# *ZyXEL G-220F*

***802.11g Wireless USB Adapter***

# *User's Guide*

Version 1.00
October 2004

ZyXEL
Unleash Networking Power

# Copyright



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**Online Registration**

Register online at www.zyxel.com for free future product updates and information.

# Information for Canadian Users

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective operation and safety requirements. The Industry Canada does not guarantee that the equipment will operate to a user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

For their own protection, users should ensure that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

**Caution**

Users should not attempt to make such connections themselves, but should contact the appropriate electrical inspection authority, or electrician, as appropriate.

**Note**

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 Industry.

# Federal Communications Commission (FCC) Interference Statement

The device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operations.

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 commercial environment. 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.

If this equipment does cause harmful interference to radio/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:

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

### Notice 1

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

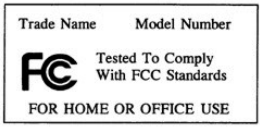
This product has been designed for the WLAN 2.4 GHz network throughout the EC region and Switzerland, with restrictions in France.

### Caution

1. The equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, under 47 CFR 2.1093 paragraph (d)(2).
2. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

### Certifications

Refer to the product page at www.zyxel.com.



# Customer Support

When contacting your Customer Support Representative, please have the following information ready:

- Product model and serial number.
- Warranty Information.
- Date you received your product.
- Brief description of the problem and the steps you took to solve it.

| METHOD / LOCATION | SUPPORT E-MAIL<br>SALES E-MAIL | TELEPHONE[1]<br>FAX[1] | WEB SITE<br>FTP SITE | REGULAR MAIL |
|---|---|---|---|---|
| WORLDWIDE | support@zyxel.com.tw<br>sales@zyxel.com.tw | +886-3-578-3942<br>+886-3-578-2439 | www.zyxel.com<br>www.europe.zyxel.com<br>ftp.zyxel.com<br>ftp.europe.zyxel.com | ZyXEL Communications Corp.<br>6 Innovation Road II<br>Science Park<br>Hsinchu 300<br>Taiwan |
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| NORWAY | support@zyxel.no<br>sales@zyxel.no | +47 22 80 61 80<br>+47 22 80 61 81 | www.zyxel.no | ZyXEL Communications A/S<br>Nils Hansens vei 13<br>0667 Oslo<br>Norway |

[1] "+" is the (prefix) number you enter to make an international telephone call.

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|---|---|---|---|---|
| SWEDEN | support@zyxel.se<br>sales@zyxel.se | +46 31 744 7700<br>+46 31 744 7701 | www.zyxel.se | ZyXEL Communications A/S<br>Sjöporten 4, 41764 Göteborg<br>Sweden |
| FINLAND | support@zyxel.fi | +358-9-4780-8411 | www.zyxel.fi | ZyXEL Communications Oy<br>Malminkaari 10<br>00700 Helsinki<br>Finland |

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# Preface

Congratulations on the purchase of your new ZyXEL G-220F!

## About This User's Guide

This manual provides information about the ZyXEL Wireless LAN Utility.

## Syntax Conventions

- "Type" or "Enter" means for you to type one or more characters. "Select" or "Choose" means for you to use one of the predefined choices.
- Mouse action sequences are denoted using a comma. For example, "click the Apple icon, **Control Panels** and then **Modem**" means first click the Apple icon, then point your mouse pointer to **Control Panels** and then click **Modem**.
- Window and command choices are in **Bold Times New Roman** font. Predefined field choices are in **Bold Arial** font.
- The ZyXEL G-220F 802.11g Wireless USB Adapter is referred to as the ZyXEL G-220F in this guide.
- The ZyXEL Wireless LAN Utility may be referred to as the ZyXEL WLAN Utility or, simply, as the ZyXEL Utility in this guide.

## Related Documentation

- Support Disk

  Refer to the included CD for support documents and device drivers.

- Quick Installation Guide

  Our Quick Installation Guide is designed to help you get your ZyXEL G-220F up and running right away. It contains a detailed easy-to-follow connection diagram and information on installing your ZyXEL G-220F.

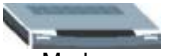
- ZyXEL Glossary and Web Site

  Please refer to www.zyxel.com for an online glossary of networking terms and additional support documentation.

## User Guide Feedback

Help us help you. E-mail all User's Guide-related comments, questions or suggestions for improvement to techwriters@zyxel.com.tw or send regular mail to The Technical Writing Team, ZyXEL Communications Corp., 6 Innovation Road II, Science-Based Industrial Park, Hsinchu, 300, Taiwan. Thank you.

**Graphics Icons Key**

| | | |
|---|---|---|
|  Wireless Access Point |  Computer |  Notebook computer |
|  Server |  Modem |  Wireless Signal |
|  Telephone |  Switch |  Router |

# Chapter 1
# Getting Started

*This chapter introduces the ZyXEL G-220F and prepares you to use the ZyXEL Utility.*

## 1.1 About Your ZyXEL G-220F

The ZyXEL G-220F is an IEEE 802.11g compliant wireless LAN adapter. With the ZyXEL G-220F, you can enjoy the wireless mobility within the coverage area.

The following lists the main features of your ZyXEL G-220F.

- Your ZyXEL G-220F can communicate with other IEEE 802.11b/g compliant wireless devices.
- Automatic rate selection.
- Offers 64-bit, 128-bit and 256-bit WEP (Wired Equivalent Privacy) data encryption for network security.
- Proprietary SoftAP feature turns your ZyXEL G-220F into an access point (AP).
- Low CPU utilization allowing more computer system resources for other programs.
- A built-in antenna
- Plug-and-play installation for Windows ME, Windows 2000 and Windows XP.
- Driver and utility support for Windows 98 Second Edition, Windows ME, Windows 2000 and Windows XP.

## 1.2 ZyXEL G-220F Hardware and Utility Installation

Follow the instructions in the *Quick Installation Guide* to install the ZyXEL Utility and make hardware connections.

## 1.3 Configuration Methods

To configure your ZyXEL G-220F, use one of the following applications:

- Wireless Zero Configuration (WZC) (recommended for Windows XP)
- Odyssey Client Manager (recommended if you want to configure WPA or WPA-PSK with Windows 98 Second Edition, Windows ME or Windows 2000)
- ZyXEL Utility (required when you want to use the ZyXEL G-220F as an access point)

**DO NOT use the Windows XP configuration tool or the Odyssey Client Manager and the ZyXEL Utility at the same time.**

**The bundled Odyssey Client Manager only works for your ZyXEL G-220F. Do NOT use the Odyssey Client Manager to configure non-ZyXEL WLAN adapters.**

Refer to the Odyssey Client Manager documentation for more information.

## 1.4 Windows XP Users Only

You must disable WZC if you want to use the ZyXEL utility. Refer to the appendices on how to deactivate WZC or how to use WZC to manage the ZyXEL G-220F.

## 1.5 Accessing the ZyXEL Utility

After you install and start the ZyXEL Utility, an icon for the ZyXEL Utility appears in the system tray.

**When the ZyXEL Utility system tray icon displays, the ZyXEL G-220F is installed properly.**


**Figure 1-1 ZyXEL Utility: System Tray Icon**

The color of the ZyXEL Utility system tray icon indicates the status of the ZyXEL G-220F. Refer to the following table for details.

**Table 1-1 ZyXEL Utility: System Tray Icon**

| COLOR | DESCRIPTION |
|---|---|
| Red | The ZyXEL G-220F is operating in wireless station mode but is not connected to a wireless network. |
| Green | The ZyXEL G-220F is operating in wireless station mode and connected to a wireless network. |
| Pale Blue | The ZyXEL G-220F is operating in access point mode. |

Double-click on the ZyXEL Wireless LAN Utility icon in the system tray to open the ZyXEL Utility. The ZyXEL Utility screens are similar in all Microsoft Windows versions. Screens for Windows XP are shown.

**Click the icon (located in the top right corner) to display the on-line help window.**

# 1.6 ZyXEL G-220F Modes

You can set your ZyXEL G-220F to operate in either wireless station or access point (AP) modes.

In wireless station mode, your ZyXEL G-220F must connect to a peer wireless station or an AP to take part in your wireless network.

In access point mode, your ZyXEL G-220F functions as an access point. This allows you to set up your wireless network without using a dedicated AP device. Up to 16 wireless stations can associate to the ZyXEL G-220F to form a wireless network. Refer to *Section 4.1* for more information.

## 1.6.1 Change ZyXEL G-220F Modes

To change between the modes, select either the **Station Mode** or **AP Mode** option in the any ZyXEL Utility screens.

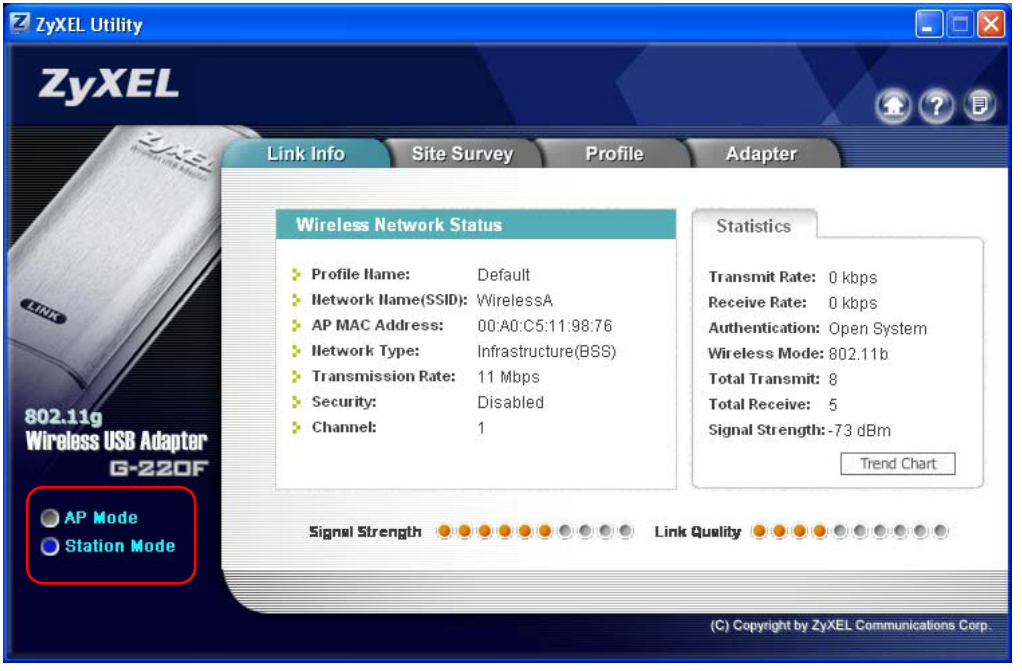



**Figure 1-2 ZyXEL Utility**

**Wait for about five seconds for the ZyXEL Utility to complete the mode change. The current mode is indicated by the color of the radio button.**

**When you use the Windows XP configuration tool and the ZyXEL Utility to configure the ZyXEL G-220F at the same time, the ZyXEL G-220F automatically operates in wireless station mode and doesn't allow any configuration change.**

# Chapter 2
# Wireless LAN Network

*This chapter provides background information on wireless LAN network.*

## 2.1 Overview

This section describes the wireless LAN network terms and applications.

### 2.1.1 IEEE 802.11g 11 Mbps Wireless LAN

IEEE 802.11g is fully compatible with the IEEE 802.11b standard. This means an IEEE 802.11b radio card can interface directly with an IEEE 802.11g wireless device (and vice versa) at 11 Mbps or lower depending on range. IEEE 802.11g has several intermediate rate steps between the maximum and minimum data rates. The IEEE 802.11g data rate and modulation are as follows:

**Table 2-1 IEEE 802.11G**

| DATA RATE (MBPS) | MODULATION |
|---|---|
| 1 | DBPSK (Differential Binary Phase Shift Keyed) |
| 2 | DQPSK (Differential Quadrature Phase Shift Keying) |
| 5.5 / 11 | CCK (Complementary Code Keying) |
| 6/9/12/18/24/36/48/54 | OFDM (Orthogonal Frequency Division Multiplexing) |

**The ZyXEL G-220F may be prone to RF (Radio Frequency) interference from other 2.4 GHz devices such as microwave ovens, wireless phones, Bluetooth enabled devices, and other wireless LANs.**

### 2.1.2 SSID

The SSID (Service Set Identity) is a unique name shared among all wireless devices in a wireless network. Wireless devices must have the same SSID to communicate with each other.

### 2.1.3 Channel

A radio frequency used by a wireless device is called a channel.

### 2.1.4 Transmission Rate (Tx Rate)

The ZyXEL G-220F provides various transmission (data) rate options for you to select. Options include **Fully Auto**, **1 Mbps**, **2 Mbps**, **5.5 Mbps**, **11 Mbps**, **6 Mbps**, **9 Mbps**, **12 Mbps**, **18 Mbps**, **24 Mbps**, **36 Mbps**, **48 Mbps**, and **54 Mbps**. In most networking scenarios, the factory default **Fully Auto** setting proves the most efficient. This setting allows your ZyXEL G-220F to operate at the maximum transmission (data) rate. When the communication quality drops below a certain level, the ZyXEL G-220F automatically switches to a lower transmission (data) rate. Transmission at lower data speeds is usually more reliable. However, when the communication quality improves again, the ZyXEL G-220F gradually increases the transmission (data) rate again until it reaches the highest available transmission rate.

You can select any of the above options. If you wish to balance speed versus reliability, select **54 Mbps** in a networking environment where you are certain that all wireless devices can communicate at the highest transmission (data) rate. **1 Mbps** or **2 Mbps** are used often in networking environments where the range of the wireless connection is more important than speed.

**With USB1.1, the ZyXEL G-220F can only transmit at up to 11Mbps.**

### 2.1.5 Wireless Network Application

Wireless LAN works in either of the two modes: ad-hoc and infrastructure.

To connect to a wired network within a coverage area using Access Points (APs), set the ZyXEL G-220F operation mode to **Infrastructure (BSS)**. An AP acts as a bridge between the wireless stations and the wired network. In case you do not wish to connect to a wired network, but prefer to set up a small independent wireless workgroup without an AP, use the **Ad-hoc (IBSS)** (Independent Basic Service Set) mode.

#### Ad-Hoc (IBSS)

Ad-hoc mode does not require an AP or a wired network. Two or more wireless stations communicate directly to each other. An ad-hoc network may sometimes be referred to as an Independent Basic Service Set (IBSS).

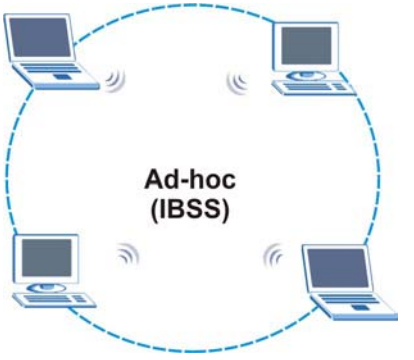



**Figure 2-1 IBSS Example**

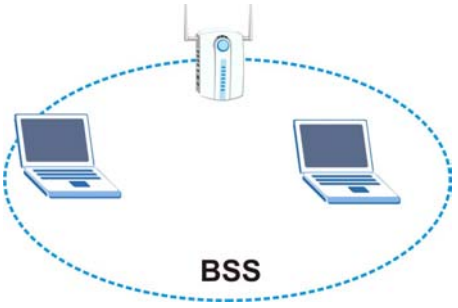



**Figure 2-2 BSS Example**

A series of overlapping BSS and a network medium, such as an Ethernet forms an Extended Service Set (ESS) or infrastructure network. All communication is done through the AP, which relays data packets to other wireless stations or devices connected to the wired network. Wireless stations can then access resource, such as the printer, on the wired network.

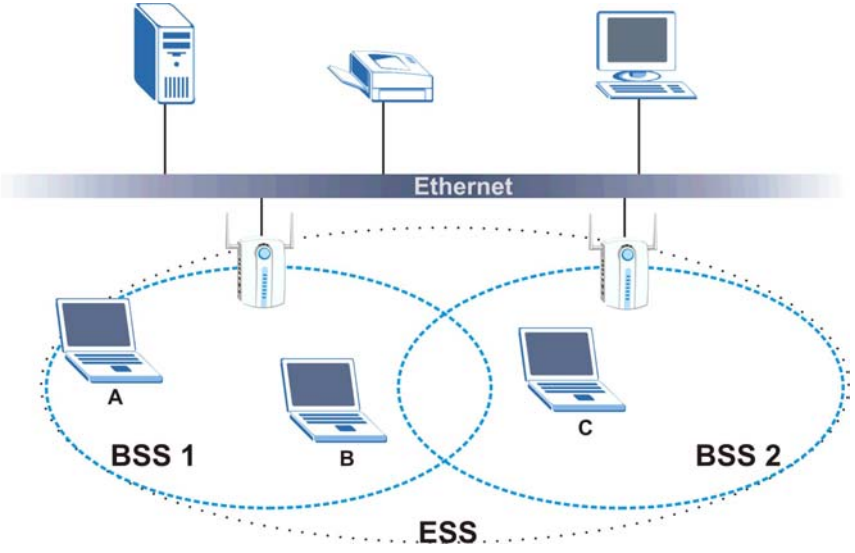



**Figure 2-3 Infrastructure Network Example**

### Access Point Mode

The following figure depicts a network example in which you set the ZyXEL G-220F in access point mode.

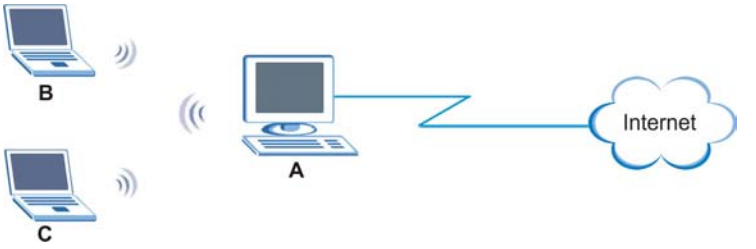



**Figure 2-4 ZyXEL G-220F as an Access Point Example**

In the example, the ZyXEL G-220F is installed on computer **A** and set to operate in access point mode. Computer **A** shares Internet connection to the wireless LAN, so wireless stations **B** and **C** can access the Internet.

## 2.1.6 Roaming

In an infrastructure network, wireless stations are able to switch from one BSS to another as they move between the coverage areas. During this period, the wireless stations maintain uninterrupted connection to the network. This is roaming. As the wireless station moves from place to place, it is responsible for choosing the most appropriate AP depending on the signal strength, network utilization or other factors.

The following figure depicts a roaming example. When wireless station **B** moves to position **X**, the ZyXEL G-220F in wireless station **B** automatically switches the channel to the one used by access point **2** in order to stay connected to the network.

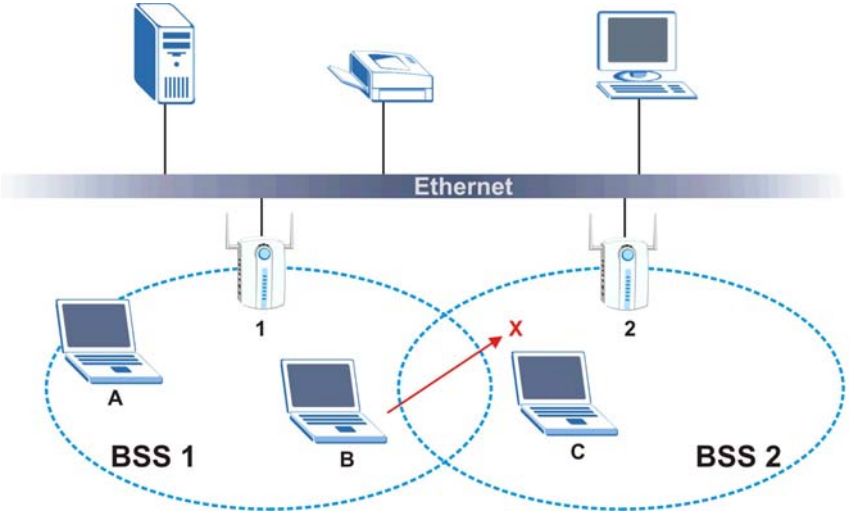



**Figure 2-5 Roaming Example**

## 2.2 Wireless LAN Security

Wireless LAN security is vital to your network to protect wireless communications.

Configure the wireless LAN security using the **Configuration** or the **Profile Security Settings** screen. If you do not enable any wireless security on your ZyXEL G-220F, the ZyXEL G-220F's wireless communications are accessible to any wireless networking device that is in the coverage area.

### 2.2.1 Data Encryption with WEP

WEP (Wired Equivalent Privacy) encryption scrambles all data packets transmitted between the ZyXEL G-220F and the AP or other wireless stations to keep network communications private. Both the wireless stations and the access points must use the same WEP key for data encryption and decryption.

There are two ways to create WEP keys in your ZyXEL G-220F.

- Automatic WEP key generation based on a "password phrase" called a passphrase. The passphrase is case sensitive. You must use the same passphrase for all WLAN adapters with this feature in the same WLAN.
  For WLAN adapters without the passphrase feature, you can still take advantage of this feature by writing down the four automatically generated WEP keys from the **Security Settings** screen of the ZyXEL Utility and entering them manually as the WEP keys in the other WLAN adapter(s).
- Enter the WEP keys manually.

Your ZyXEL G-220F allows you to configure up to four 64-bit, 128-bit or 256-bit WEP keys and only one key is used as the default key at any one time.

## 2.3 Fragmentation Threshold

A **Fragmentation Threshold** is the maximum data fragment size (between 256 and 2432 bytes) that can be sent in the wireless network before the ZyXEL G-220F will fragment the packet into smaller data frames.

A large **Fragmentation Threshold** is recommended for networks not prone to interference while you should set a smaller threshold for busy networks or networks that are prone to interference.

If the **Fragmentation Threshold** value is smaller than the **RTS/CTS Threshold** value (see previously) you set then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS Threshold** size.

## 2.4 RTS/CTS Threshold

A hidden node occurs when two stations are within range of the same access point, but are not within range of each other. The following figure illustrates a hidden node. Both stations are within range of the access point (AP) or wireless gateway, but out-of-range of each other, so they cannot "hear" each other, that is they do not know if the channel is currently being used. Therefore, they are considered hidden from each other.

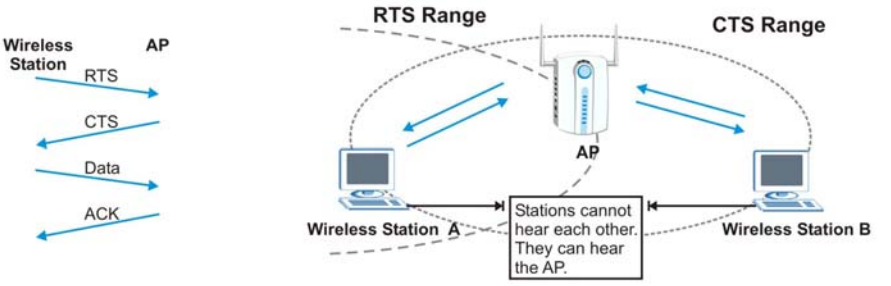



**Figure 2-6 RTS Threshold**

When station **A** sends data to the AP, it might not know that the station **B** is already using the channel. If these two stations send data at the same time, collisions may occur when both sets of data arrive at the AP at the same time, resulting in a loss of messages for both stations.

**RTS/CTS Threshold** is designed to prevent collisions due to hidden nodes. An **RTS/CTS Threshold** defines the biggest size data frame you can send before an RTS (Request To Send)/CTS (Clear to Send) handshake is invoked.

When a data frame exceeds the **RTS/CTS Threshold** value you set (between 0 to 2432 bytes), the station that wants to transmit this frame must first send an RTS (Request To Send) message to the AP for permission to send it. The AP then responds with a CTS (Clear to Send) message to all other stations within its range to notify them to defer their transmission. It also reserves and confirms with the requesting station the time frame for the requested transmission.

Stations can send frames smaller than the specified **RTS/CTS Threshold** directly to the AP without the RTS (Request To Send)/CTS (Clear to Send) handshake.

You should only configure **RTS/CTS Threshold** if the possibility of hidden nodes exists on your network and the "cost" of resending large frames is more than the extra network overhead involved in the RTS (Request To Send)/CTS (Clear to Send) handshake.

If the **RTS/CTS Threshold** value is greater than the **Fragmentation Threshold** value (see next), then the RTS (Request To Send)/CTS (Clear to Send) handshake will never occur as data frames will be fragmented before they reach **RTS/CTS Threshold** size.

**Enabling the RTS Threshold causes redundant network overhead that could negatively affect the throughput performance.**

## 2.5 Authentication Type

The IEEE 802.11b standard describes a simple authentication method between the wireless stations and AP. Three authentication modes are defined: **Auto**, **Open System** and **Shared Key**.

**Open System** mode is implemented for ease-of-use and when security is not an issue. The wireless station and the AP do *not* share a secret key. Thus the wireless stations can associate with any AP and listen to any data transmitted plaintext.

**Shared Key** mode involves a shared secret key to authenticate the wireless station to the AP. This requires you to enable the WEP encryption and specify a WEP key on both the wireless station and the AP.

**Auto** authentication mode allows the ZyXEL G-220F to switch between the open and shared key authentication modes automatically. Use the auto mode if you do not know the authentication mode of the other wireless stations.

## 2.6 Preamble Type

A preamble is used to synchronize the transmission timing in your wireless network. There are two preamble modes: **Long Preamble** and **Short Preamble**.

Short preamble takes less time to process and minimizes overhead, so it should be used in a good wireless network environment when all wireless stations support it.

Select **Long Preamble** if you have a 'noisy' network or are unsure of what preamble mode the access point or the other wireless stations support as all IEEE 802.11b compliant wireless adapters must support long preamble. However, not all wireless adapters support short preamble. Use long preamble if you are unsure what preamble mode the wireless adapters support, to ensure interpretability between the ZyXEL G-220F and the access point/wireless stations and to provide more reliable communication in 'noisy' networks.

Select **Auto** to have the ZyXEL G-220F automatically use short preamble when all access point/wireless stations support it, otherwise the ZyXEL G-220F uses long preamble.

The ZyXEL G-220F and the access point/wireless stations MUST use the same preamble mode in order to communicate.

# Chapter 3
# Wireless Station Mode Configuration

*This chapter shows you how to configure your ZyXEL G-220F in wireless station mode.*

## 3.1 Introduction

To set your ZyXEL G-220F in wireless station mode, refer to *Section 1.6.1*.

## 3.2 The Link Info Screen

When the ZyXEL Utility starts, the **Link Info** screen displays, showing the current configuration and connection status of your ZyXEL G-220F.

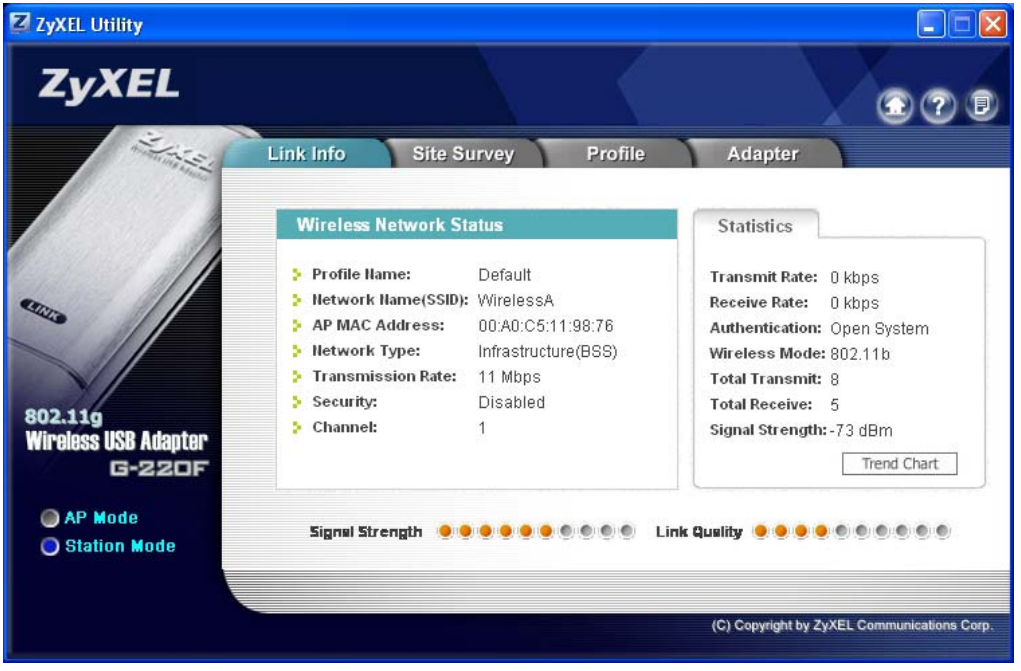



**Figure 3-1 Station Mode: Link Info**

The following table describes the labels in this screen.

**Table 3-1 Station Mode: Link Info**

| LABEL | DESCRIPTION |
|---|---|
| AP Mode<br>Station Mode | Use the radio button to set the ZyXEL G-220F to operate in wireless station or access point mode.<br>Refer to *Section 1.6* for more information. |
| Wireless Network Status | |
| Profile Name | This is the name of the profile you are currently using. |
| Network Name (SSID) | The SSID identifies the Service Set to which a wireless station is associated. This field displays the name of the wireless device to which the ZyXEL G-220F is associated. |
| AP MAC Address | This field displays the MAC address of the wireless device to which the ZyXEL G-220F is associated. |
| Network Type | This field displays the network type (**Infrastructure(BSS)** or **Ad Hoc**) of the wireless network. |
| Transmission Rate | This field displays the current transmission rate of the ZyXEL G-220F in megabits per second (Mbps). |
| Security | This field displays whether WEP data encryption is activated (**WEP**) or inactive (**Disabled**). |
| Channel | This field displays the radio channel the ZyXEL G-220F is currently using. |
| Statistics | |
| Transmit Rate | This field displays the current data transmission rate in kilobits per second (Kbps). |
| Receive Rate | This field displays the current data receiving rate in kilobits per second (Kbps). |
| Authentication | This field displays the authentication method of the ZyXEL G-220F. |
| Wireless Mode | This field indicates the wireless standard (802.11b or 802.11g) of the wireless device. This field displays **G Only**, **B Only** or **Mixed Mode**. |
| Total Transmit | This field displays the total number of data frames transmitted. |
| Total Receive | This field displays the total number of data frames received. |
| Signal Strength | This field displays the signal strength of the ZyXEL G-220F. |
| Trend Chart | Click this button to display the real-time statistics of the data rate in kilobits per second (Kbps). |
| Signal Strength | The status bar shows the strength of the signal. |
| Link Quality | The status bar shows the quality of the signal. |

### 3.2.1 Trend Chart

Click **Trend Chart** in the **Link Info** screen to display a screen as shown below. Use this screen to view real-time data traffic statistics.

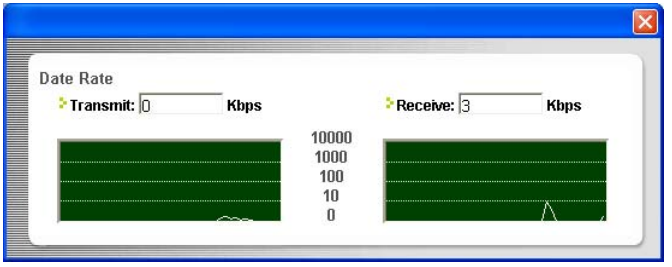



**Figure 3-2 Station Mode: Link Info: Trend Chart**

The following table describes the labels in this screen.

**Table 3-2 Station Mode: Link Info: Trend Chart**

| LABEL | DESCRIPTION |
|---|---|
| Transmit | This field displays the current data transmission rate in kilobits per second (Kbps). |
| Receive | This field displays the current data receiving rate in kilobits per second (Kbps). |

## 3.3 The Site Survey Screen

Use the **Site Survey** screen to scan for and connect to a wireless network automatically.

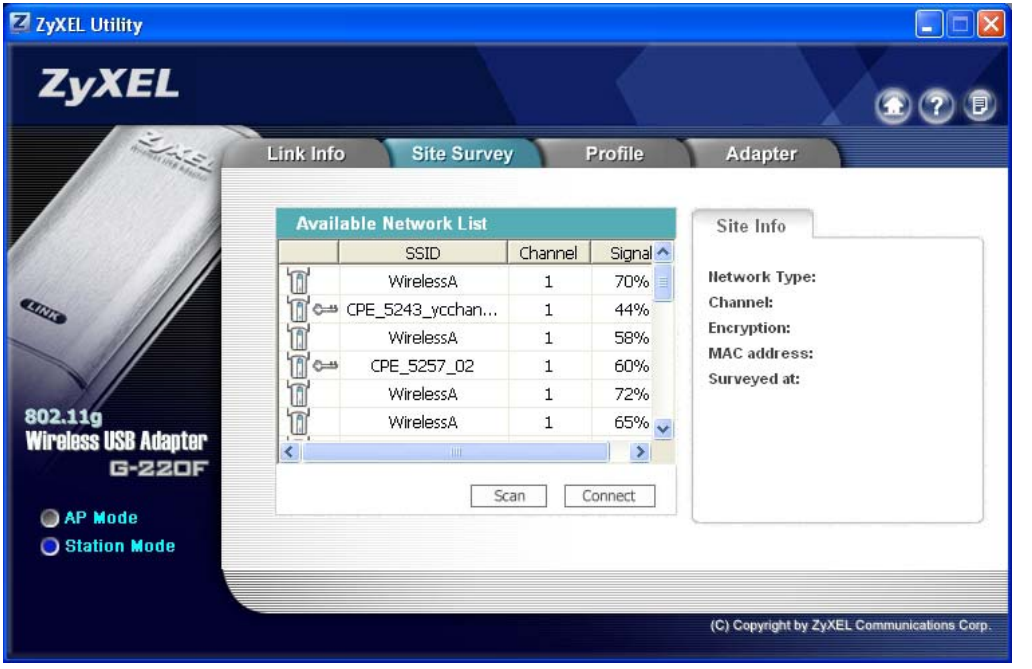



**Figure 3-3 Station Mode: Site Survey**

The following table describes the labels in this screen.

**Table 3-3 Station Mode: Site Survey**

| LABEL | DESCRIPTION |
|---|---|
| Available Network List<br>Click a column heading to sort the entries. | |
| , , or | denotes that the wireless device is in infrastructure mode and the wireless security is activated.<br>denotes that the wireless device is in infrastructure mode but the wireless security is deactivated.<br>denotes that the wireless device is in Ad-Hoc mode and the wireless security is activated.<br>denotes that the wireless device is in Ad-Hoc mode but the wireless security is deactivated. |

**Table 3-3 Station Mode: Site Survey**

| LABEL | DESCRIPTION |
|---|---|
| SSID | This field displays the SSID (Service Set IDentifier) of each wireless device. |
| Channel | This field displays the channel number used by each wireless device. |
| Signal | This field displays the signal strength of each wireless device. |
| Scan | Click **Scan** to search for available wireless devices within transmission range. |
| Connect | Click **Connect** to associate to the selected wireless device. |
| Site Info<br>Click an entry in the **Available Network List** table to display the information of the selected wireless device. | |
| Network Type | This field displays the network type (**Infrastructure** or **Ad Hoc**) of the wireless device. |
| Channel | This field displays the channel number used by each wireless device. |
| Encryption | This field shows whether data encryption is activated (**WEP**, **WPA-PSK** or **WPA**) or inactive (**Disable**). |
| MAC address | This field displays the MAC address of the wireless device. |
| Surveyed at | This field displays the time when the wireless device is scanned. |

## 3.3.1 Connecting to a WLAN Network

Follow the steps below to connect to a WLAN network using the **Site Survey** screen.

**Step 1.** Click **Scan** to search for all available wireless networks within range.

**Step 2.** To join a network, click an entry in the table to select a wireless network and then click **Connect**.

**Step 3.** If the WEP encryption is activated for the selected wireless network, the **Security Settings** screen displays. You must set the related fields in the **Security Settings** screen to the same security settings as the associated wireless device. Refer to *Section 3.3.2* for more information. Otherwise click the close (  ) button and connect to another wireless network without WEP encryption.

**Step 4.** Verify that you have successfully connected to the selected network and check the network information in the **Link Info** screen.

## 3.3.2 Security Settings

When you configure the ZyXEL G-220F to connect to a network with WEP encryption activated and the security settings are disabled on the ZyXEL G-220F, the screen displays as follows.

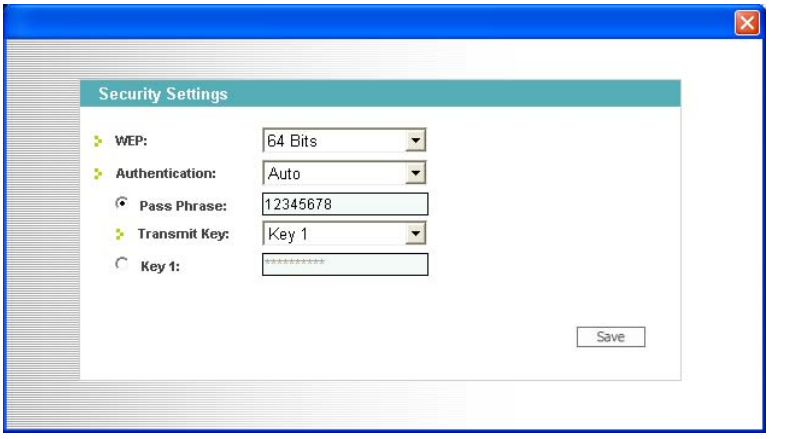



**Figure 3-4 Station Mode: Site Survey: Security Settings**

The following table describes the labels in this screen.

**Table 3-4 Station Mode: Site Survey: Security Settings**

| LABEL | DESCRIPTION |
|---|---|
| Security Settings | |
| WEP | Select **64 Bits**, **128 Bits** or **256 Bits** to activate WEP encryption and then fill in the related fields.<br>Select **Disable** to deactivate WEP encryption. |
| Authentication | Select an authentication method. Choices are **Auto**, **Shared Key** and **Open System**.<br>Refer to *Section 2.5* for more information. |
| Pass Phrase | When you select the radio button, enter the passphrase. As you enter the passphrase, the ZyXEL G-220F automatically generates four different WEP keys and displays it in the key field below.<br>Refer to *Section 2.2.1* for more information. |
| Transmit Key | Select a default WEP key to use for data encryption. The key displays in the field below. |

**Table 3-4 Station Mode: Site Survey: Security Settings**

| LABEL | DESCRIPTION |
|---|---|
| Key x (where x is a number between 1 and 4) | Select this option if you want to manually enter the WEP keys.<br>Enter the WEP key in the field provided.<br>If you select **64 Bits** in the **WEP** field.<br>◆ Enter either 10 hexadecimal digits in the range of "A-F", "a-f" and "0-9" (for example, 11AA22BB33) for HEX key type<br>or<br>◆ Enter 5 ASCII characters (case sensitive) ranging from "a-z", "A-Z" and "0-9" (for example, MyKey) for ASCII key type.<br><br>If you select **128 Bits** in the **WEP** field,<br>◆ Enter either 26 hexadecimal digits in the range of "A-F", "a-f" and "0-9" (for example, 00112233445566778899AABBCC) for HEX key type<br>or<br>◆ Enter 13 ASCII characters (case sensitive) ranging from "a-z", "A-Z" and "0-9" (for example, MyKey12345678) for ASCII key type.<br><br>If you select **256 Bits** in the **WEP** field,<br>◆ Enter either 58 hexadecimal digits in the range of "A-F", "a-f" and "0-9" (for example, 000011112222333344445555666677778888999AAAABBBBCCCC000011) for HEX key type<br>or<br>◆ Enter 29 ASCII characters (case sensitive) ranging from "a-z", "A-Z" and "0-9" (for example, MyKey11112222333344445555678) for ASCII key type.<br>**The values for the WEP keys must be set up exactly the same on all wireless devices in the same wireless LAN.**<br>**ASCII WEP keys are case sensitive.** |
| Save | Click **Save** to save the changes back to the ZyXEL G-220F. Otherwise, click the close (  ) button to discard the changes and go back to the **Link Info** screen. |

## 3.4 The Profile Screen

Click the **Profile** tab in the ZyXEL Utility program to display the **Profile** screen as shown next.

The profile function allows you to save the wireless network settings in this screen, or use one of the pre-configured network profiles.

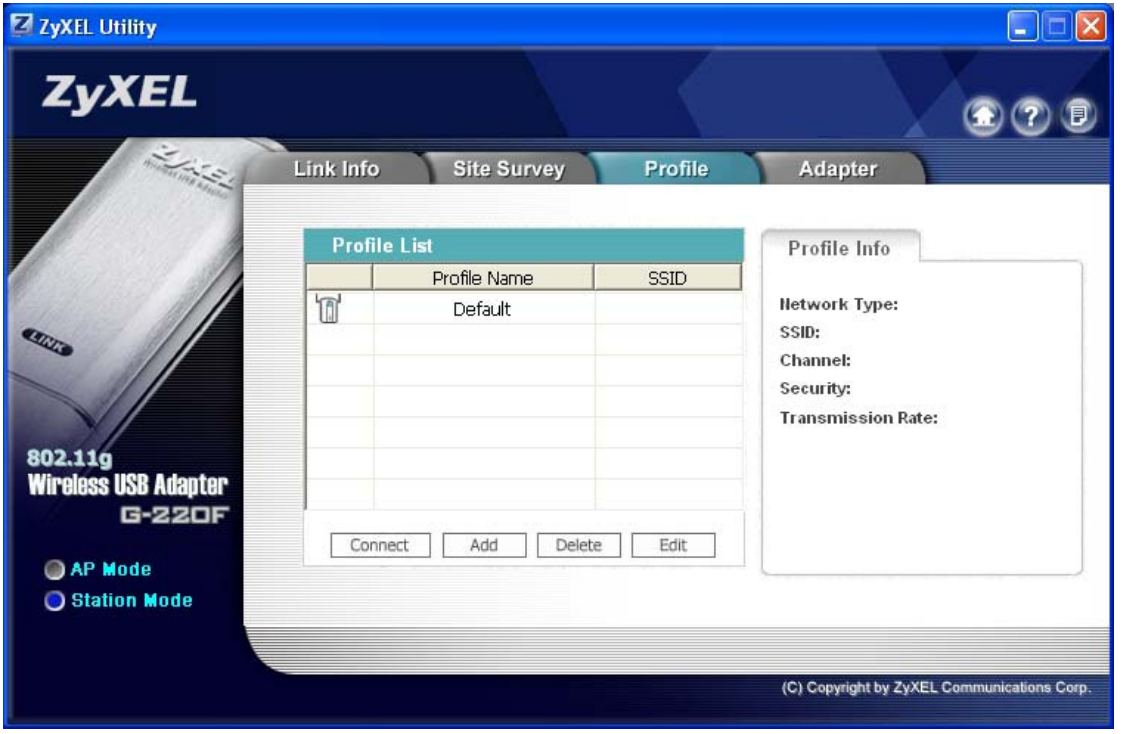



**Figure 3-5 Station Mode: Profile**

The following table describes the labels in this screen.

**Table 3-5 Station Mode: Profile**

| LABEL | DESCRIPTION |
|---|---|
| Profile List<br>Click a column heading to sort the entries. | |

**Table 3-5 Station Mode: Profile**

| LABEL | DESCRIPTION |
|---|---|
|  |  denotes that the wireless device is in infrastructure mode and the wireless security is activated.<br>  denotes that the wireless device is in infrastructure mode but the wireless security is deactivated.<br>  denotes that the wireless device is in Ad-Hoc mode and the wireless security is activated.<br>  denotes that the wireless device is in Ad-Hoc mode but the wireless security is deactivated. |
| Profile Name | This is the name of the pre-configured profile. |
| SSID | This is the SSID of the wireless network to which the selected profile associate. |
| Connect | To use a previously saved network profile, select a pre-configured profile name in the table and click **Connect**. |
| Add | To add a new profile into the table, click **Add**. |
| Delete | To delete an existing wireless network configuration, select a profile in the table and click **Delete**. |
| Edit | To edit an existing wireless network configuration, select a profile in the table and click **Edit**. |
| Profile Info<br>The following fields display detail information of the selected profile in the **Profile List** table. | |
| Network Type | This field displays the network type (**Infrastructure** or **Ad Hoc**) of the profile. |
| SSID | This field displays the SSID (Service Set IDentifier) of the profile. |
| Channel | This field displays the channel number used by the profile. |
| Security | This field shows whether WEP data encryption is activated (**Enabled**) or inactive (**Disabled**). |
| Transmission Rate | This field displays the transmission speed of the selected profile in megabits per second (Mbps). |

## 3.4.1 Adding a New Profile

Follow the steps below to add a new profile.

**Step 1.** Click **Add** in the **Profile** screen. An **Add New Profile** screen displays as shown next. Click **Next** to continue.

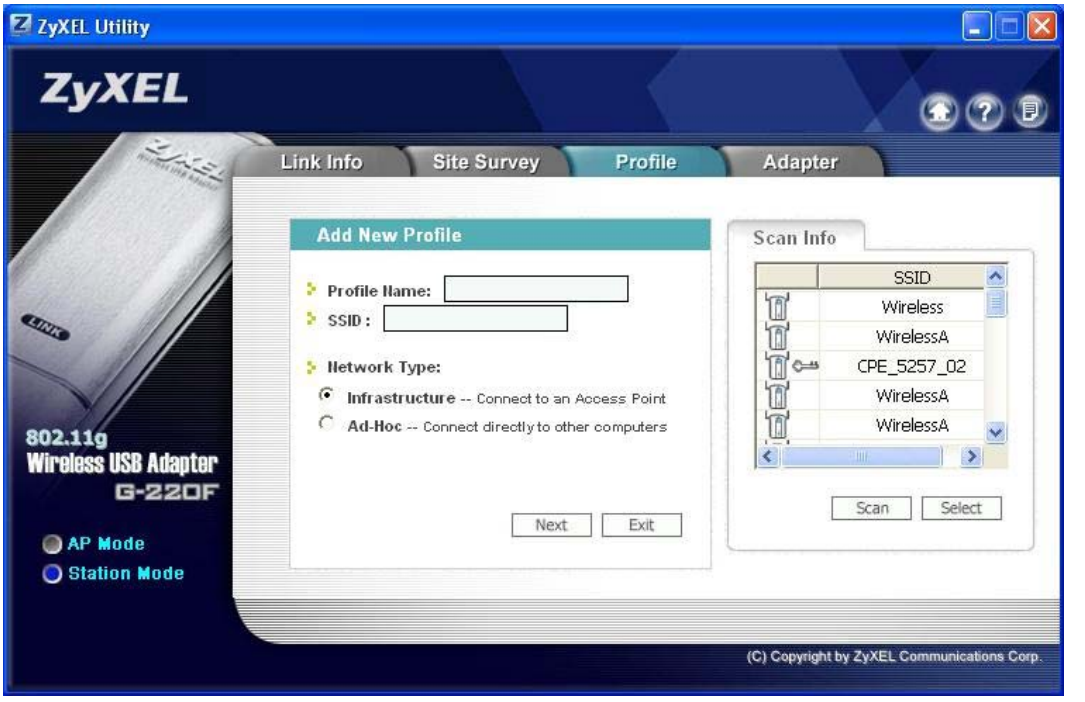



**Figure 3-6 Station Mode: Profile: Add New Profile**

The following table describes the labels in this screen.

**Table 3-6 Station Mode: Profile: Add New Profile**

| LABEL | DESCRIPTION |
|---|---|
| Add New Profile | |
| Profile Name | Enter a descriptive name in this field. |
| SSID | Select an available wireless device in the **Scan Info** table and click **Select**, or enter the SSID of the wireless device to which you want to associate in this field manually.<br>Otherwise, leave this field blank to have the ZyXEL G-220F associate to or roam between any infrastructure wireless networks. |
| Network Type | Select the **Infrastructure** radio button to associate to an AP.<br>Select the **Ad-Hoc** radio button to associate to a peer computer. |

**Table 3-6 Station Mode: Profile: Add New Profile**

| LABEL | DESCRIPTION |
|---|---|
| Next | Click **Next** to go to the next screen. |
| Exit | Click **Exit** to go back to the previous screen without saving. |
| Scan Info<br>This table displays the information of the available wireless networks within the transmission range. | |
|  |  denotes that the wireless device is in infrastructure mode and the wireless security is activated.<br>  denotes that the wireless device is in infrastructure mode but the wireless security is deactivated.<br>  denotes that the wireless device is in Ad-Hoc mode and the wireless security is activated.<br>  denotes that the wireless device is in Ad-Hoc mode but the wireless security is deactivated. |
| SSID | This field displays the SSID (Service Set IDentifier) of each wireless device. |
| Scan | Click **Scan** to search for available wireless devices within transmission range. |
| Select | Select an available wireless device in the table and click **Select** to add it to this profile. Whenever you activate this profile, the ZyXEL G-220F associates to the selected wireless network only. |

**Step 2.** If you select the **Ad-Hoc** network type in the previous screen, a screen displays as follows. Select a channel number and wireless LAN mode and click **Next** to continue.

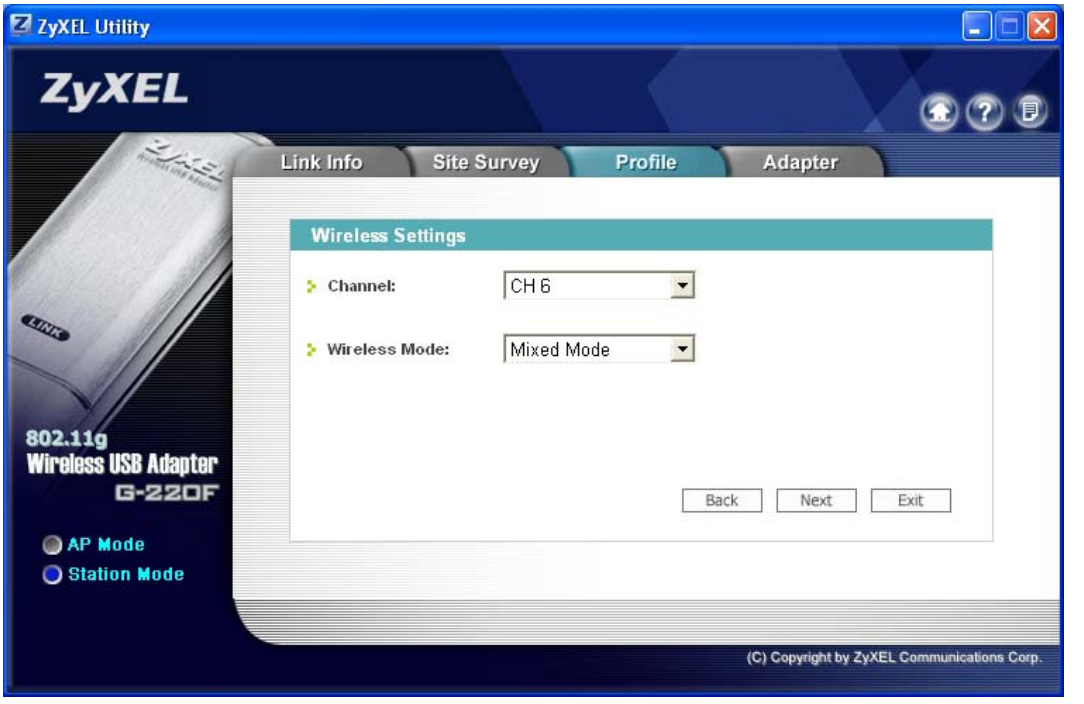



**Figure 3-7 Station Mode: Profile: Select a Channel**

The following table describes the labels in this screen.

**Table 3-7 Station Mode: Profile: Select a Channel**

| LABEL | DESCRIPTION |
|---|---|
| Wireless Settings | |
| Channel | Select a channel number from the drop-down list box. To associate to an ad-hoc network, you must use the same channel as the peer computer. |
| Wireless Mode | Select **Mixed Mode** to have the ZyXEL G-220F connect to either an IEEE 802.11g or IEEE 802.11b wireless device.<br>Select **G Only** to have the ZyXEL G-220F connect to an IEEE 802.11g wireless device only and vice versa.<br>Select **B Only** to have the ZyXEL G-220F connect to an IEEE 802.11g wireless device only and vice versa. |

**Step 3.** Select **WEP** from the drop-down list box to enable WEP encryption. Otherwise, select **Disabled** to allow the ZyXEL G-220F to communicate with the access points or other peer wireless computers without any data encryption and skip to *Step 5*.

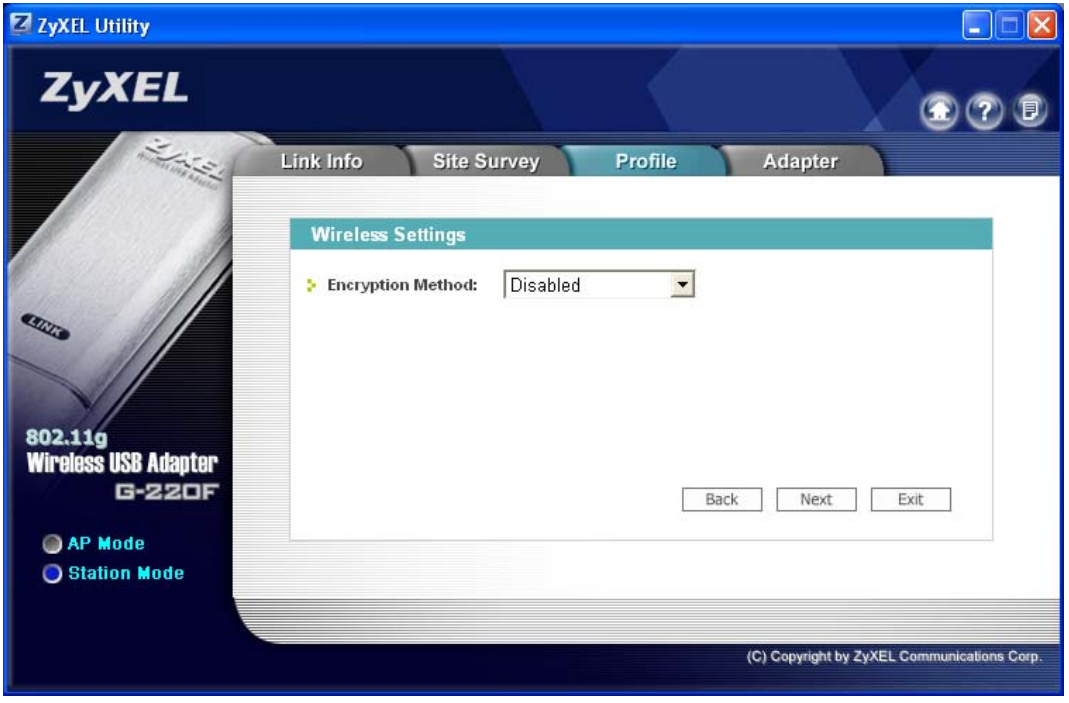



**Figure 3-8 Station Mode: Profile: Wireless Settings**

**Step 4.** The WEP keys are used to encrypt data before transmitting. The values for the keys must be set up exactly the same on the APs or other peer wireless computers as they are on the ZyXEL G-220F. Refer to *Section 3.3.1* for detailed information on setting up the WEP key.

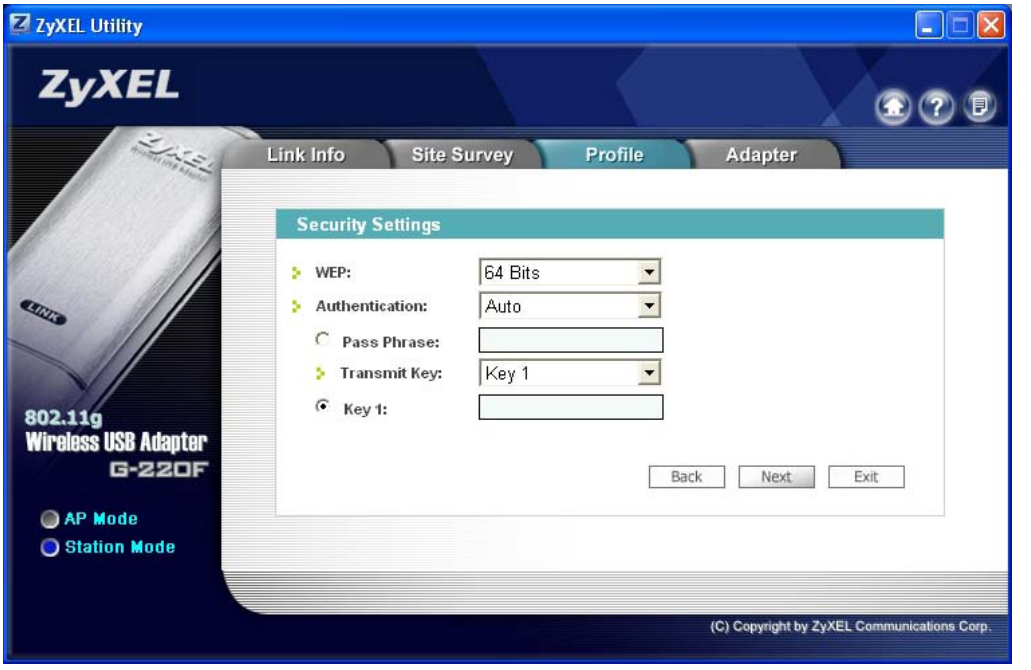



**Figure 3-9 Station Mode: Profile: Security Settings**

**Step 5.** This read-only screen shows a summary of the new profile settings. Verify that the settings are correct. Click **Save** to save and go to the next screen. Click **Back** to return to the previous screen. Otherwise, click **Exit** to go back to the **Profile** screen without saving.

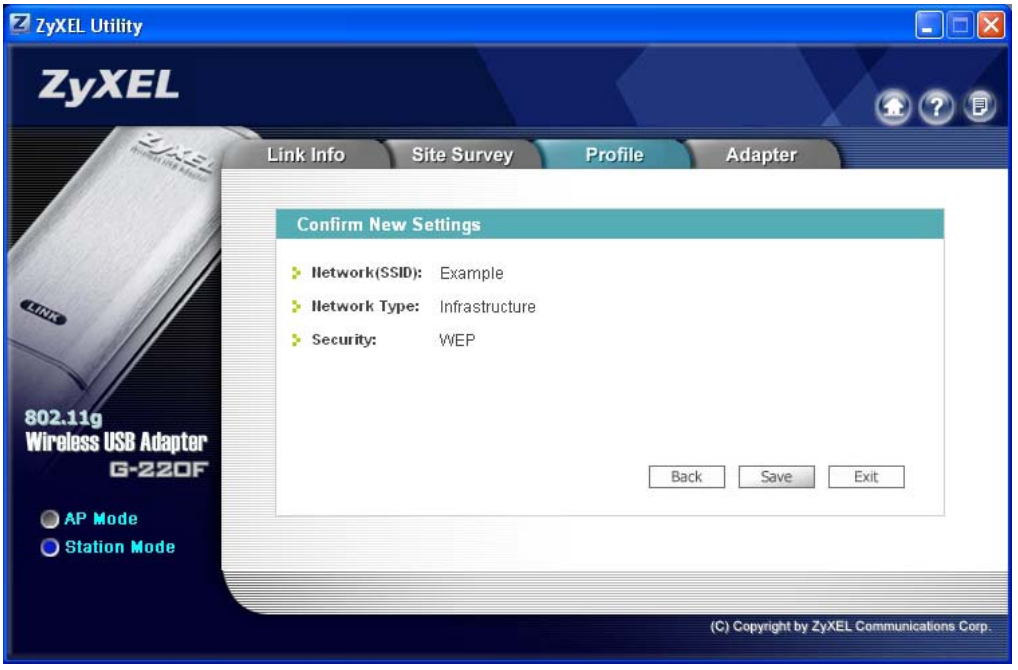



**Figure 3-10 Station Mode: Profile: Confirm New Settings**

**Step 6.** To use this network profile, click the **Activate Now** button. Otherwise, click the **Activate Later** button.

**Once you activate a profile, the ZyXEL Utility will use that profile the next time it is started.**

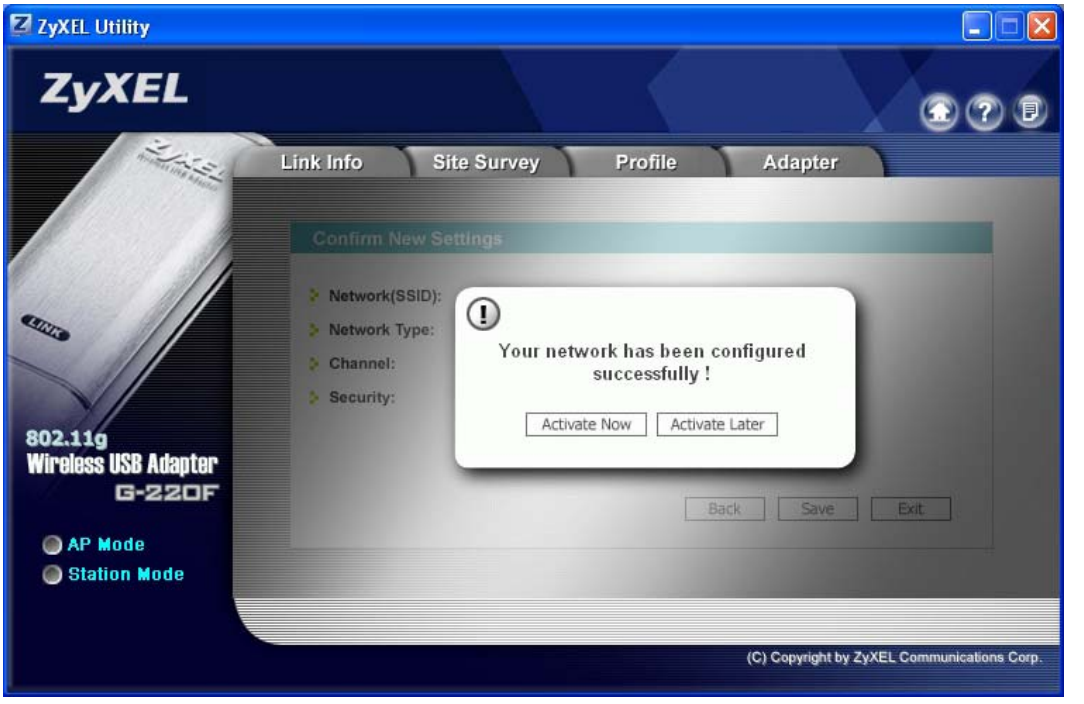



**Figure 3-11 Station Mode: Profile: Activate the Profile**

## 3.5 The Adapter Screen

To set the advanced features on the ZyXEL G-220F, click the **Adapter** tab.

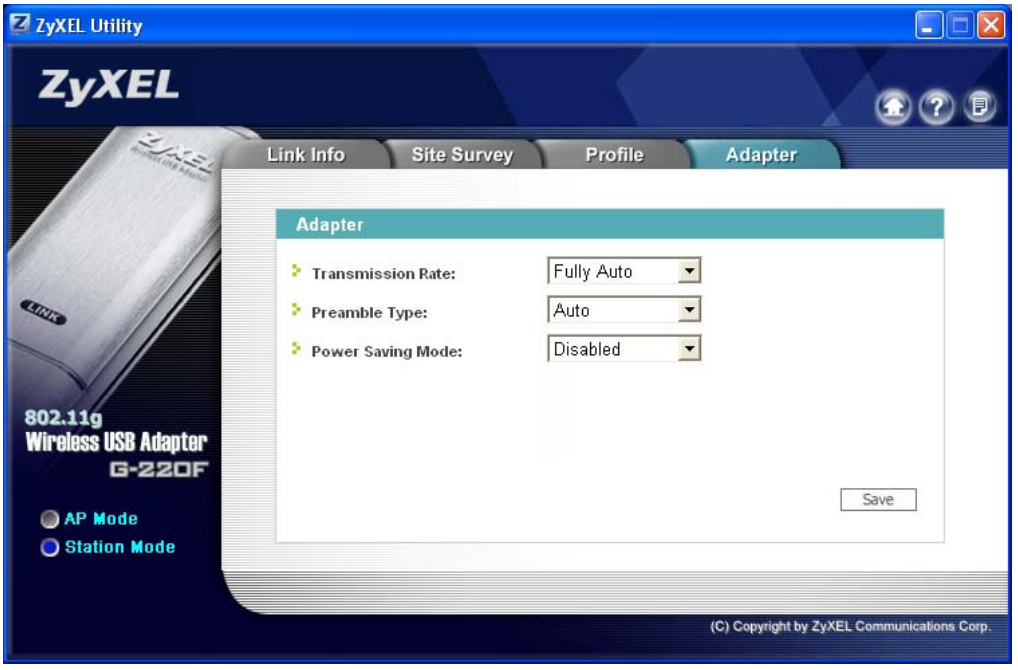



**Figure 3-12 Station Mode: Adapter**

The following table describes the labels in this screen.

**Table 3-8 Station Mode: Adapter**

| LABEL | DESCRIPTION |
|---|---|
| Adapter | |
| Transmission Rate | Select a transmission speed from the drop-down list box. Choose from **Fully Auto** (default), **1 Mbps**, **2 Mbps**, **5.5 Mbps**, **11 Mbps**, **6 Mbps**, **9 Mbps**, **12 Mbps**, **18 Mbps**, **24 Mbps**, **36 Mbps**, **48 Mbps**, and **54 Mbps**. |
| Preamble Type | Select a preamble type. Choices are **Long Preamble**, **Short Preamble** and **Auto**.<br>The default setting is **Auto**.<br>Refer to *Section 2.6* for more information. |
| Power Saving Mode | Select **Enabled** to save power (especially for notebook computers). This forces the ZyXEL G-220F to go to sleep mode when it is not transmitting data.<br>When you select **Disabled**, the ZyXEL G-220F will never go to sleep mode. |

**Table 3-8 Station Mode: Adapter**

| LABEL | DESCRIPTION |
|---|---|
| Save | Click **Save** to save the changes back to the ZyXEL G-220F and return to the **Link Info** screen. |

# Chapter 4
# Access Point Mode Configuration

*This chapter shows you how to configure your ZyXEL G-220F in access point mode.*

## 4.1 Introduction

To set your ZyXEL G-220F as an Access Point (AP), refer to *Section 1.6.1*.

In access point mode, your ZyXEL G-220F functions as an access point. This allows you to set up your wireless networks without using a dedicated AP device. Up to 16 wireless stations can associate to the ZyXEL G-220F.

### 4.1.1 Additional Setup Requirements

To bridge your wired and wireless network using the ZyXEL G-220F, the following requirements must be met:

1. The ZyXEL G-220F must be installed on a computer connected to the wired network.
2. Either configure network sharing (refer to the appendix for an example) or bridge the two interfaces (wireless and wired) on the computer.
3. Set the wireless station's IP address to be in the same subnet as the computer in which the ZyXEL G-220F is installed. Refer to the *Setting Up Your Computer's IP Address* appendix.

## 4.2 The Link Info Screen

Select the **AP Mode** radio button and wait for about five seconds to display the screen as shown.

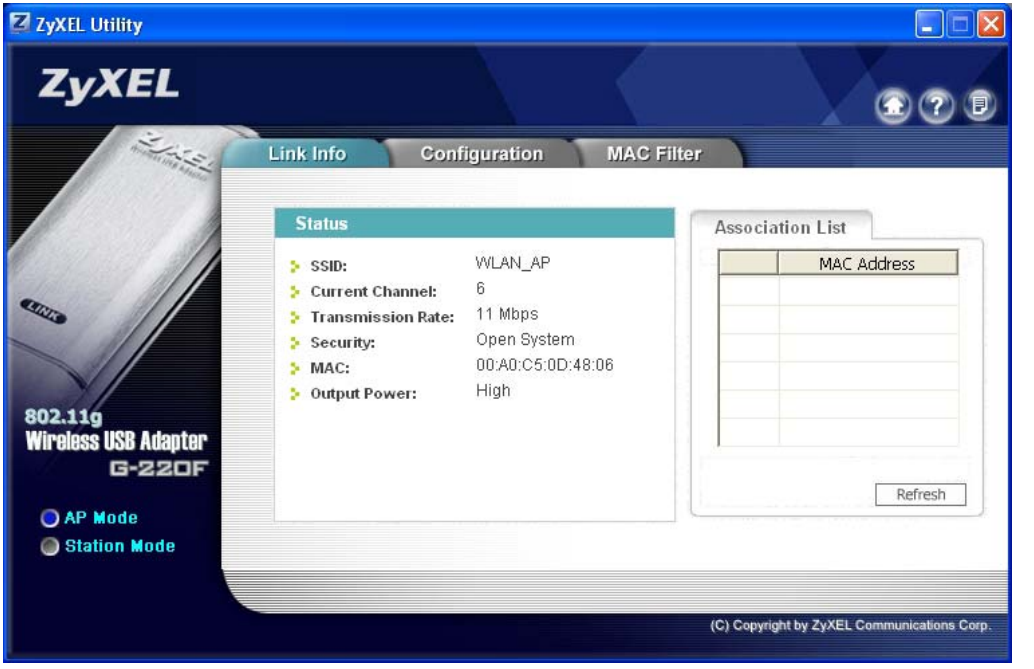


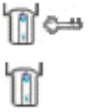

**Figure 4-1 Access Point Mode: Link Info**

The following table describes the labels in this screen.

**Table 4-1 Access Point Mode: Link Info**

| LABEL | DESCRIPTION |
|---|---|
| Status | |
| SSID | This field displays the name that identifies your ZyXEL G-220F in the wireless LAN network. |
| Current Channel | This field displays the radio channel the ZyXEL G-220F is currently using. |
| Security | This field displays the authentication type of the ZyXEL G-220F. |
| MAC | This field displays the MAC address of the ZyXEL G-220F. |
| Output Power | This field shows the strength of the ZyXEL G-220F's antenna gain or transmission power. |
| Association List | |

**Table 4-1 Access Point Mode: Link Info**

| LABEL | DESCRIPTION |
|---|---|
|  or |  denotes that the wireless device is in infrastructure mode and the wireless security is activated.<br>  denotes that the wireless device is in infrastructure mode but the wireless security is deactivated. |
| MAC Address | This field displays the MAC addresses of up to 16 wireless stations that are currently connected to the ZyXEL G-220F. |
| Refresh | Click **Refresh** to update this screen. |

## 4.3 The Configuration Screen

Click **Configuration** in the **ZyXEL Utility** screen to display the screen as shown.

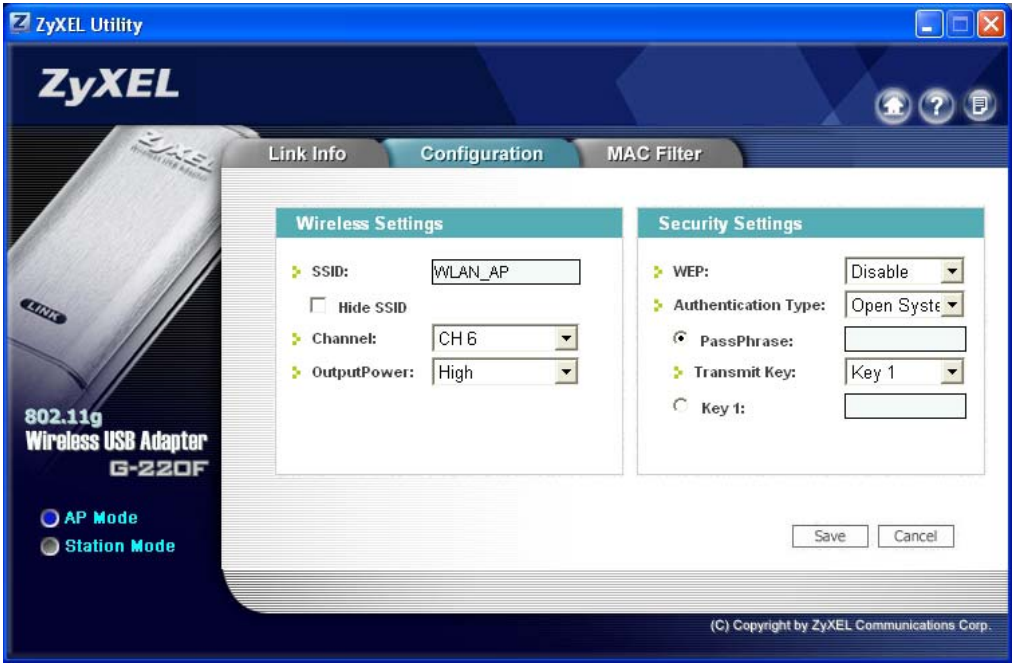



**Figure 4-2 Access Point Mode: Configuration**

The following table describes the labels in this screen.

**Table 4-2 Access Point Mode: Configuration**

| LABEL | DESCRIPTION |
|---|---|
| Wireless Settings | |
| SSID | The SSID identifies the Service Set to which a wireless station is associated. Wireless stations associating to the access point (the ZyXEL G-220F) must have the same SSID. Enter a descriptive name (up to 32 printable 7-bit ASCII characters) for the wireless LAN. |
| Hide SSID | Select this check box to hide the SSID in the outgoing beacon frame so a station cannot obtain the SSID through passive scanning using a site survey tool. |
| Channel | Set the operating frequency/channel depending on your geographical region. |
| OutputPower | Set this field if you need to conserve power consumption (especially for notebook computers). This control changes the strength of the ZyXEL G-220F's antenna gain or transmission power. Antenna gain, measured in dBm (decibel relative units compared to milliwatts), is the increase in coverage. Higher antenna gain improves the range of the signal for better communications.<br>Select **High** to set the ZyXEL G-220F's antenna to transmit at 17-dBm.<br>Select **Medium-High** to set the ZyXEL G-220F's antenna to transmit at 15-dBm.<br>Select **Medium-Low** to set the ZyXEL G-220F's antenna to transmit at 13-dBm.<br>Select **Low** to set the ZyXEL G-220F's antenna to transmit at 11-dBm. This allows for the least power consumption. |
| Security Settings | |
| WEP | Select **64 Bits**, **128 Bits** or **256 Bits** to activate WEP encryption and then fill in the related fields.<br>Select **Disable** to deactivate the WEP encryption. |
| Authentication Type | Select an authentication method. Choices are **Auto**, **Shared Key** and **Open System**.<br>Refer to *Section 2.5* for more information. |
| Pass Phrase | When you select the radio button, enter the passphrase. As you enter the passphrase, the ZyXEL G-220F automatically generates four different WEP key and displays it in the key field below.<br>Refer to *Section 2.2.1* for more information. |
| Transmit Key | Select a default WEP key to use for data encryption. The key displays in the field below. |

**Table 4-2 Access Point Mode: Configuration**

| LABEL | DESCRIPTION |
|---|---|
| Key x (where x is a number between 1 and 4) | Select this option if you want to manually enter the WEP keys.<br>Enter the WEP key in the field provided.<br>If you select **64 Bits** in the **WEP** field.<br>◆ Enter either 10 hexadecimal digits in the range of "A-F", "a-f" and "0-9" (for example, 11AA22BB33) for HEX key type<br>or<br>◆ Enter 5 ASCII characters (case sensitive) ranging from "a-z", "A-Z" and "0-9" (for example, MyKey) for ASCII key type.<br>If you select **128 Bits** in the **WEP** field,<br>◆ Enter either 26 hexadecimal digits in the range of "A-F", "a-f" and "0-9" (for example, 00112233445566778899AABBCC) for HEX key type<br>or<br>◆ Enter 13 ASCII characters (case sensitive) ranging from "a-z", "A-Z" and "0-9" (for example, MyKey12345678) for ASCII key type.<br>If you select **256 Bits** in the **WEP** field,<br>◆ Enter either 58 hexadecimal digits in the range of "A-F", "a-f" and "0-9" (for example, 0000111122223333444455556666777788889999AAAABBBBCCCC000011) for HEX key type<br>or<br>◆ Enter 29 ASCII characters (case sensitive) ranging from "a-z", "A-Z" and "0-9" (for example, MyKey11112222333344445555678) for ASCII key type.<br>**The values for the WEP keys must be set up exactly the same on all wireless devices in the same wireless LAN.**<br>**ASCII WEP keys are case sensitive.** |
| Save | Click **Save** to save the changes. |
| Cancel | Click **Cancel** to discard the changes. |

## 4.4 The MAC Filter Screen

The **MAC Filter** screen allows you to configure the ZyXEL G-220F to give exclusive access to (Accept) devices or exclude devices from (Reject) connecting to the ZyXEL G-220F. Every Ethernet device has a unique MAC (Media Access Control) address. The MAC address is assigned at the factory and consists of

six pairs of hexadecimal characters, for example, 00:A0:C5:00:00:02. You need to know the MAC address of the device(s) to configure this screen.

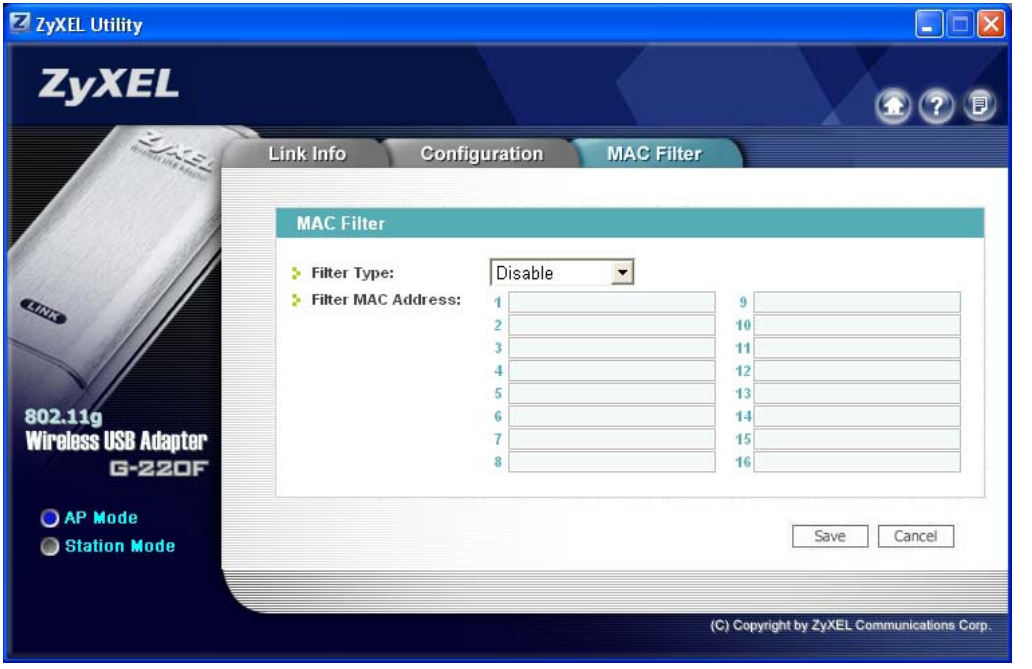



**Figure 4-3 Access Point Mode: MAC Filter**

The following table describes the labels in this screen.

**Table 4-3 Access Point Mode: MAC Filter**

| LABEL | DESCRIPTION |
|---|---|
| Filter Type | Define the filter action for the list of MAC addresses in the MAC address filter table.<br>Select **Disable** to deactivate the MAC filter feature.<br>Select **Reject** to block access to the ZyXEL G-220F, MAC addresses not listed will be allowed to access the ZyXEL G-220F.<br>Select **Accept** to permit access to the ZyXEL G-220F, MAC addresses not listed will be denied access to the ZyXEL G-220F. |
| Filter MAC Address | |

**Table 4-3 Access Point Mode: MAC Filter**

| LABEL | DESCRIPTION |
|---|---|
| 1-16 | Specify the MAC address(es) of the wireless station(s) that is allowed or denied association to the ZyXEL G-220F.<br>Enter six pairs of hexadecimal digits (separated by colons) in the range of "A-F", "a-f" and "0-9" (for example, 00:A0:C5:00:00:02).<br>If you enter an invalid MAC address, once you click **Save** to save the values, a warning screen will be displayed. |
| Save | Click **Save** to save the changes back to the ZyXEL G-220F. |
| Cancel | Click **Cancel** to discard the changes. |

# Chapter 5
# Maintenance

*This chapter describes how to uninstall or upgrade the ZyXEL Utility.*

## 5.1 The About Screen

The **About** screen displays related version numbers of the ZyXEL G-220F. To display the screen as shown below, click the about (  ) button.


**Figure 5-1 About**

The following table describes the read-only fields in this screen.

**Table 5-1 About**

| LABEL | DESCRIPTION |
|---|---|
| Driver Version | This field displays the version number of the ZyXEL G-220F driver. |
| Utility Version | This field displays the version number of the ZyXEL Utility. |

## 5.2 Uninstalling the ZyXEL Utility

Follow the steps below to remove (or uninstall) the ZyXEL Utility from your computer.

**Step 1.** Click **Start**, **Programs**, **ZyXEL G-220F Utility**, **Uninstall ZyXEL G-220F Utility**.

**Step 2.** When prompted, click **OK** to remove the driver and the utility software.

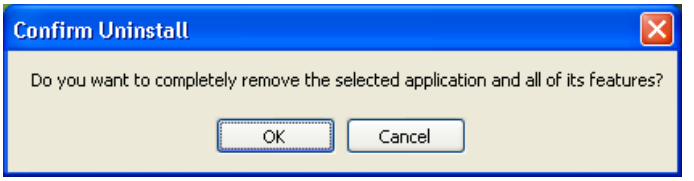



**Figure 5-2 Confirm Uninstall**

**Step 3.** Click **Finish** to complete uninstalling the software and restart the computer when prompted.

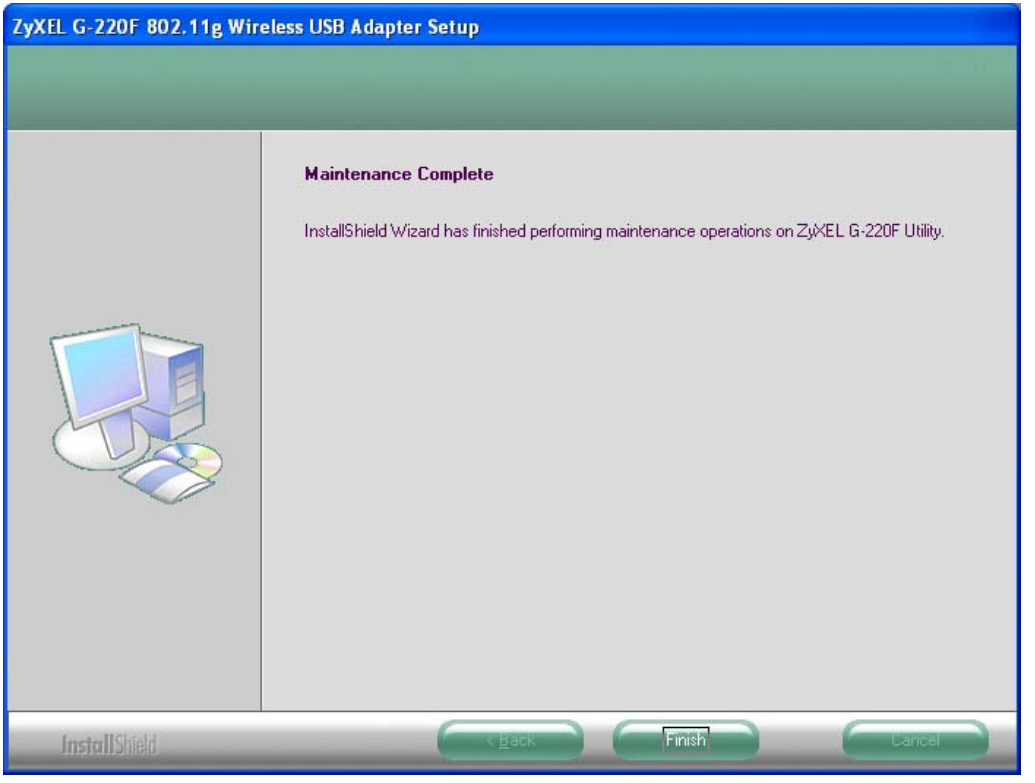



**Figure 5-3 Uninstalling the ZyXEL Utility**

## 5.3 Upgrading the ZyXEL Utility

**Before you uninstall the ZyXEL Utility, take note of the current network configuration.**

To perform the upgrade, follow the steps below.

**Step 1.** Download the latest version of the utility from the ZyXEL web site and save the file on your computer.

**Step 2.** Follow the steps in *Section 5.2* to remove the current ZyXEL Utility from your computer.

**Step 3.** Restart your computer when prompted.

**Step 4.** Remove the ZyAIR from your computer.

**Step 5.** Double-click on the setup program for the new utility to start the ZyXEL Utility installation.

**Step 6.** Check the version numbers in the **About** screen to make sure the new utility is installed properly.

# Chapter 6
# Troubleshooting

*This chapter covers potential problems and the possible remedies. After each problem description, some instructions are provided to help you to diagnose and to solve the problem.*

## 6.1 Problems Starting the ZyXEL Utility Program

**Table 6-1 Troubleshooting Starting ZyXEL Utility Program**

| | |
|---|---|
| Cannot start the ZyXEL Wireless LAN Utility | Make sure the ZyXEL G-220F is properly inserted and the LED(s) is on. Refer to the *Quick Installation Guide* for the LED descriptions. |
| | Use the **Device Manager** to check for possible hardware conflicts.<br>Click **Start**, **Settings**, **Control Panel**, **System**, **Hardware** and **Device Manager**. Verify the status of the ZyXEL G-220F under **Network Adapter**. (Steps may vary depending on the version of Windows). |
| | Install the ZyXEL G-220F in another computer.<br>If the error persists, you may have a hardware problem. In this case, you should contact your local vendor. |
| Cannot change to Access Point mode | If you use the Windows XP configuration tool and the ZyXEL Utility to configure the ZyXEL G-220F at the same time, the ZyXEL G-220F automatically operates in wireless station mode. You need to disable the Windows XP configuration tool to change between the modes using the ZyXEL Utility (refer to the *Section 1.6* for more information). |

## 6.2 Problem Connecting to an Access Point

**Table 6-2 Troubleshooting Access Point Connection Problem**

| PROBLEM | CORRECTIVE ACTION |
|---|---|
| When using the Windows XP configuration tool, cannot scan for or connect to any access points. | The ZyXEL G-220F might still be operating in access point mode. This results when you set the ZyXEL G-220F to operate in access point mode using the ZyXEL Utility, close the ZyXEL Utility and then use the Windows XP configuration tool.<br>Before you use the Windows XP configuration tool, make sure you set the ZyXEL G-220F to operate in station mode before you close and exit the ZyXEL Utility. |

## 6.3 Problem with the Link Status

**Table 6-3 Troubleshooting Link Quality**

| PROBLEM | CORRECTIVE ACTION |
|---|---|
| The link quality and/or signal strength is poor all the time. | Search and connect to another AP with a better link quality using the **Site Survey** screen.<br>Move your computer closer to the AP or the peer computer(s) within the transmission range.<br>There may be too much radio interference (for example microwave or another AP using the same channel) around your wireless network. Relocate or reduce the radio interference. |

## 6.4 Problems Communicating With Other Computers

**Table 6-4 Troubleshooting Communication Problem**

| PROBLEM | CORRECTIVE ACTION |
|---|---|
| In wireless station mode, the computer with the ZyXEL G-220F installed cannot communicate with the other computer(s). | |
| A. **Infrastructure** | Make sure that the AP and the associated computers are turned on and working properly.<br>Make sure the ZyXEL G-220F computer and the associated AP use the same SSID.<br>Change the AP and the associated wireless clients to use another radio channel if interference is high.<br>Make sure that the computer and the AP share the same security option and key. Verify the settings in the **Profile Security Settings** screen. |
| B. **Ad-Hoc (IBSS)** | Verify that the peer computer(s) is turned on.<br>Make sure the ZyXEL G-220F computer and the peer computer(s) are using the same SS ID and channel.<br>Make sure that the computer and the peer computer(s) share the same security option and key.<br>Change the wireless clients to use another radio channel if interference is high. |

**Table 6-4 Troubleshooting Communication Problem**

| PROBLEM | CORRECTIVE ACTION |
|---|---|
| In access point mode, the wireless station(s) cannot associate to the ZyXEL G-220F. | Verify that the computer with the ZyXEL G-220F installed is turned on.<br>Make sure the wireless station(s) uses the same SSID as the ZyXEL G-220F.<br>Make sure the wireless station(s) uses the same security option and/or WEP keys.<br>Verify that the wireless station(s) is not blocked in the **MAC Filter** screen. |

# Appendix A
# Product Specifications

| PHYSICAL SPECIFICATIONS | |
|---|---|
| **Product Name** | ZyXEL G-220F 802.11g Wireless USB Adapter |
| **Interface** | USB 2.0 compatible |
| **Standards** | IEEE 802.11b<br>IEEE 802.11g |
| **Network Architectures** | Infrastructure<br>Ad-Hoc |
| **Operating Frequencies** | 2.412-2.484GHz |
| **Operating Channels** | IEEE 802.11b: 11 Channels (North America)<br>IEEE 802.11g: 11 Channels (North America)<br>IEEE 802.11b: 13 Channels (Europe)<br>IEEE 802.11g: 13 Channels (Europe) |
| **Data Rate** | IEEE 802.11b: 11, 5.5, 2, 1Mbps<br>IEEE 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps |
| **Modulation** | IEEE 802.11g: Orthogonal Frequency Division Multiplexing (64QAM, 16QAM, QPSK and BPSK)<br>IEEE 802311b: PBCC, Direct Sequence Spread Spectrum (CCK, DQPSK, DBPSK). |
| **Security** | 64/128/256-bit WEP |
| **Operating Temperature** | 0 ~ 50 degrees Centigrade |
| **Storage Temperature** | -30 ~ 60 degrees Centigrade |
| **Operating Humidity** | 20 ~ 95% (non-condensing) |
| **Storage Humidity** | 20 ~ 95% (non-condensing) |
| **Power Consumption** | IEEE 802.11g: TX: 450mA RX: 345mA<br>IEEE 802.11b: TX: 450mA RX: 345mA |
| **Voltage** | 5V |
| **Weight** | 25.8 g |

| | |
|---|---|
| **Dimension** | (W) 95 mm × (D) 30 mm × (H) 16 mm |

| **RADIO SPECIFICATIONS** | |
|---|---|
| **Media Access Protocol** | IEEE 802.11 |
| **Frequency** | 2.4 ~ 2.484GHz (Industrial Scientific Medical Band) |
| **Channels** | 1~11 Channels (USA, Canada)<br>1~13 Channels (Europe) |
| **Data Rate** | 802.11g (OFDM): 6, 9, 12, 18, 24, 36, 48, 54 Mbps<br>802.11b: 1, 2, 5.5, 11 Mbps |
| **Modulation** | 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps (OFDM)<br>802.11b: 11, 5.5 Mbps (CCK), 2 Mbps (DQPSK), 1 Mbps (DBPSK) |
| **Output Power** | 17 dBm (typical) at 11Mbps CCK, QPSK, BPSK<br>15 dBm (typical) at 54Mbps OFDM |
| **RX Sensitivity** | 802.11g (OFDM): 54 Mbps: < -72 dBm<br>802.11b (CCK): 11 Mbps: < -85 dBm |

| **SOFTWARE SPECIFICATIONS** | |
|---|---|
| **Device Drivers** | Microsoft Windows 98 Second Edition, Windows ME, Windows 2000, Windows XP |
| **Roaming** | IEEE 802.11b/g compliant |
| **WEP** | Supports 64-bit, 128-bit and 256-bit WEP encryption |

| **ENVIRONMENTAL SPECIFICATIONS** | |
|---|---|
| **Temperature** | Operating: 0° ~ 50° C<br>Storage: -30° ~ 60° C |
| **Relative Humidity** | 20% to 95% (non-condensing) |

# Appendix B
# Setting up Your Computer's IP Address

All computers must have a 10M or 100M Ethernet adapter card and TCP/IP installed.

Windows 95/98/Me/NT/2000/XP, Macintosh OS 7 and later operating systems and all versions of UNIX/LINUX include the software components you need to install and use TCP/IP on your computer. Windows 3.1 requires the purchase of a third-party TCP/IP application package.

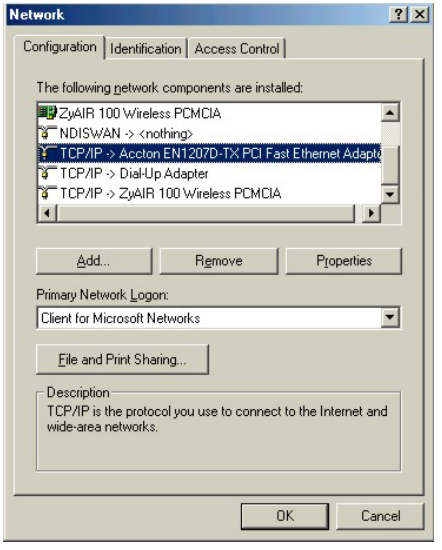
TCP/IP should already be installed on computers using Windows NT/2000/XP, Macintosh OS 7 and later operating systems.

After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

If you manually assign IP information instead of using dynamic assignment, make sure that your computers have IP addresses that place them in the same subnet as the ZyXEL G-220F.

### Windows 95/98/Me

Click **Start**, **Settings**, **Control Panel** and double-click the **Network** icon to open the **Network** window.




The **Network** window **Configuration** tab displays a list of installed components. You need a network adapter, the TCP/IP protocol and Client for Microsoft Networks.

If you need the adapter:

a. In the **Network** window, click **Add**.

b. Select **Adapter** and then click **Add**.

c. Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

a. In the **Network** window, click **Add**.

b. Select **Protocol** and then click **Add**.

c. Select **Microsoft** from the list of **manufacturers**.

d. Select **TCP/IP** from the list of network protocols and then click **OK**.

If you need Client for Microsoft Networks:

a. Click **Add**.

b. Select **Client** and then click **Add**.

c. Select **Microsoft** from the list of manufacturers.

d. Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.

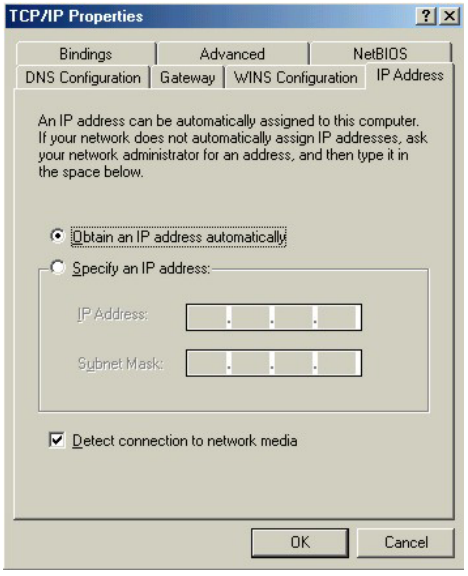
e. Restart your computer so the changes you made take effect.

In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**.

1. Click the **IP Address** tab.

   -If your IP address is dynamic, select **Obtain an IP address automatically**.

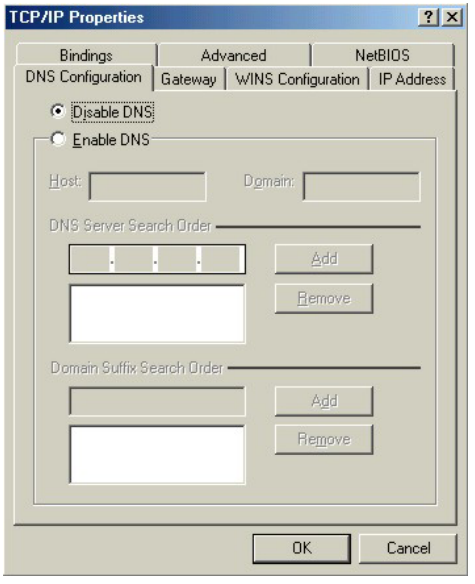
   -If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.




2. Click the **DNS** Configuration tab.

   -If you do not know your DNS information, select **Disable DNS**.

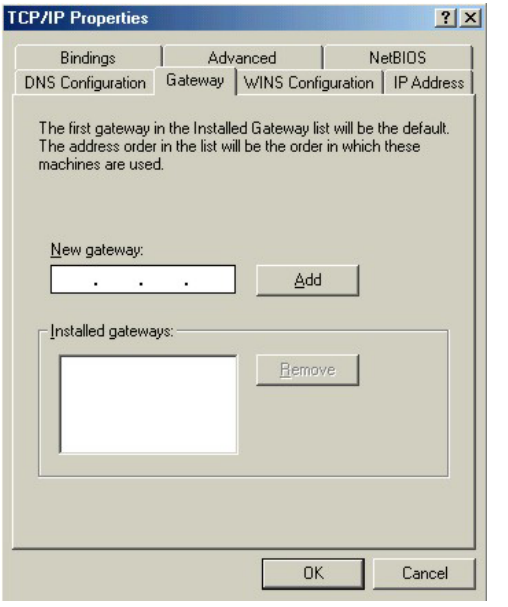
   -If you know your DNS information, select **Enable DNS** and type the information in the fields below (you may not need to fill them all in).



3. Click the **Gateway** tab.

   -If you do not know your gateway's IP address, remove previously installed gateways.

   -If you have a gateway IP address, type it in the **New gateway field** and click **Add**.




4. Click **OK** to save and close the **TCP/IP Properties** window.
5. Click **OK** to close the **Network** window. Insert the Windows CD if prompted.
6. Restart your computer when prompted.

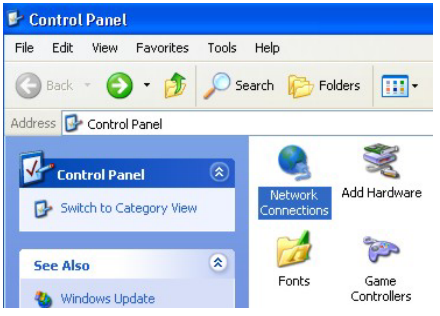
*Verifying Your Computer's IP Address*

1. Click **Start** and then **Run**.
2. In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.
3. Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

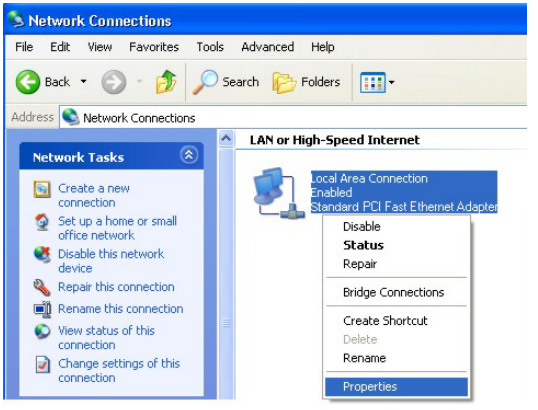
**Windows 2000/NT/XP**

1. For Windows XP, click **start**, **Control Panel**. In Windows 2000/NT, click **Start**, **Settings**, **Control Panel**.

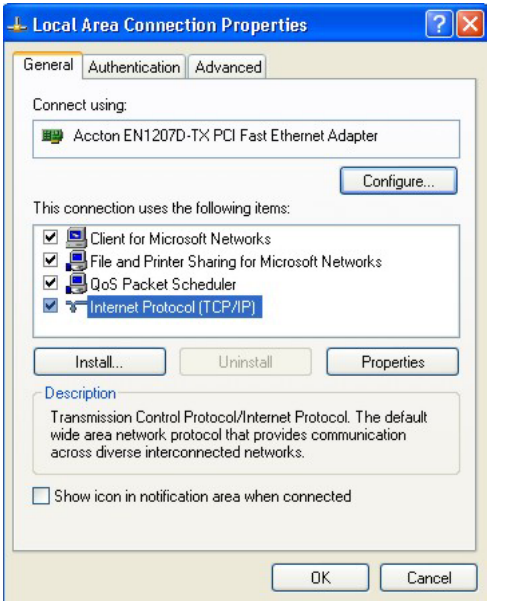

2. For Windows XP, click **Network Connections**. For Windows 2000/NT, click **Network and Dial-up Connections**.




3. Right-click **Local Area Connection** and then click **Properties**.



4. Select **Internet Protocol (TCP/IP)** (under the **General** tab in Win XP) and click **Properties**.

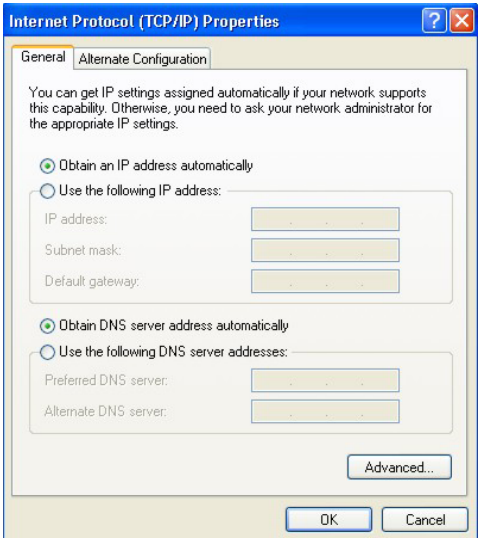



5. The **Internet Protocol TCP/IP Properties** window opens (the **General tab** in Windows XP).

   -If you have a dynamic IP address click **Obtain an IP address automatically**.

   -If you have a static IP address click **Use the following IP Address** and fill in the **IP address**, **Subnet mask**, and **Default gateway** fields.

   Click **Advanced**.



6. -If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Setting**s tab and click **OK**.

   Do one or more of the following if you want to configure additional IP addresses:

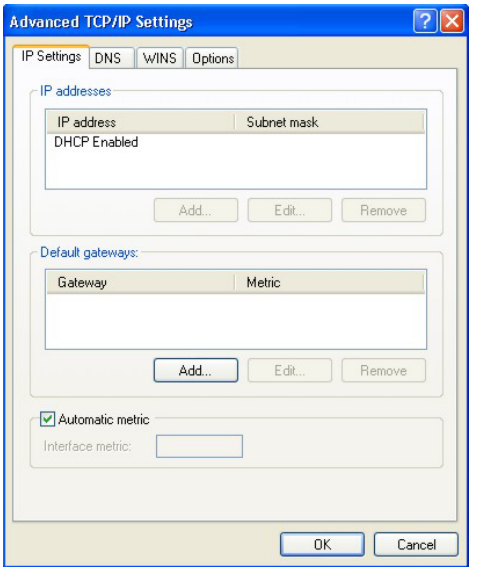
   -In the **IP Settings** tab, in IP addresses, click **Add**.

   -In **TCP/IP Address**, type an IP address in **IP address** and a subnet mask in **Subnet mask**, and then click **Add**.

   -Repeat the above two steps for each IP address you want to add.

   -Configure additional default gateways in the **IP Settings** tab by clicking **Add** in **Default gateways**.

   -In **TCP/IP Gateway Address**, type the IP address of the default gateway in **Gateway**. To manually configure a default metric (the number of transmission hops), clear the **Automatic metric** check box and type a metric in **Metric**.




   -Click **Add**.

   -Repeat the previous three steps for each default gateway you want to add.

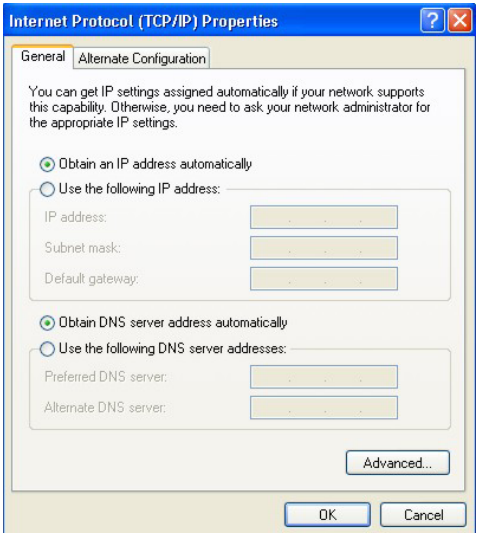
   -Click **OK** when finished.

7. In the **Internet Protocol TCP/IP Properties** window (the **General tab** in Windows XP):

   -Click **Obtain DNS server address automatically** if you do not know your DNS server IP address(es).

   -If you know your DNS server IP address(es), click **Use the following DNS server addresses**, and type them in the **Preferred DNS server** and **Alternate DNS server** fields.

   If you have previously configured DNS servers, click **Advanced** and then the **DNS** tab to order them.



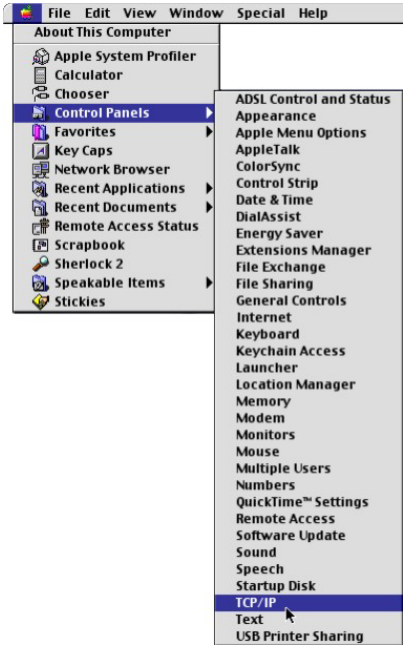

8. Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.
9. Click **OK** to close the **Local Area Connection Properties** window.
10. Restart your computer (if prompted).

*Verifying Your Computer's IP Address*

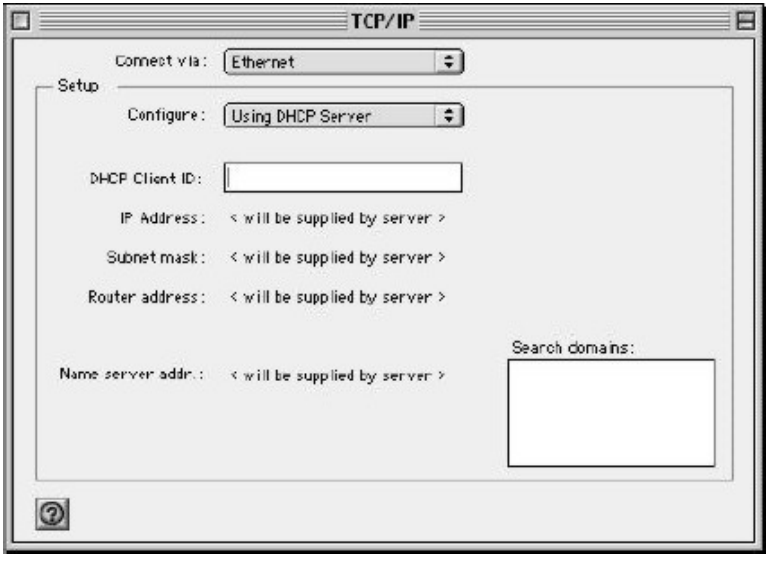
1. Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.
2. In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

**Macintosh OS 8/9**

1. Click the **Apple** menu, **Control Panel** and double-click **TCP/IP** to open the **TCP/IP Control Panel**.




2. Select **Ethernet** from the **Connect via** list.




3. For dynamically assigned settings, select **Using DHCP Server** from the **Configure:** list.

4. For statically assigned settings, do the following:

   -From the **Configure** box, select **Manually**.

   -Type your IP address in the **IP Address** box.

   -Type your subnet mask in the **Subnet mask** box.

   -Type the IP address of your ZyXEL G-220F in the **Router address** box.

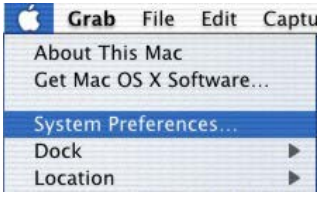
5. Close the **TCP/IP Control Panel**.
6. Click **Save** if prompted, to save changes to your configuration.
7. Restart your computer (if prompted).

*Verifying Your Computer's IP Address*

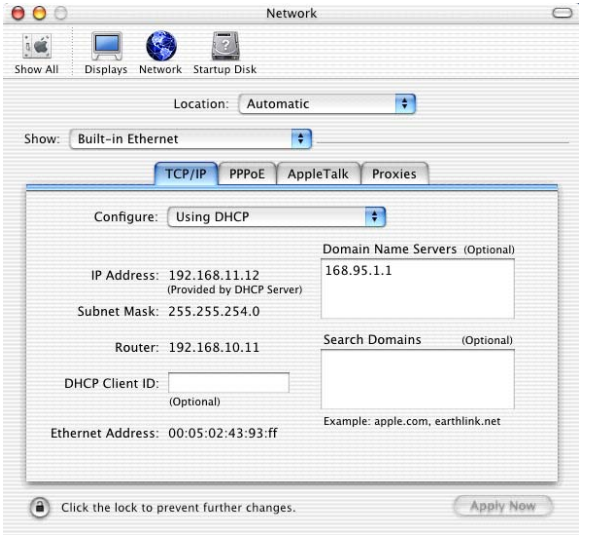
Check your TCP/IP properties in the **TCP/IP Control Panel** window.

### Macintosh OS X

1. Click the **Apple** menu, and click **System Preferences** to open the **System Preferences** window.




2. Click **Network** in the icon bar.
   - Select **Automatic** from the **Location** list.
   - Select **Built-in Ethernet** from the **Show** list.
   - Click the **TCP/IP** tab.



3. For dynamically assigned settings, select **Using DHCP** from the **Configure** list.
4. For statically assigned settings, do the following:
   -From the **Configure** box, select **Manually**.
   -Type your IP address in the **IP Address** box.
   -Type your subnet mask in the **Subnet mask** box.
   -Type the IP address of your ZyXEL G-220F in the **Router address** box.
5. Click **Apply Now** and close the window.
6. Restart your computer (if prompted).

*Verifying Your Computer's IP Address*

Check your TCP/IP properties in the **Network** window.

# Appendix C
# Access Point Mode Setup Example

This example uses the network sharing feature in Windows 2000 to bridge the wired and wireless network when you set the ZyXEL G-220F in access point (AP) mode.

Refer to *Section 4.1.1* for setup methods and requirements.

Steps may vary depending on your Windows version. You may need to install additional software in Windows 98 Second Edition and Windows ME.

### Configuring the Computer on Which You Install the ZyXEL G-220F

**Step 1.** Refer to *Section 1.6.1* to set the ZyXEL G-220F to operate in AP mode.

**Step 2.** Click **Start**, **Settings**, **Network and Dial-up Connections** (or click **Start**, **Settings**, **Control Panel** and double-click **Network and Dial-up Connections**).

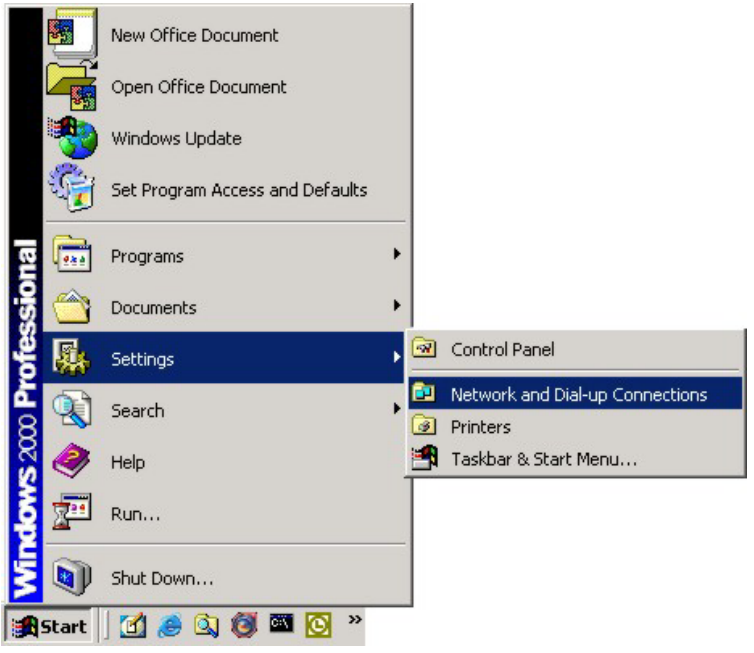



**Diagram 1 Windows 2000: Start**

**Step 3.** Right-click on the icon for your wired Ethernet adapter and click **Properties**.

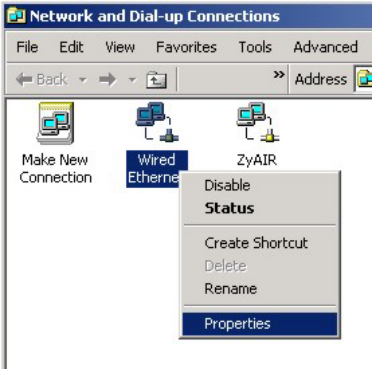



**Diagram 2 Windows 2000: Network and Dial-up Connections**

**Step 4.** A Properties screen displays. Click the **Sharing** tab and select **Enable Internet Connection Sharing for this connection**. Click **OK**.

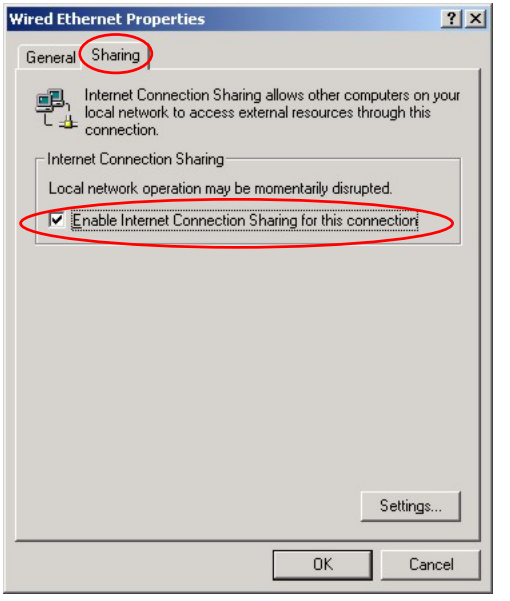



**Diagram 3 Windows 2000: Network Properties**

**Step 5.** A notice screen displays. Click **Yes**.


**Diagram 4 Windows 2000: Local Network**

### Configuring the Wireless Station Computer

Refer to the *Setting Up Your Computer's IP Address* appendix to set up the wireless station computer(s) IP address.

# Appendix D
# Disable Windows XP Wireless LAN Configuration Tool

Windows XP includes a configuration tool (also known as Wireless Zero Configuration (WZC)) for wireless devices.

Follow the steps below to disable the configuration tool in Windows XP after you install the ZyXEL Utility. The screen varies depending on the version of Windows XP service pack.

### Via the Wireless Network System Tray Icon

If the network icon for wireless connections is not present in the system tray, see the next section.

**Step 1.** Double-click the network icon for wireless connections in the system tray.

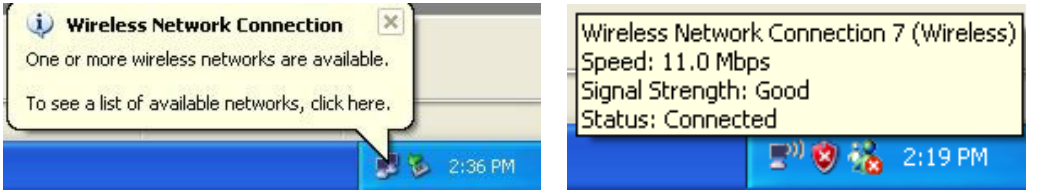



**Diagram 5 Windows XP: System Tray Icon**

**Step 2.** Windows XP SP1: When a **Wireless Network Connection** window displays, click **Advanced…**.

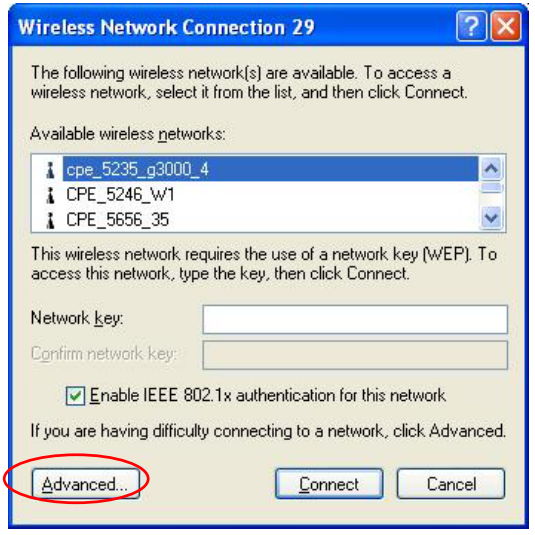



**Diagram 6 Windows XP SP1: Wireless Network Connection**

Windows XP SP2: When a **Wireless Network Connection** window displays, click **Change advanced settings** under **Related Tasks** and then the **Wireless Networks** tab.

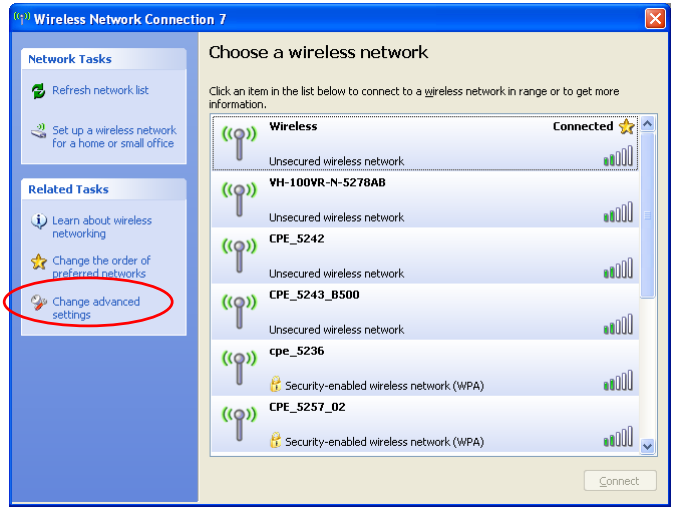



**Diagram 7 Windows XP SP2: Wireless Network Connection**

**Step 3.** In the **Wireless Network Connection Properties** window, make sure the **Use Windows to configure my wireless network settings** check box is *not* selected. Click **OK**.

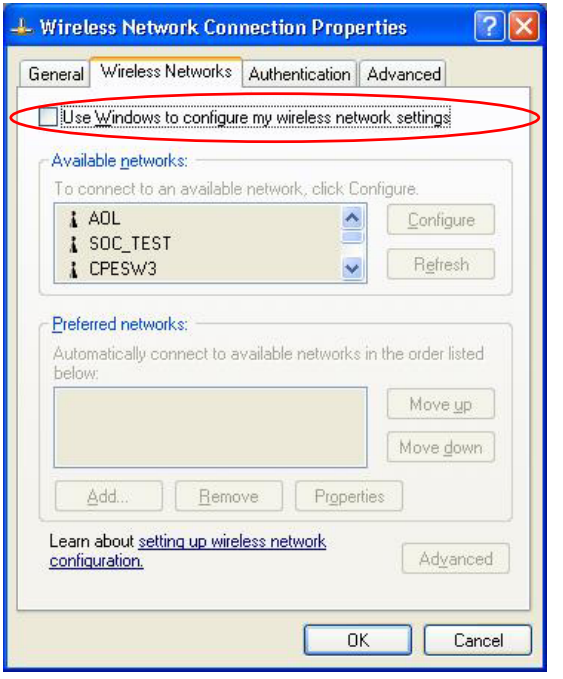



**Diagram 8 Windows XP SP1: Wireless Network Connection Properties**

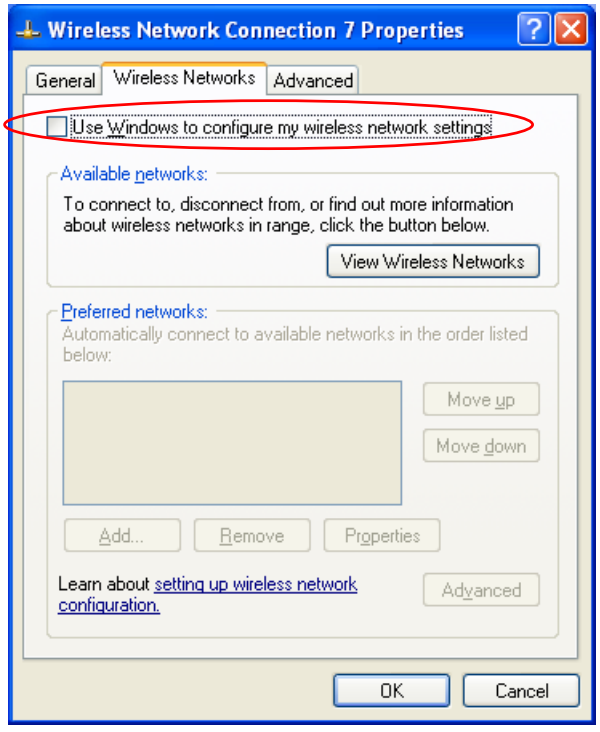



**Diagram 9 Windows XP SP2: Wireless Network Connection Properties**

### Via the Control Panel

**Step 1.** If the icon for the wireless network connection is not in the system tray, click **Start**, **Control Panel** and double-click **Network Connections**.

**Step 4.** Double-click on the icon for wireless network connection to display a status window as shown next.

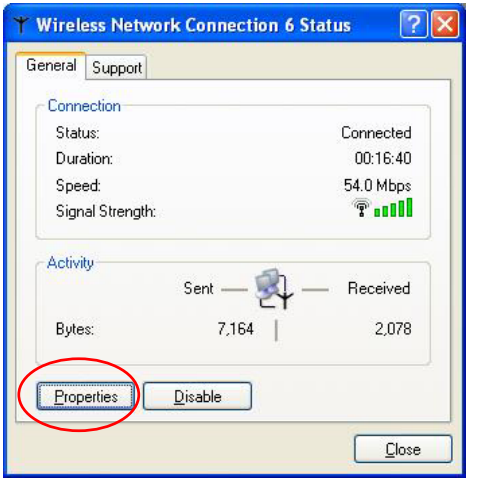



**Diagram 10 Windows XP SP1: Wireless Network Connection Status**

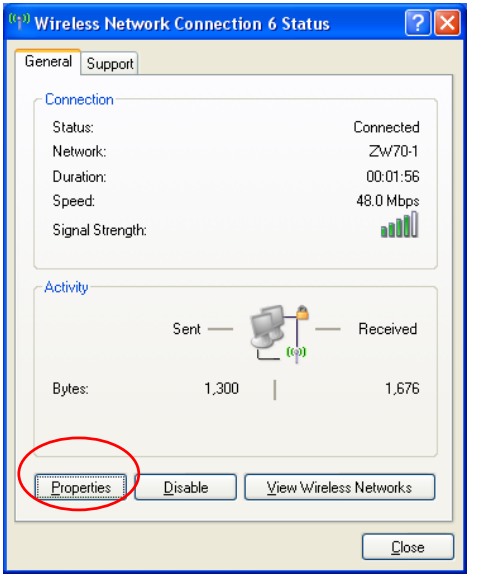



**Diagram 11 Windows XP SP2: Wireless Network Connection Status**

**Step 5.** Click **Properties** and click the **Wireless Networks** tab.

**Step 6.** In the **Wireless Network Connection Properties** window, make sure the **Use Windows to configure my wireless network settings** check box is *not* selected. Click **OK**.

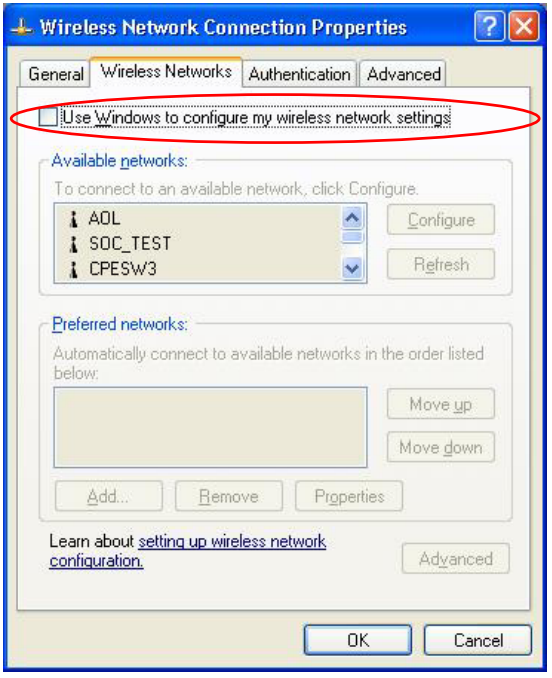



**Diagram 12 Windows XP SP1: Wireless Network Connection Properties**

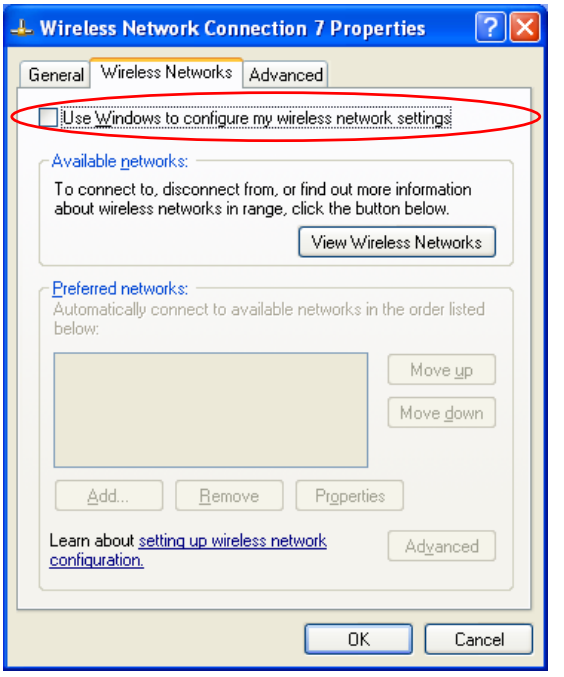



**Diagram 13 Windows XP SP2: Wireless Network Connection Properties**

# Appendix E
# Management with Wireless Zero Configuration

*This appendix shows you how to manage your ZYXEL G-220F using the Windows XP wireless configuration tool.*

Be sure you have the Windows XP service pack 2 installed on your computer. Otherwise, you should at least have the Windows XP service pack 1 already on your computer and download the support patch for WPA from the Microsoft web site.

Windows XP SP2 screen shots are shown unless otherwise specified. Click the help icon ( ) in most screens, move the cursor to the item that you want the information about and click to view the help.

## Activating Wireless Zero Configuration

Make sure the **Use Windows to configure my wireless network settings** check box is selected in the **Wireless Network Connection Properties** screen. Refer to *Appendix D*.

If you see the following screen, refer to article 871122 on the Microsoft web site for information on starting WZC.

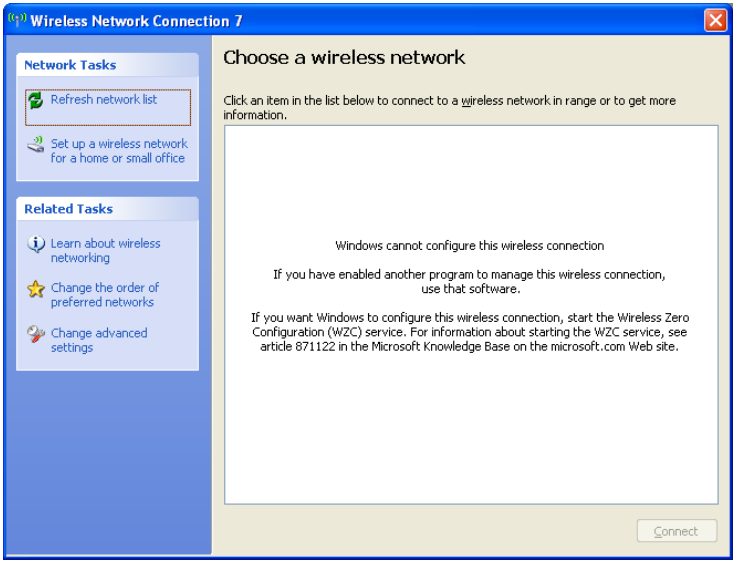



**Diagram 14 Windows XP SP2: WZC Not Available**

### Connecting to a Wireless Network

**Step 1.** Double-click the network icon for wireless connections in the system tray to open the **Wireless Network Connection Status** screen.


**Diagram 15 Windows XP SP2: System Tray Icon**

The type of the wireless network icon in Windows XP SP2 indicates the status of the ZyXEL G-220F. Refer to the following table for details.

**Chart 1 Windows XP SP2: System Tray Icon**

| ICON | DESCRIPTION |
|---|---|
|  | The ZyXEL G-220F is connected to a wireless network. |
|  | The ZyXEL G-220F is in the process of connecting to a wireless network. |
|  | The connection to a wireless network is limited because the network did not assign a network address to the computer. |
|  | The ZyXEL G-220F is not connected to a wireless network. |

**Step 2.** Windows XP SP2: In the **Wireless Network Connection Status** screen, click **View Wireless Networks** to open the **Wireless Network Connection** screen.

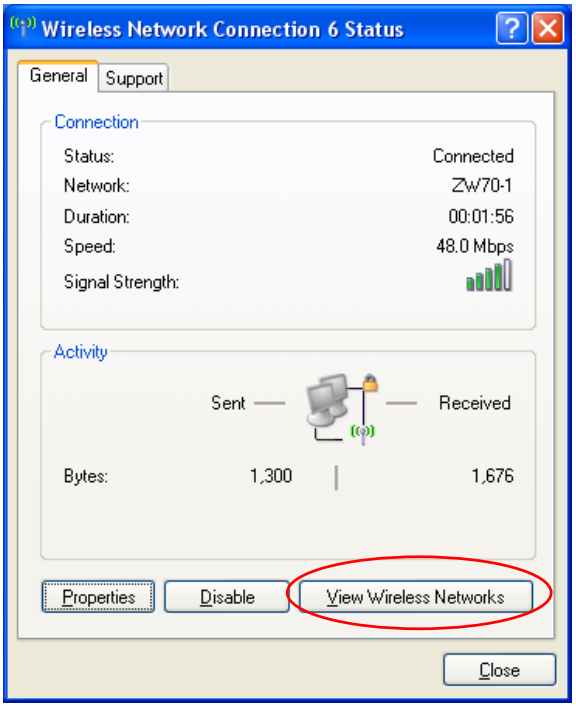



**Diagram 16 Windows XP SP2: Wireless Network Connection Status**

Windows XP SP1: In the **Wireless Network Connection Status** screen, click **Properties** and the **Wireless Networks** tab to open the **Wireless Network Connection Properties** screen.

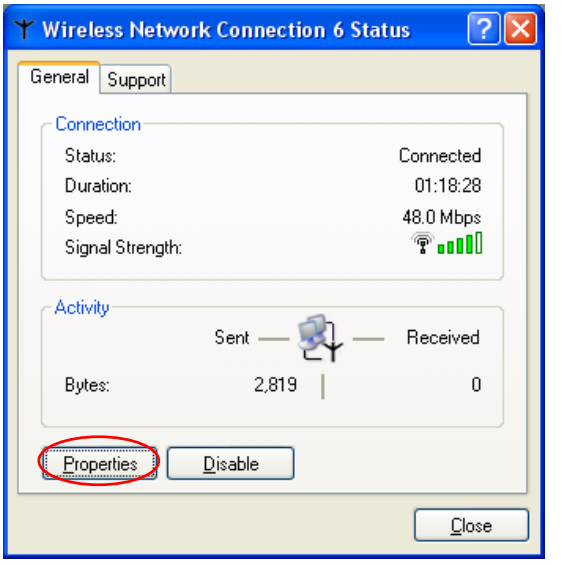



**Diagram 17 Windows XP SP1: Wireless Network Connection Status**

**Step 3.** Windows XP SP2: Click **Refresh network list** to reload and search for available wireless devices within transmission range. Select a wireless network in the list and click **Connect** to join the selected wireless network.

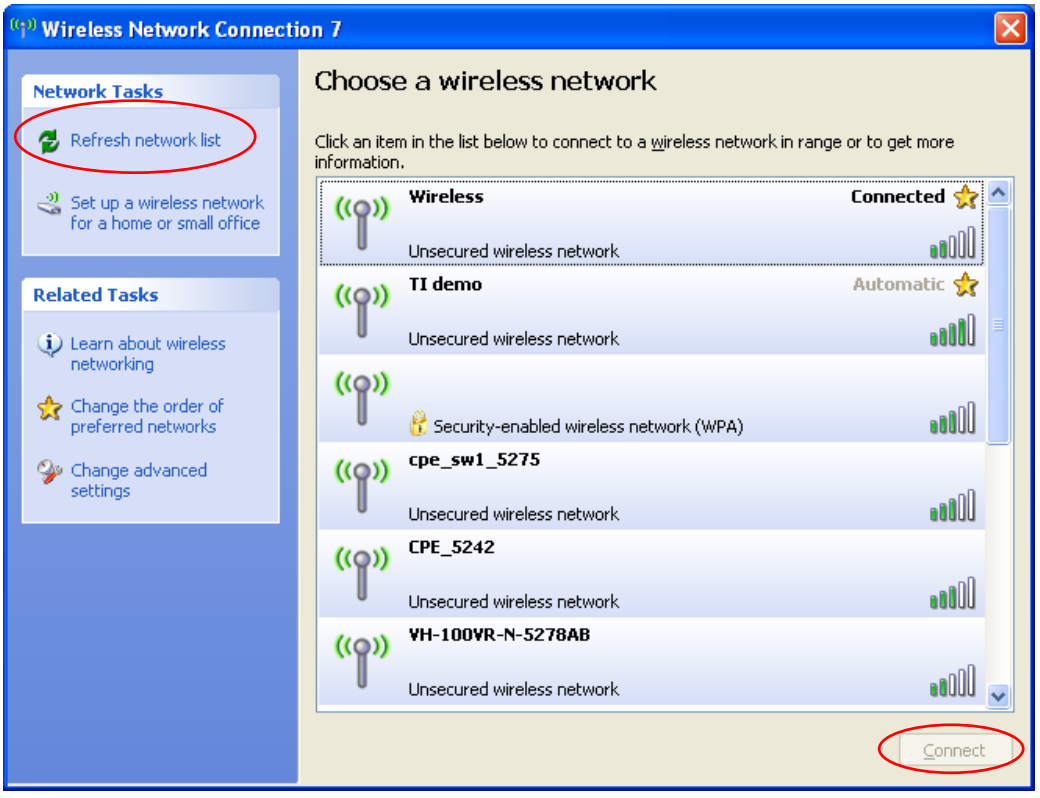



**Diagram 18 Windows XP SP2: Wireless Network Connection**

The following table describes the icons in the wireless network list.

**Chart 2 Windows XP SP2: Wireless Network Connection**

| ICON | DESCRIPTION |
|---|---|
|  | This denotes that the wireless security is activated for the wireless network. |
|  | This denotes that this wireless network is your preferred network. Ordering your preferred networks is important because the ZyXEL G-220F tries to associate to the preferred network first in the order that you specify. Refer to the section on security settings for detailed information. |
|  | This denotes the signal strength of the wireless network.<br>Move your cursor to the icon to see details on the signal strength. |

Windows XP SP1: Click **Refresh** to reload and search for available wireless devices within transmission range. Select a wireless network in the **Available networks** list, click **Configure** and set the related fields to the same security settings as the associated AP to add the selected network into the **Preferred networks** table. Click **OK** to join the selected wireless network. Refer to the section on security settings (discussed later) for more information.

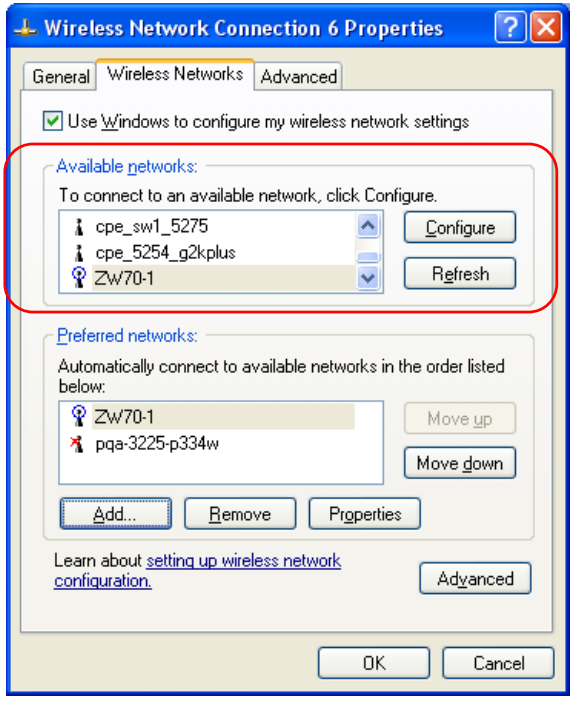



**Diagram 19 Windows XP SP1: Wireless Network Connection Properties**

**Step 4.** Windows XP SP2: If the wireless security is activated for the selected wireless network, the **Wireless Network Connection** screen displays. You must set the related fields in the **Wireless Network Connection** screen to the same security settings as the associated AP. Refer to the section on security settings (discussed later) for more information. Otherwise click **Cancel** and connect to another wireless network without data encryption. If there is no security activated for the selected wireless network, a warning screen appears. Click **Connect Anyway** if wireless security is not your concern.

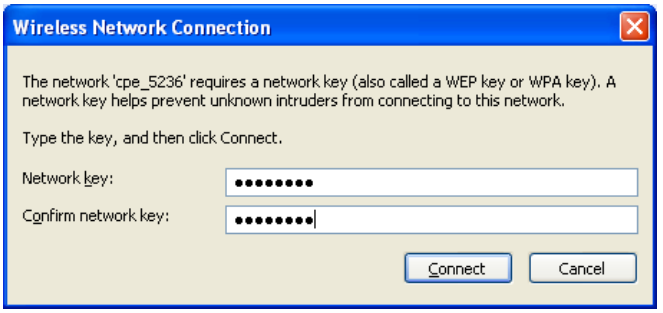



**Diagram 20 Windows XP SP2: Wireless Network Connection: WEP or WPA-PSK**

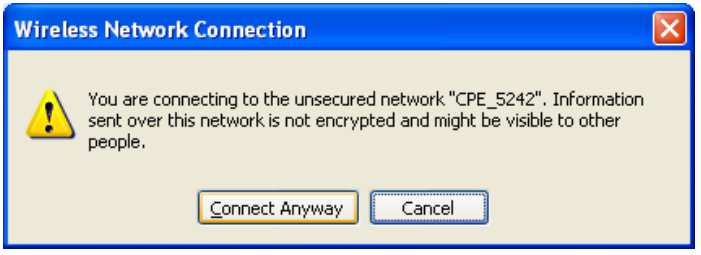



**Diagram 21 Windows XP SP2: Wireless Network Connection: No Security**

**Step 5.** Verify that you have successfully connected to the selected network and check connection status in the wireless network list or the connection icon in the **Preferred networks** or **Available networks** list.

The following table describes the connection icons.

**Chart 3 Windows XP: Wireless Networks**

| ICON | DESCRIPTION |
|---|---|
|  | This denotes the wireless network is an available wireless network. |
|  | This denotes the ZyXEL G-220F is associated to the wireless network. |
|  | This denotes the wireless network is not available. |

### Security Settings

When you configure the ZyXEL G-220F to connect to a secure network but the security settings are not yet enabled on the ZyXEL G-220F, you will see different screens according to the authentication and encryption methods used by the selected network.

### Association

Select a network in the **Preferred networks** list and click **Properties** to view or configure security.

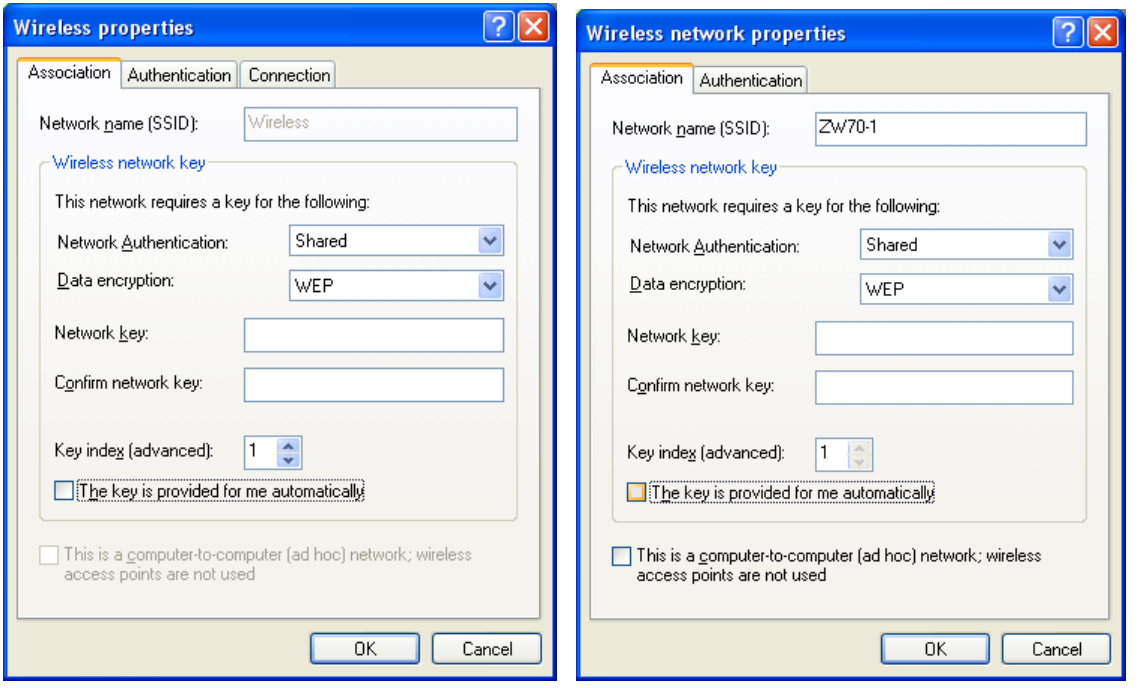



**Diagram 22 Windows XP: Wireless (network) properties: Association**

The following table describes the labels in this screen.

**Chart 4 Windows XP: Wireless (network) properties: Association**

| LABEL | DESCRIPTION |
|---|---|
| Network name (SSID) | This field displays the SSID (Service Set IDentifier) of each wireless network. |
| Network Authentication | This field automatically shows the authentication method (**Share**, **Open**, **WPA** or **WPA-PSK**) used by the selected network.<br>Refer to *Section 2.5* for more information. |
| Data Encryption | This field automatically shows the encryption type (**TKIP**, **WEP** or **Disable**) used by the selected network. |

**Chart 4 Windows XP: Wireless (network) properties: Association**

| LABEL | DESCRIPTION |
|---|---|
| Network Key | Enter the passphrase, pre-shared key or WEP key.<br>The values for the keys must be set up exactly the same on all wireless devices in the same wireless LAN. |
| Confirm network key | Enter the key again for confirmation. |
| Key index (advanced) | Select a default WEP key to use for data encryption.<br>This field is available only when the network use **WEP** encryption method and the **The key is provided for me automatically** check box is not selected. |
| The key is provided for me automatically | If this check box is selected, the wireless AP assigns the ZyXEL G-220F a key. |
| This is a computer-to-computer (ad hoc) network; wireless access points are not used | If this check box is selected, you are connecting to another computer directly. |
| OK | Click **OK** to save your changes. |
| Cancel | Click **Cancel** to leave this screen without saving any changes you may have made. |

### Authentication

Click the **Authentication** tab in the **Wireless (network) properties** screen to display the screen shown next. The fields on this screen are grayed out when the network is in Ad-Hoc mode or data encryption is disabled.

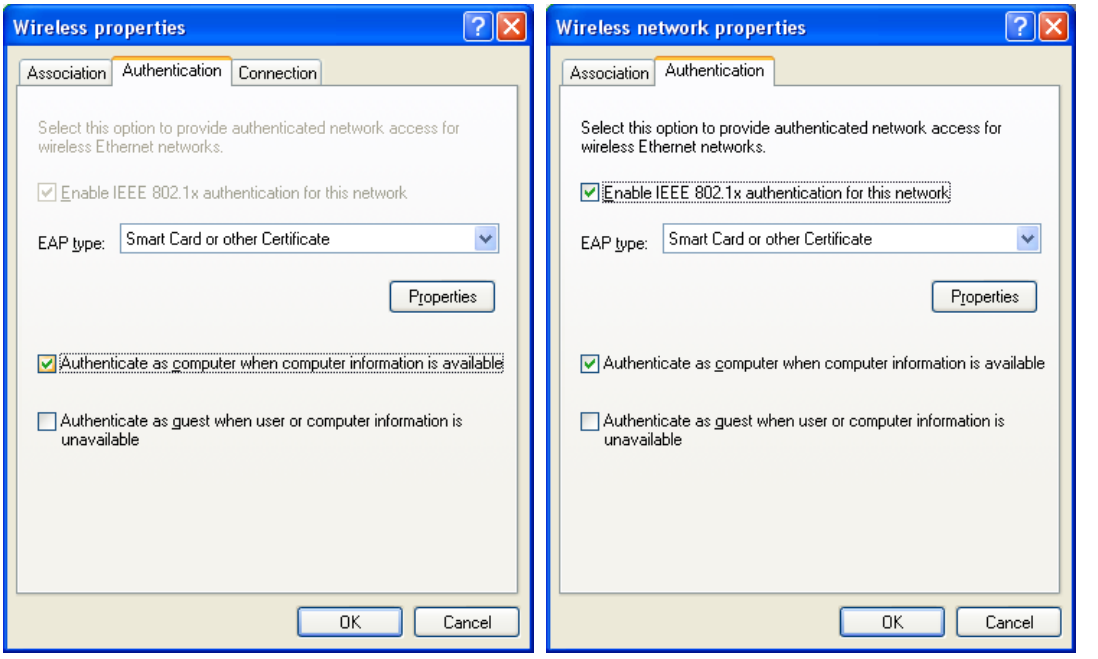



**Diagram 23 Windows XP: Wireless (network) properties: Authentication**

The following table describes the labels in this screen.

**Chart 5 Windows XP: Wireless (network) properties: Authentication**

| LABEL | DESCRIPTION |
|---|---|
| Enable IEEE 802.1x authentication for this network | This field displays whether the IEEE 802.1x authentication is active.<br>If the network authentication is set to **Open** in the previous screen, you can choose to disable or enable this feature. |
| EAP Type | Select the type of EAP authentication. Options are **Protected EAP (PEAP)** and **Smart Card or other Certificate**. |
| Properties | Click this button to open the properties screen and configure certificates. The screen varies depending on what you select in the **EAP type** field. |
| Authenticate as computer when computer information is available | Select this check box to have the computer send its information to the network for authentication when a user is not logged on. |

**Chart 5 Windows XP: Wireless (network) properties: Authentication**

| LABEL | DESCRIPTION |
|---|---|
| Authenticate as guest when user or computer information is unavailable | Select this check box to have the computer access to the network as a guest when a user is not logged on or computer information is not available. |
| OK | Click **OK** to save your changes. |
| Cancel | Click **Cancel** to close this screen without saving any changes you may have made. |

### Authentication Properties

Select an EAP authentication type in the **Wireless (network) properties: Authentication** screen and click the **Properties** button to display the following screen.

*Protected EAP Properties*

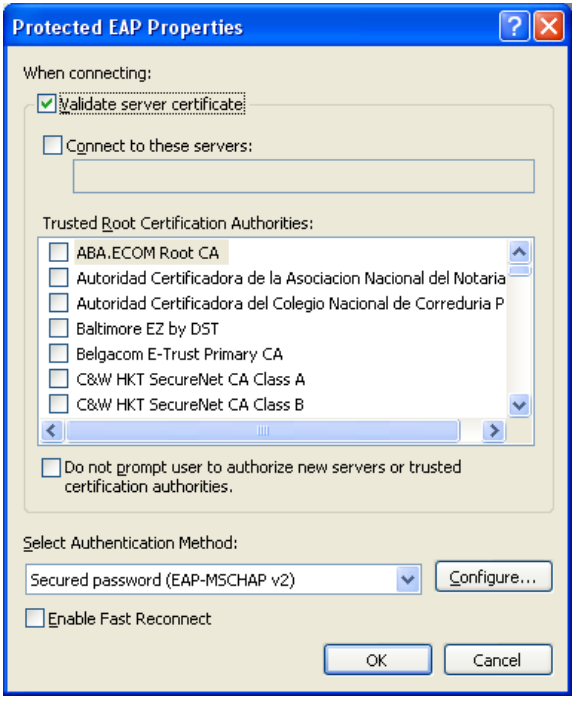



**Diagram 24 Windows XP: Protcted EAP Properties**

The following table describes the labels in this screen.

**Chart 6 Windows XP: Protected EAP Properties**

| LABEL | DESCRIPTION |
|---|---|
| Validate server certificate | Select the check box to verify the certificate of the authentication server. |
| Connect to these servers | Select the check box and specify a domain in the field below to have your computer connect to a server which resides only within this domain. |
| Trusted Root Certification Authorities: | Select a trusted certification authority from the list below.<br>**You must first have a wired connection to a network and obtain the certificate(s) from a certificate authority (CA). Consult your network administrator for more information.** |
| Do not prompt user to authorize new server or trusted certification authorities. | Select this check box to authorize a new authentication server or trusted CA without prompting.<br>This field is available only if you installed the Windows XP server pack 2. |
| Select Authentication Method: | Select an authentication method from the drop-down list box and click **Configure** to do settings. |
| Enable Fast Reconnect | Select the check box to automatically reconnect to the network (without re-authentication) if the wireless connection goes down. |
| OK | Click **OK** to save your changes. |
| Cancel | Click **Cancel** to leave this screen without saving any changes you may have made. |

*Smart Card or other Certificate Properties*

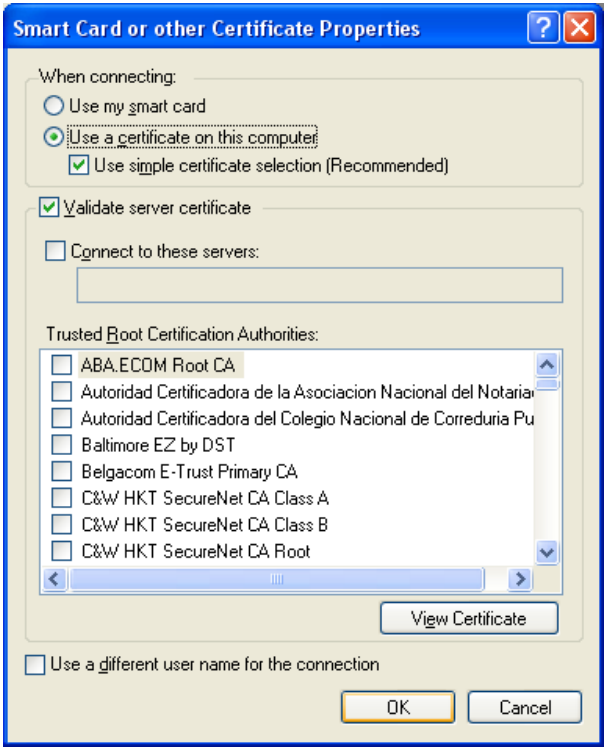



**Diagram 25 Windows XP: Smart Card or other Certificate Properties**

The following table describes the labels in this screen.

**Chart 7 Windows XP: Smart Card or other Certificate Properties**

| LABEL | DESCRIPTION |
|---|---|
| Use my smart card | Select this check box to use the smart card for authentication. |
| Use a certificate on this computer | Select this check box to use a certificate on your computer for authentication. |
| Validate server certificate | Select the check box to check the certificate of the authentication server. |
| Connect to these servers | Select the check box and specify a domain in the field below to have your computer connect to a server which resides only within this domain. |

**Chart 7 Windows XP: Smart Card or other Certificate Properties**

| LABEL | DESCRIPTION |
|---|---|
| Trusted Root Certification Authorities: | Select a trusted certification authority from the list below.<br>**You must first have a wired connection to a network and obtain the certificate(s) from a certificate authority (CA). Consult your network administrator for more information.** |
| View Certificate | Click this button if you want to verify the selected certificate. |
| Use a different user name for the connection: | Select the check box to use a different user name when the user name in the smart card or certificate is not the same as the user name in the domain that you are logged on to. |
| OK | Click **OK** to save your changes. |
| Cancel | Click **Cancel** to leave this screen without saving any changes you may have made. |

### Ordering the Preferred Networks

Follow the steps below to manage your preferred networks.

**Step 1.** Windows XP SP2: Click **Change the order of preferred networks** in the **Wireless Network Connection** screen (see *Diagram 18*)The screen displays as shown.

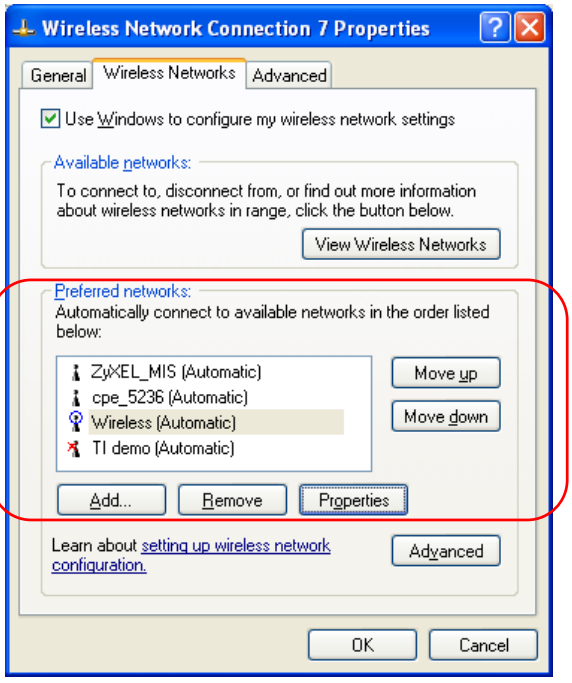



**Diagram 26 Windows XP SP2: Wireless Networks: Preferred Networks**

Windows XP SP1: In the **Wireless Network Connection Status** screen, click **Properties** and the **Wireless Networks** tab to open the screen as shown.

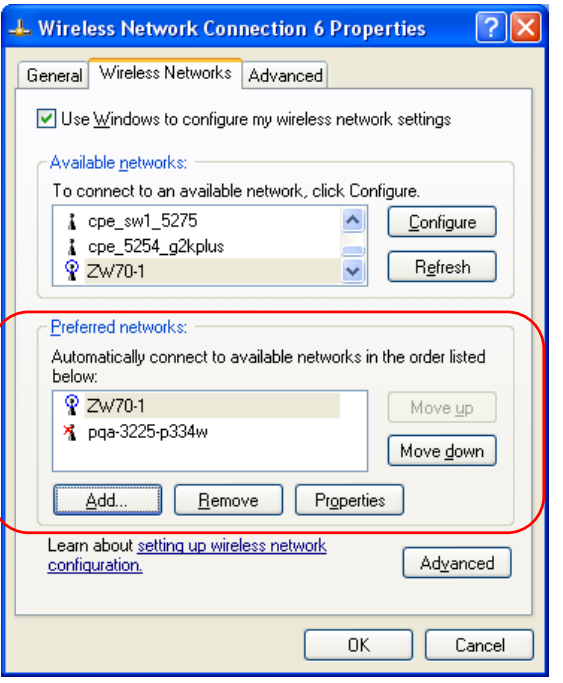



**Diagram 27 Windows XP SP1: Wireless Networks: Preferred Networks**

**Step 2.** Whenever the ZyXEL G-220F tries to connect to a new network, the new network is added in the **Preferred networks** table automatically. Select a network and click **Move up** or **Move down** to change it's order, click **Remove** to delete it or click **Properties** to view the security, authentication or connection information of the selected network. Click **Add** to add a preferred network into the list manually.

# Appendix F
# Types of EAP Authentication

This appendix discusses the five popular EAP authentication types: **EAP-MD5**, **EAP-TLS**, **EAP-TTLS**, **PEAP** and **LEAP**. The type of authentication you use depends on the RADIUS server. Consult your network administrator for more information.

### EAP-MD5 (Message-Digest Algorithm 5)

MD5 authentication is the simplest one-way authentication method. The authentication server sends a challenge to the wireless station. The wireless station 'proves' that it knows the password by encrypting the password with the challenge and sends back the information. Password is not sent in plain text.

However, MD5 authentication has some weaknesses. Since the authentication server needs to get the plaintext passwords, the passwords must be stored. Thus someone other than the authentication server may access the password file. In addition, it is possible to impersonate an authentication server as MD5 authentication method does not perform mutual authentication. Finally, MD5 authentication method does not support data encryption with dynamic session key. You must configure WEP encryption keys for data encryption.

### EAP-TLS (Transport Layer Security)

With EAP-TLS, digital certifications are needed by both the server and the wireless stations for mutual authentication. The server presents a certificate to the client. After validating the identity of the server, the client sends a different certificate to the server. The exchange of certificates is done in the open before a secured tunnel is created. This makes user identity vulnerable to passive attacks. A digital certificate is an electronic ID card that authenticates the sender's identity. However, to implement EAP-TLS, you need a Certificate Authority (CA) to handle certificates, which imposes a management overhead.

### EAP-TTLS (Tunneled Transport Layer Service)

EAP-TTLS is an extension of the EAP-TLS authentication that uses certificates for only the server-side authentications to establish a secure connection. Client authentication is then done by sending username and password through the secure connection, thus client identity is protected. For client authentication, EAP-TTLS supports EAP methods and legacy authentication methods such as PAP, CHAP, MS-CHAP and MS-CHAP v2.

### PEAP (Protected EAP)

Like EAP-TTLS, server-side certificate authentication is used to establish a secure connection, then use simple username and password methods through the secured connection to authenticate the clients, thus hiding client identity. However, PEAP only supports EAP methods, such as EAP-MD5, EAP-MSCHAPv2 and EAP-GTC (EAP-Generic Token Card), for client authentication. EAP-GTC is implemented only by Cisco.

### LEAP

LEAP (Lightweight Extensible Authentication Protocol) is a Cisco implementation of IEEE802.1x.

For added security, certificate-based authentications (EAP-TLS, EAP-TTLS and PEAP) use dynamic keys for data encryption. They are often deployed in corporate environments, but for public deployment, a simple user name and password pair is more practical. The following table is a comparison of the features of five authentication types.

**Comparison of EAP Authentication Types**

| | EAP-MD5 | EAP-TLS | EAP-TTLS | PEAP | LEAP |
|---|---|---|---|---|---|
| **Mutual Authentication** | No | Yes | Yes | Yes | Yes |
| **Certificate – Client** | No | Yes | Optional | Optional | No |
| **Certificate – Server** | No | Yes | Yes | Yes | No |
| **Dynamic Key Exchange** | No | Yes | Yes | Yes | Yes |
| **Credential Integrity** | None | Strong | Strong | Strong | Moderate |
| **Deployment Difficulty** | Easy | Hard | Moderate | Moderate | Moderate |
| **Client Identity Protection** | No | No | Yes | Yes | No |

# Appendix G Index

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