Yes	Yes		Yes	-	
	-		Yes				
5	2432 MHz	Yes	Yes		Yes	-	
	-		Yes				
6	2437 MHz	Yes	Yes		Yes	-	
	-		Yes-				
7	2442 MHz	Yes	Yes		Yes	-	
	-		Yes				
8	2447 MHz	Yes	Yes		Yes	-	
	-		Yes				
9	2452 MHz	Yes	Yes		Yes	-	
	-		Yes				
10	2457 MHz	Yes	Yes		Yes	Yes	
		Yes	Yes				
11	2462 MHz	Yes	Yes		Yes	Yes	
		Yes	Yes				
12	2467 MHz	-	-		Yes	Yes	
13	2472 MHz	-	-		Yes	Yes	
		Yes					
14	2484 MHz	-	-		-	-	
					Yes		

Glossary

Access Point (AP)

An networking device that seamlessly connects wired and wireless networks. Access Points combined with a distributed system support the creation of multiple radio cells that enable roaming throughout a facility.

Ad Hoc

A wireless network composed solely of stations within mutual communication range of each other (no Access Point).

AES(Advance Encryption Standard)

AES is the U.S. government's next-generation cryptography algorithm, which will replace DES and 3DES. This encryption key protocol is applied in 802.1i standard to improve WLAN security. AES will require new hardware, in contrast with TKIP that can be used on existing wireless devices.

Basic Service Area (BSS)

A set of stations controlled by a single coordination function.

Broadband

A type of data transmission in which a single medium (such as cable) carries several channels of data at once.

Channel

An instance of medium use for the purpose of passing protocol data units that may be used simultaneously, in the same volume of space, with other instances of medium use (on other channels) by other instances of the same physical layer, with an acceptably low frame error ratio due to mutual interference.

Client

A client is the desktop or mobile PC that is connected to your network.

COFDM (for 802.11a or 802.11g)

Signal power alone is not enough to maintain 802.11b-like distances in an 802.11a/g environment. To compensate, a new physical-layer encoding technology was designed that departs from the traditional direct-sequence technology being deployed today. This technology is called COFDM (coded OFDM). COFDM was developed specifically for indoor wireless use and offers performance much superior to that of spread-spectrum solutions. COFDM works by breaking one high-speed data carrier into several

lower-speed subcarriers, which are then transmitted in parallel. Each high-speed carrier is 20 MHz wide and is broken up into 52 subchannels, each approximately 300 KHz wide. COFDM uses 48 of these subchannels for data, while the remaining four are used for error correction. COFDM delivers higher data rates and a high degree of multipath reflection recovery, thanks to its encoding scheme and error correction.

Each subchannel in the COFDM implementation is about 300 KHz wide. At the low end of the speed gradient, BPSK (binary phase shift keying) is used to encode 125 Kbps of data per channel, resulting in a 6,000-Kbps, or 6 Mbps, data rate. Using quadrature phase shift keying, you can double the amount of data encoded to 250 Kbps per channel, yielding a 12-Mbps data rate. And by using 16-level quadrature amplitude modulation encoding 4 bits per hertz, you can achieve a data rate of 24 Mbps. The 802.11a/g standard specifies that all 802.11a/g-compliant products must support these basic data rates. The standard also lets the vendor extend the modulation scheme beyond 24 Mbps. Remember, the more bits per cycle (hertz) that are encoded, the more susceptible the signal will be to interference and fading, and ultimately, the shorter the range, unless power output is increased.

Device Name

Also known as DHCP client ID or network name. Sometimes provided by an ISP when using DHCP to assign addresses.

DHCP (Dynamic Host Configuration Protocol)

This protocol allows a computer (or many computers on your network) to be automatically assigned a single IP address from a DHCP server.

DNS Server Address (Domain Name System)

DNS allows Internet host computers to have a domain name and one or more IP addresses. A DNS server keeps a database of host computers and their respective domain names and IP addresses, so that when a user enters a domain name into the Internet browser, the user is sent to the proper IP address. The DNS server address used by the computers on your home network is the location of the DNS server your ISP has assigned.

DSL Modem (Digital Subscriber Line)

A DSL modem uses your existing phone lines to transmit data at high speeds.

Direct-Sequence Spread Spectrum (for 802.11b)

Spread spectrum (broadband) uses a narrowband signal to spread the transmission over a segment of the radio frequency band or spectrum.

Direct-sequence is a spread spectrum technique where the transmitted signal is spread over a particular frequency range.

Direct-sequence systems communicate by continuously transmitting a redundant pattern of bits called a chipping sequence. Each bit of transmitted data is mapped into chips and rearranged into a pseudorandom spreading code to form the chipping sequence. The chipping sequence is combined with a transmitted data stream to produce the output signal.

Wireless mobile clients receiving a direct-sequence transmission use the spreading code to map the chips within the chipping sequence back into bits to recreate the original data transmitted by the wireless device. Intercepting and decoding a direct-sequence transmission requires a predefined algorithm to associate the spreading code used by the transmitting wireless device to the receiving wireless mobile client.

This algorithm is established by IEEE 802.11b specifications. The bit redundancy within the chipping sequence enables the receiving wireless mobile client to recreate the original data pattern, even if bits in the chipping sequence are corrupted by interference. The ratio of chips per bit is called the spreading ratio. A high spreading ratio increases the resistance of the signal to interference. A low spreading ratio increases the bandwidth available to the user. The wireless device uses a constant chip rate of 11Mchips/s for all data rates, but uses different modulation schemes to encode more bits per chip at the higher data rates. The wireless device is capable of an 11 Mbps data transmission rate, but the coverage area is less than a 1 or 2 Mbps wireless device since coverage area decreases as bandwidth increases.

Encryption

This provides wireless data transmissions with a level of security.

Extended Service Set (ESS)

A set of one or more interconnected basic service set (BSSs) and integrated local area networks (LANs) can be configured as an Extended Service Set.

ESSID (Extended Service Set Identifier)

You must have the same ESSID entered into the gateway and each of its wireless clients. The ESSID is a unique identifier for your wireless network.

Ethernet

The most widely used LAN access method, which is defined by the IEEE 802.3 standard. Ethernet is normally a shared media LAN meaning all devices

on the network segment share total bandwidth. Ethernet networks operate at 10Mbps using CSMA/CD to run over 10-BaseT cables.

Firewall

A firewall determines which information passes in and out of a network. NAT can create a natural firewall by hiding a local network's IP addresses from the Internet. A Firewall prevents anyone outside of your network from accessing your computer and possibly damaging or viewing your files.

Gateway

A network point that manages all the data traffic of your network, as well as to the Internet and connects one network to another.

IEEE

The Institute of Electrical and Electronics Engineers. The IEEE sets standards for networking, including Ethernet LANs. IEEE standards ensure interoperability between systems of the same type.

IEEE 802.11

IEEE 802.xx is a set of specifications for LANs from the Institute of Electrical and Electronic Engineers (IEEE). Most wired networks conform to 802.3, the specification for CSMA/CD based Ethernet networks or 802.5, the specification for token ring networks. 802.11 defines the standard for wireless LANs encompassing three incompatible (non-interoperable) technologies: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), and Infrared. 802.11 specifies a carrier sense media access control and physical layer specifications for 1 and 2 Mbps wireless LANs.

IEEE 802.11a (54Mbits/sec)

Compared with 802.11b: The 802.11b standard was designed to operate in the 2.4-GHz ISM (Industrial, Scientific and Medical) band using direct-sequence spread-spectrum technology. The 802.11a standard, on the other hand, was designed to operate in the more recently allocated 5-GHz UNII (Unlicensed National Information Infrastructure) band. And unlike 802.11b, the 802.11a standard departs from the traditional spread-spectrum technology, instead using a frequency division multiplexing scheme that's intended to be friendlier to office environments.

The 802.11a standard, which supports data rates of up to 54 Mbps, is the Fast Ethernet analog to 802.11b, which supports data rates of up to 11 Mbps. Like Ethernet and Fast Ethernet, 802.11b and 802.11a use an identical MAC (Media Access Control). However, while Fast Ethernet uses the same

physical-layer encoding scheme as Ethernet (only faster), 802.11a uses an entirely different encoding scheme, called OFDM (orthogonal frequency division multiplexing).

The 802.11b spectrum is plagued by saturation from wireless phones, microwave ovens and other emerging wireless technologies, such as Bluetooth. In contrast, 802.11a spectrum is relatively free of interference.

The 802.11a standard gains some of its performance from the higher frequencies at which it operates. The laws of information theory tie frequency, radiated power and distance together in an inverse relationship. Thus, moving up to the 5-GHz spectrum from 2.4 GHz will lead to shorter distances, given the same radiated power and encoding scheme.

Compared with 802.11g: 802.11a is a standard for access points and radio NICs that is ahead of 802.11g in the market by about six months. 802.11a operates in the 5GHz frequency band with twelve separate non-overlapping channels. As a result, you can have up to twelve access points set to different channels in the same area without them interfering with each other. This makes access point channel assignment much easier and significantly increases the throughput the wireless LAN can deliver within a given area. In addition, RF interference is much less likely because of the less-crowded 5 GHz band.

IEEE 802.11b (11Mbits/sec)

In 1997, the Institute of Electrical and Electronics Engineers (IEEE) adopted the 802.11 standard for wireless devices operating in the 2.4 GHz frequency band. This standard includes provisions for three radio technologies: direct sequence spread spectrum, frequency hopping spread spectrum, and infrared. Devices that comply with the 802.11 standard operate at a data rate of either 1 or 2 Mbps.

In 1999, the IEEE created the 802.11b standard. 802.11b is essentially identical to the 802.11 standard except 802.11b provides for data rates of up to 11 Mbps for direct sequence spread spectrum devices. Under 802.11b, direct sequence devices can operate at 11 Mbps, 5.5 Mbps, 2 Mbps, or 1 Mbps. This provides interoperability with existing 802.11 direct sequence devices that operate only at 2 Mbps.

Direct sequence spread spectrum devices spread a radio signal over a range of frequencies. The IEEE 802.11b specification allocates the 2.4 GHz frequency band into 14 overlapping operating Channels. Each Channel corresponds to a different set of frequencies.

IEEE 802.11g

802.11g is a proposed (to be finalized) new extension to 802.11b (used in

majority of wireless LANs today) that broadens 802.11b's data rates to 54 Mbps within the 2.4 GHz band using OFDM (orthogonal frequency division multiplexing) technology. 802.11g allows backward compatibility with 802.11b devices but only at 11 Mbps or lower, depending on the range and presence of obstructions.

Infrastructure

A wireless network centered about an access point. In this environment, the access point not only provides communication with the wired network but also mediates wireless network traffic in the immediate neighborhood.

IP (Internet Protocol)

The TCP/IP standard protocol that defines the IP datagram as the unit of information passed across an Internet and provides the basis for connectionless packet delivery service. IP includes the ICMP control and error message protocol as an integral part. It provides the functional equivalent of ISO OSI Network Services.

IP Address

An IP address is a 32-bit number that identifies each sender or receiver of information that is sent across the Internet. An IP address has two parts: the identifier of a particular network on the Internet and an identifier of the particular device (which can be a server or a workstation) within that network.

ISM Bands (Industrial, Scientific, and Medicine Bands)

Radio frequency bands that the Federal Communications Commission (FCC) authorized for wireless LANs. The ISM bands are located at 902 MHz, 2.400 GHz, and 5.7 GHz.

ISP (Internet Service Provider)

An organization that provides access to the Internet. Small ISPs provide service via modem and ISDN while the larger ones also offer private line hookups (T1, fractional T1, etc.).

LAN (Local Area Network)

A communications network that serves users within a defined geographical area. The benefits include the sharing of Internet access, files and equipment like printers and storage devices. Special network cabling (10 Base-T) is often used to connect the PCs together.

MAC Address (Media Access Control)

A MAC address is the hardware address of a device connected to a network.

NAT (Network Address Translation)

NAT masks a local network's group of IP addresses from the external network, allowing a local network of computers to share a single ISP account. This process allows all of the computers on your home network to use one IP address. This will enable access to the Internet from any computer on your home network without having to purchase more IP addresses from your ISP.

NIC (Network Interface Card)

A network adapter inserted into a computer so that the computer can be connected to a network. It is responsible for converting data from stored in the computer to the form transmitted or received.

Packet

A basic message unit for communication across a network. A packet usually includes routing information, data, and sometimes error detection information.

PCMCIA (Personal Computer Memory Card International Association)

The Personal Computer Memory Card International Association (PCMCIA), develops standards for PC cards, formerly known as PCMCIA cards. These cards are available in three types, and are about the same length and width as credit cards. However, the different width of the cards ranges in thickness from 3.3 mm (Type I) to 5.0 mm (Type II) to 10.5 mm (Type III). These cards can be used for various functions, including memory storage, land line modems and wireless modems.

PPP (Point-to-Point Protocol)

PPP is a protocol for communication between computers using a serial interface, typically a personal computer connected by phone line to a server.

PPPoE (Point-to-Point Protocol over Ethernet)

Point-to-Point Protocol is a method of secure data transmission. PPP using Ethernet to connect to an ISP.

Radio Frequency (RF) Terms: GHz, MHz, Hz

The international unit for measuring frequency is Hertz (Hz), equivalent to the older unit of cycles per second. One megahertz (MHz) is one million

Hertz. One gigahertz (GHz) is one billion Hertz. The standard US electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55-1.6 MHz, the FM broadcast radio frequency band is 88-108 MHz, and wireless 802.11 LANs operate at 2.4 GHz.

RIP (Routing Information Protocol)

Routing Information Protocol(RIP1) is defined as a means by which routing equipment can find the best path for transmitting data packets from one network to another. Upgrades have been made to the RIP1 protocol, resulting in Routing Information Protocol Version 2 (RIP2). RIP2 was developed to cover some of the inefficiencies of RIP1.

Metric: RIP metric is a value of distance for the network. Usually RIP increments the metric when the network information is received. Redistributed routes' default metric offset is set to 1. These rules can be used to change the metric offset only for the matched networks specified or excluded in the Route Metric Offset table. But the metric offset of other networks is still set to 1.

SSID (Service Set ID)

SSID is a group name shared by every member of a wireless network. Only client PCs with the same SSID are allowed to establish a connection.

Station

Any device containing IEEE 802.11 wireless medium access conformity.

Subnet Mask

A subnet mask is a set of four numbers configured like an IP address. It is used to create IP address numbers used only within a particular network.

TCP (Transmission Control Protocol)

The standard transport level protocol that provides the full duplex, stream service on which many application protocols depend. TCP allows a process or one machine to send a stream of data to a process on another. Software implementing TCP usually resides in the operating system and uses the IP to transmit information across the network.

TKIP (Temporal Key Integrity Protocol)

TKIP is used in WPA to replace WEP with a new encryption algorithm that is stronger than the WEP algorithm but that uses the calculation facilities present on existing wireless devices to perform encryption operations.

WAN (Wide Area Network)

A system of LANs, connected together. A network that connects computers located in separate areas, (i.e., different buildings, cities, countries). The Internet is a wide area network.

WECA (Wireless Ethernet Compatibility Alliance)

An industry group that certifies cross-vender interoperability and compatibility of IEEE 802.11b wireless networking products and to promote that standard for enterprise, small business, and home environments.

WEP (Wired Equivalent Privacy)

The IEEE 802.11b standard specifies an optional encryption feature, known as Wired Equivalent Privacy or WEP, that is designed to provide a wireless LAN with a security level equal to what is found on a wired Ethernet network. WEP encrypts the data portion of each packet exchanged on the 802.11b network using either a 64-bit or 128-bit encryption algorithm. In addition, WEP is also used in conjunction with the optional Shared Key Authentication algorithm to prevent unauthorized devices from associating with an 802.11b network.

WLAN (Wireless Local Area Network)

This is a group of computers and other devices connected wirelessly in a small area. A wireless network is referred to as LAN or WLAN.

WPA (Wi-Fi Protected Access)

Wi-Fi Protected Access is a specification, which offsets encryption and authentication improvements that are stronger than the Wireless Encryption Protocol (WEP), which it is meant to replace.

WPA-PSK (Wi-Fi Protected Access – Pre-Shared Key)

WPA-PSK is a special mode of WPA for home environment without a Remote Authentication Dial-In User Service (RADIUS). It is required to enter a password into their access point or home wireless gateway and each clients that is on the wireless network to keeps out eavesdroppers and other unauthorized users by requiring all devices to have the matching password.

6. Safety Information

Federal Communications Commission

This device complies with FCC Rules Part 15. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- 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 Federal Communications Commission (FCC) rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING! The use of a shielded-type power cord is required in order to meet FCC emission limits and to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used. Use only shielded cables to connect I/O devices to this equipment. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

Reprinted from the Code of Federal Regulations #47, part 15.193, 1993. Washington DC: Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office.

FCC Radio Frequency Interference Requirements

MPE Statement: Your device contains a low power transmitter. When device is transmitted it sends out Radio Frequency (RF) signal.

This device is restricted to INDOOR USE due to its operation in the 5.15 to 5.25GHz frequency range. FCC requires this product to be used indoors for the frequency range 5.15 to 5.25GHz to reduce the potential for harmful interference to co-channel of the Mobile Satellite Systems.

High power radars are allocated as primary user of the 5.25 to 5.35GHz and 5.65 to 5.85GHz bands. These radar stations can cause interference with and / or damage this device.

FCC RF Exposure Guidelines (Access Points)

This Wireless LAN radio device has been evaluated under FCC Bulletin OET 65C and found compliant to the requirements as set forth in CFR 47 Sections 2.1091, 2.1093, and 15.247(b)(4) addressing RF Exposure from radio frequency devices. The radiation output power of this Wireless LAN device is far below the FCC radio frequency exposure limits. Nevertheless, this device shall be used in such a manner that the potential for human contact during normal operation – as a mobile or portable device but use in a body-worn way is strictly prohibit. When using this device, a certain separation distance between antenna and nearby persons has to be kept to ensure RF exposure compliance. In order to comply with the RF exposure limits established in the ANSI C95.1 standards, Access Point equipment should be installed and operated with minimum distance **[20cm]** between the radiator and your body. Use only with supplied antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations.

CAUTION: Any changes or modifications not expressly approved in this manual could void your authorization to use this device.

FCC RF Exposure Guidelines (Wireless Cards)

This device has been tested for compliance with FCC RF Exposure (SAR) limits in typical portable configurations.

In order to comply with SAR limits established in the ANSI C95.1 standards, it is recommended when using a WLAN Card adapter that the integrated antenna is positioned more than **[2.5cm]** from your body or nearby persons during extended periods of operation. If the antenna is positioned less than **[2.5cm]** from the user, it is recommended that the user limit the exposure time.

Canadian Department of Communications

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Operation Channel for Different Domains

N. America	2.412-2.462 GHz	Ch01 through CH11
Japan	2.412-2.484 GHz	Ch01 through Ch14
Europe ETSI	2.412-2.472 GHz	Ch01 through Ch13
France	2.457-2.472 GHz	Ch10 through Ch13

France Restricted Frequency Band

Some areas of France have a restricted frequency band. The worst case maximum authorized power indoors is:

- 10mW for the entire 2.4 GHz band (2400 MHz–2483.5 MHz)
- 100mW for frequencies between 2446.5 MHz and 2483.5 MHz

NOTE: Channels 10 through 13 inclusive operate in the band 2446.6 MHz to 2483.5 MHz.

There are few possibilities for outdoor use: On private property or on the private property of public persons, use is subject to a preliminary authorization procedure by the Ministry of Defense, with maximum authorized power of 100mW in the 2446.5–2483.5 MHz band. Use outdoors on public property is not permitted.

In the departments listed below, for the entire 2.4 GHz band:

- Maximum authorized power indoors is 100mW
- Maximum authorized power outdoors is 10mW

Departments in which the use of the 2400–2483.5 MHz band is permitted with an EIRP of less than 100mW indoors and less than 10mW outdoors:

01 Ain Orientales	36 Indre	66 Pyrénées
02 Aisne	37 Indre et Loire	67 Bas Rhin
03 Allier	41 Loir et Cher	68 Haut Rhin
05 Hautes Alpes	42 Loire	70 Haute Saône
08 Ardennes	45 Loiret	71 Saône et Loire
09 Ariège	50 Manche	75 Paris
11 Aude	55 Meuse	82 Tarn et Garonne
12 Aveyron	58 Nièvre	84 Vaucluse
16 Charente	59 Nord	88 Vosges
24 Dordogne	60 Oise	89 Yonne
25 Doubs	61 Orne	90 Territoire de Belfort
26 Drôme	63 Puy du Dôme	94 Val de Marne
32 Gers	64 Pyrénées Atlantique	

This requirement is likely to change over time, allowing you to use your wireless LAN card in more areas within France. Please check with ART for the latest information (www.art-telecom.fr)

NOTE: Your ASUS WLAN Card transmits less than 100mW, but more than 10mW.

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Specially, the following parts of this product are subject to the GNU GPL:

- The Linux operating system kernel
- The iptables packet filter and NAT software
- The busybox swiss army knife of embedded linux
- The zebra routing daemon implementation
- The udhcpd DHCP client/server implementation
- The pptp-linux PPTP client implementation
- The rp-pppoe PPPoE client implementation
- The pppd PPP daemon implementtion
- The dproxy DNS proxy implementation
- The bridge-utils package

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Version 2, June 1991

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