NWD310N

Wireless N PCI Adapter

User's Guide

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Edition 1

ZyXEL

www.zyxel.com

About This User's Guide

Intended Audience

This manual is intended for people who want to configure the NWD310N using the ZyXEL utility. You should have at least a basic knowledge of TCP/IP networking concepts and topology.

Related Documentation

- Quick Start Guide
  The Quick Start Guide is designed to help you get up and running right away. It contains information on setting up your network and configuring for Internet access.
- Online Help
  Embedded web help for descriptions of individual screens and supplementary information.
- Supporting Disk
  Refer to the included CD for support documents.
- ZyXEL Web Site
  Please refer to www.zyxel.com for additional support documentation and product certifications.

User's Guide Feedback

Help us help you. Send all User's Guide-related comments, questions or suggestions for improvement to the following address, or use e-mail instead. Thank you!

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Document Conventions

Warnings and Notes

These are how warnings and notes are shown in this User's Guide.

Warnings tell you about things that could harm you or your NWD310N.

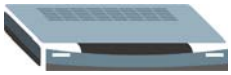
Notes tell you other important information (for example, other things you may need to configure or helpful tips) or recommendations.

Syntax Conventions

- The NWD310N may be referred to as the "NWD310N", the "device", the "system" or the "product" in this User's Guide.
- Product labels, screen names, field labels and field choices are all in **bold** font.
- A key stroke is denoted by square brackets and uppercase text, for example, [ENTER] means the "enter" or "return" key on your keyboard.
- "Enter" means for you to type one or more characters and then press the [ENTER] key. "Select" or "choose" means for you to use one of the predefined choices.
- A right angle bracket (>) within a screen name denotes a mouse click. For example, **Maintenance > Log > Log Setting** means you first click **Maintenance** in the navigation panel, then the **Log** sub menu and finally the **Log Setting** tab to get to that screen.
- Units of measurement may denote the "metric" value or the "scientific" value. For example, "k" for kilo may denote "1000" or "1024", "M" for mega may denote "1000000" or "1048576" and so on.
- "e.g.," is a shorthand for "for instance", and "i.e.," means "that is" or "in other words".

Icons Used in Figures

Figures in this User's Guide may use the following generic icons.

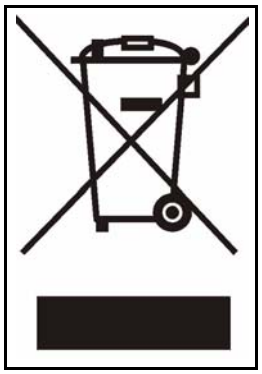
Wireless Access Point 	Computer 	Notebook computer 
Server 	Modem 	Telephone 
Internet 	Wireless Signal 	

Safety Warnings

For your safety, be sure to read and follow all warning notices and instructions.

- Do NOT use this product near water, for example, in a wet basement or near a swimming pool.
- Do NOT expose your device to dampness, dust or corrosive liquids.
- Do NOT store things on the device.
- Do NOT install, use, or service this device during a thunderstorm. There is a remote risk of electric shock from lightning.
- Connect ONLY suitable accessories to the device.
- Ground yourself (by properly using an anti-static wrist strap, for example) whenever working with the device's hardware or connections.
- ONLY qualified service personnel should service or disassemble this device.
- Antenna Warning! This device meets ETSI and FCC certification requirements when using the included antenna(s). Only use the included antenna(s).

This product is recyclable. Dispose of it properly.



Contents Overview

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PART I
Introduction and Configuration

1

Getting Started

This chapter introduces the NWD310N and prepares you to use the ZyXEL utility. The ZyXEL utility is a tool that helps you configure your NWD310N.

1.1 About Your NWD310N

Your NWD310N is an IEEE 802.11n draft 2.0 compliant wireless LAN adapter. It can also connect to IEEE 802.11b/g wireless networks. The NWD310N is WPS (Wi-Fi Protected Setup) compliant. WPS allows you to easily connect to another WPS-enabled device.

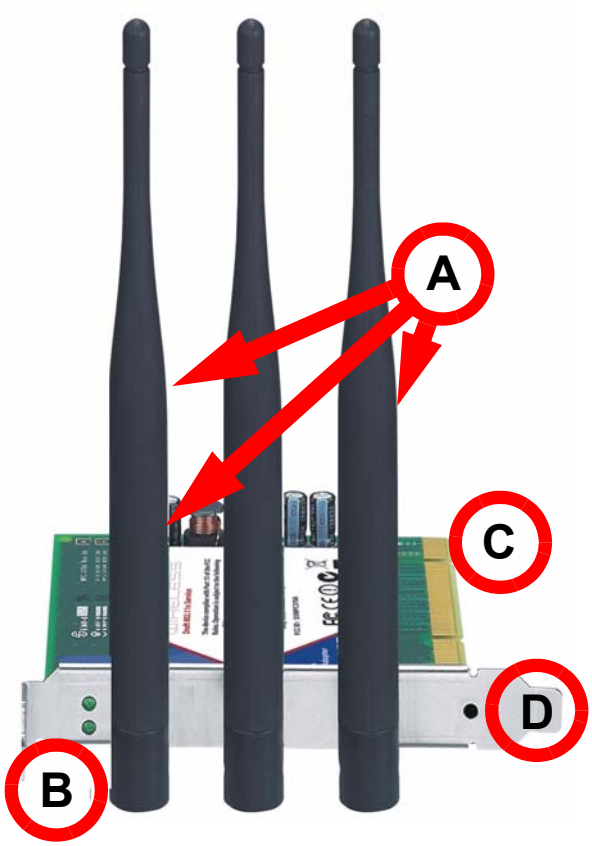
The NWD310N is a PCI adapter which occupies a PCI slot inside your desktop computer. The NWD310N also uses MIMO (Multiple-In, Multiple-Out) antenna technology to deliver high-speed wireless networking.

See your NWD310N's Quick Start Guide for installation instructions, and see the chapter on product specifications for detailed information.

1.1.1 Hardware

This section describes the NWD310N's physical appearance.

Figure 1 The NWD310N



The following table describes the NWD310N.

Table 1 NWD310N External View

LABEL	DESCRIPTION
A	Removable antennas
B	LEDs (lights)
C	WPS button
D	PCI connector

The following table describes the operation of the NWD310N's LEDs.

Table 2 NWD310N LEDs

LED	COLOR	STATUS	DESCRIPTION
Link	Green	On	The NWD310N is connected to a wireless network.
		Off	The NWD310N is not connected to a wireless network.
Tx/Rx	Yellow	On	The NWD310N is connected to a wireless network.
		Blinking	The NWD310N is connected to a wireless network and is sending or receiving data.
		Off	The NWD310N is not connected to a wireless network.

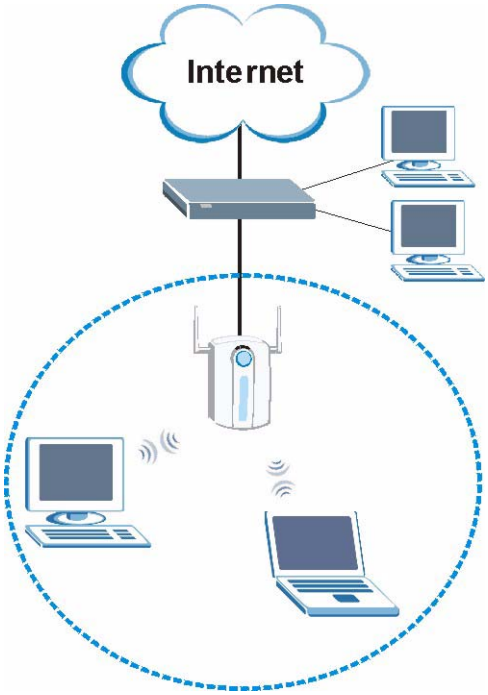
1.2 Application Overview

This section describes some network applications for the NWD310N. You can either set the network type to **Infrastructure** and connect to an AP or use **Ad-Hoc** mode and connect to a peer computer (another wireless device in Ad-Hoc mode).

1.2.1 Infrastructure

To connect to a network via an access point (AP), set the NWD310N network type to **Infrastructure** (see Chapter 4 on page 56). Through the AP, you can access the Internet or the wired network behind the AP.

Figure 2 Application: Infrastructure



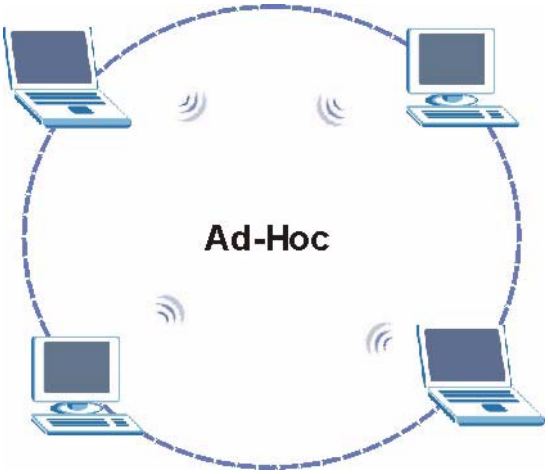
1.2.2 Ad-Hoc

To set up a small independent wireless workgroup without an AP, use **Ad-Hoc** (see Chapter 4 on page 56).

Ad-Hoc does not require an AP or a wired network. Two or more wireless clients communicate directly with each other.

Wi-Fi Protected Setup (WPS) is not available in ad-hoc mode.

Figure 3 Application: Ad-Hoc



1.3 Hardware and Utility Installation

Follow the instructions in the Quick Start Guide to install the ZyXEL utility and make hardware connections.

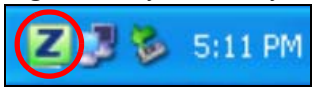
1.3.1 ZyXEL Utility Icon

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

The ZyXEL utility system tray icon displays only when the NWD310N is installed properly.

When you use the ZyXEL utility, it automatically disables Wireless Zero Configuration (WZC) in Windows XP.

Figure 4 ZyXEL Utility: System Tray Icon



The color of the ZyXEL utility system tray icon indicates the status of the NWD310N. Refer to the following table for details.

Table 3 ZyXEL Utility: System Tray Icon

COLOR	DESCRIPTION
Red	The NWD310N is not connected to a wireless network.
Green	The NWD310N is connected to a wireless network.

1.4 Configuration Methods

To configure your NWD310N, use one of the following applications:

- Wireless Zero Configuration (WZC, the Windows XP wireless configuration tool) or WLAN AutoConfig (the Windows Vista wireless configuration tool).
- The ZyXEL utility.

Do NOT use Windows XP's Wireless Zero Configuration tool at the same time you use the ZyXEL utility.

1.4.1 Enabling Windows Wireless Configuration

When you use the ZyXEL utility, it automatically disables Windows XP's wireless configuration tool.

If you want to use the Windows XP wireless configuration tool to configure the NWD310N, you need to disable the ZyXEL utility. Right-click the utility icon ( ) in the system tray and select **Exit**.

Figure 5 Enable WZC

Refer to the appendices for information on how to use the Windows wireless configuration tool to manage the NWD310N.

To reactivate the ZyXEL utility, double-click the ( ) icon on your desktop or click **Start**, **(All) Programs**, **ZyXEL Wireless N PCI Adapter Utility**, **ZyXEL Wireless N PCI Adapter Utility**.

1.4.2 Accessing the ZyXEL Utility

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 in this User's Guide.

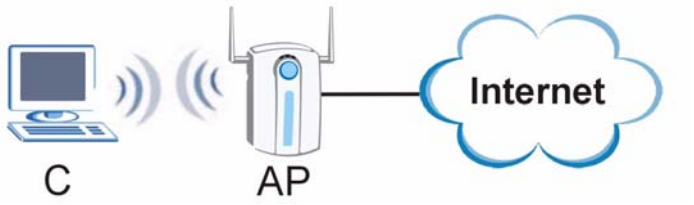
Click the  icon (located in the top right corner) to display the online help window.

2

Tutorial

The following sections show you how to join a wireless network using the ZyXEL utility, as in the following diagram. The wireless client is labeled **C** and the access point is labeled **AP**.

Figure 6 Infrastructure Network



2.1 Connecting to an AP using Wi-Fi Protected Setup (WPS)

This section gives you an example of how to set up your wireless network using WPS. This example uses the NWD310N as the wireless client, and ZyXEL's NBG334W as the Access Point (AP).

The Access Point must be a WPS-aware device.

There are two WPS methods for creating a secure connection. This tutorial shows you both.

- **Push Button Configuration (PBC)** - create a secure wireless network simply by pressing a button. See Section 2.1.1 on page 27.This is the easier method.
- **PIN Configuration** - create a secure wireless network simply by entering a wireless client's PIN (Personal Identification Number) in the NWD310N's interface. See Section 2.1.2 on page 29. This is the more secure method, since one device can authenticate the other.

2.1.1 Push Button Configuration (PBC)

1. Make sure that your access point is turned on and that it is within range of the computer with the NWD310N installed.
2. Make sure that you have installed the NWD310N's driver and utility on your computer.

3 In the NWD310N's utility, click the **Adapter** tab, enable **WPS** and select **PBC (Push Button Configuration)**. In the screen that appears, click **Start**.

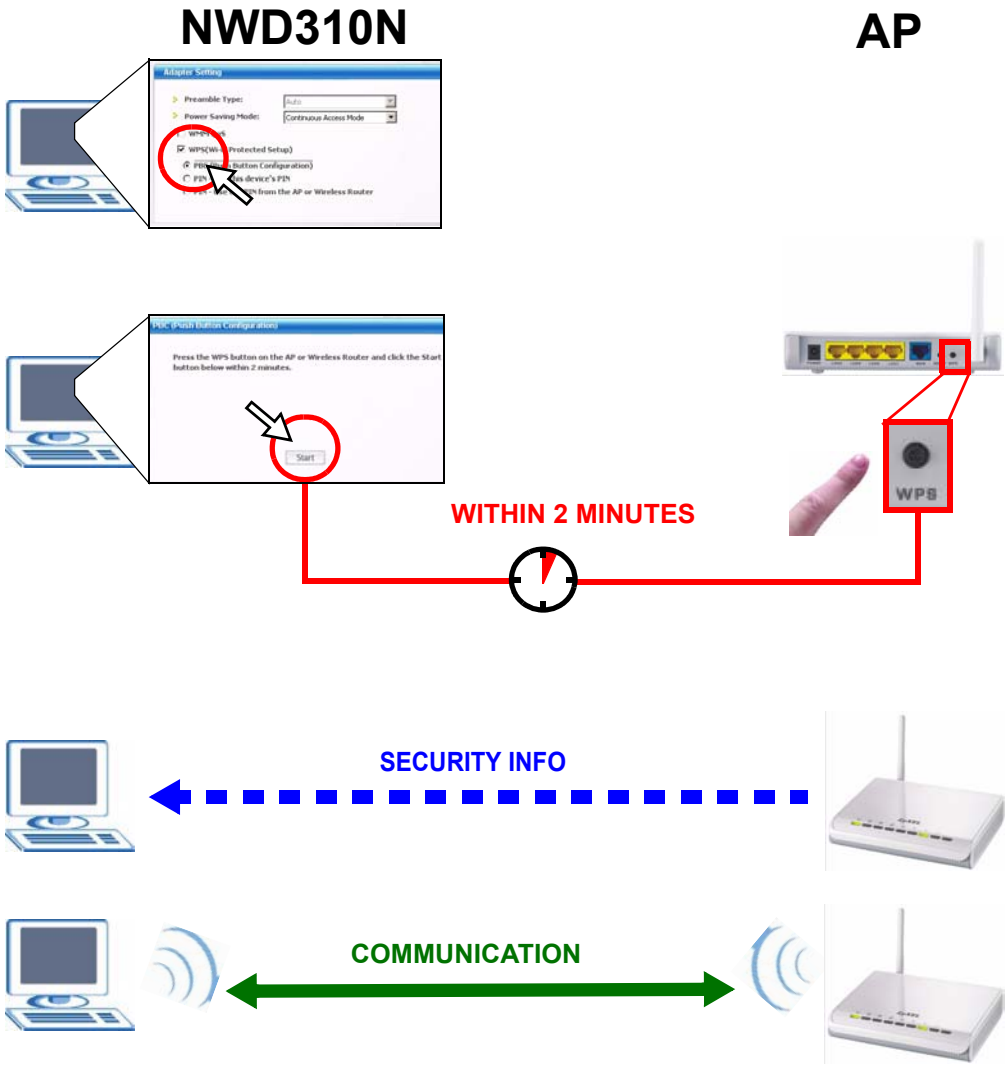
4 Log into the AP's web configurator and locate its WPS settings section. On the NBG334W, press the **Push Button** button in the **Network** > **Wireless Client** > **WPS Station** screen.

It doesn't matter which button is pressed first. You must press the second button within two minutes of pressing the first one.

The AP sends the proper configuration settings to the NWD310N. This may take up to two minutes. Then the NWD310N is able to communicate with the AP securely.

The following figure shows you an example to set up wireless network and security by pressing a button on both the AP (the NBG334W in this example) and the NWD310N.

Figure 7 Example WPS Process: PBC Method



2.1.2 PIN Configuration

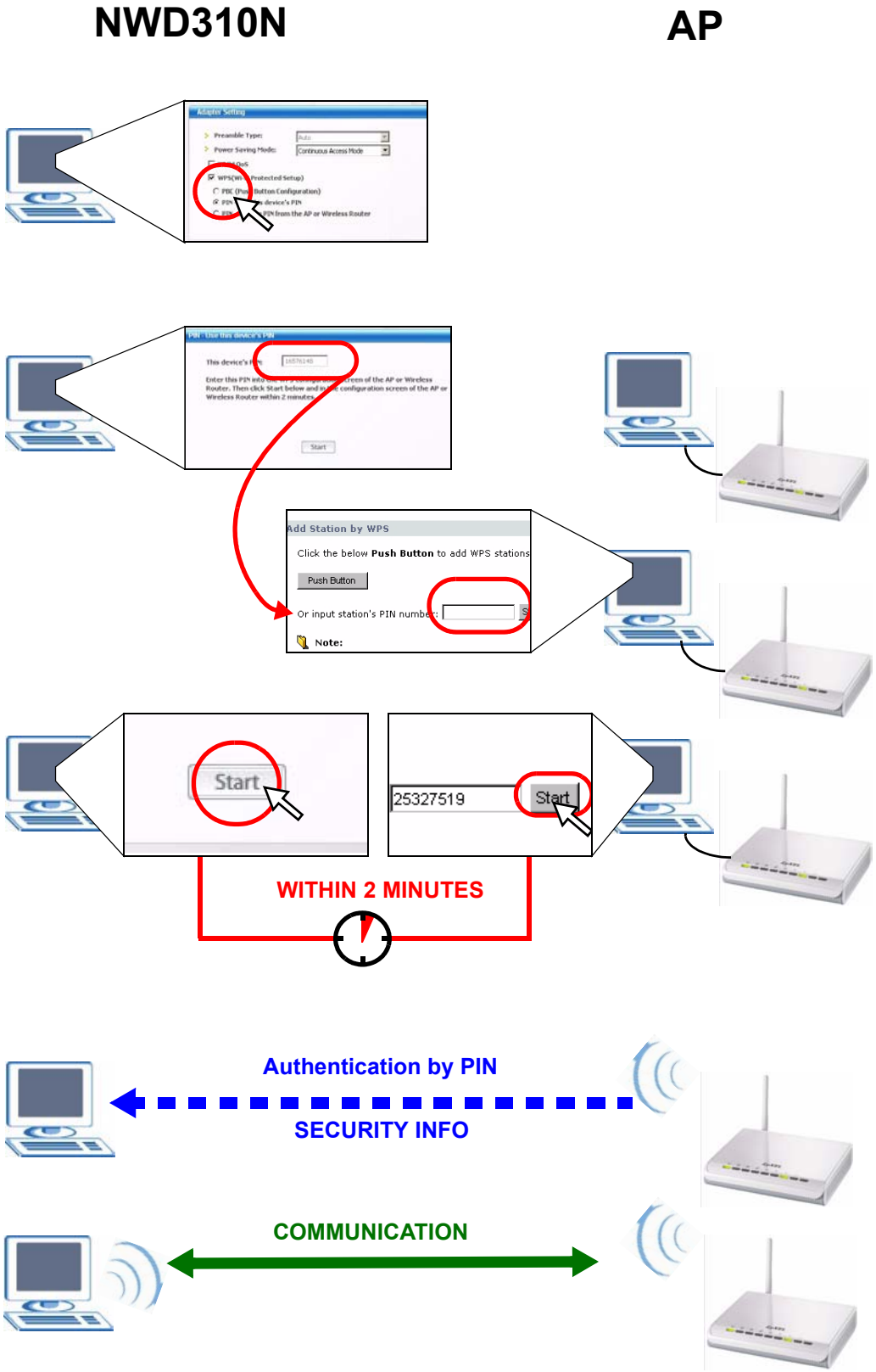
When you use the PIN configuration method, you need to use both the NWD310N's utility and the AP's configuration interface.

1. In the NWD310N's Adaptor tab, select **WPS** and **PIN - Use this Device's PIN**. Note down the PIN in the screen that appears.
2. Enter the PIN number in the AP's configuration interface. In the NBG334W, use the **PIN** field in the **Network** > **Wireless LAN** > **WPS Station** screen.
3. Click the **Start** buttons on both the NWD310N utility screen and the AP's configuration utility (the **WPS Station** screen on the NBG334W) within two minutes.

The NWD310N authenticates the wireless client and sends the proper configuration settings to the wireless client. This may take up to two minutes. Then the wireless client is able to communicate with the NWD310N securely.

The following figure shows you the example of configuring the wireless network and security on the NWD310N and the AP (ZyXEL's NBG334W in this example) by using the PIN method.

Figure 8 Example WPS Process: PIN Method



2.2 Connecting to an AP Without Using WPS

There are three ways to connect the wireless client (the NWD310N) to a network without using WPS.

- Configure nothing and leave the wireless client to automatically scan for and connect to any available network that has no wireless security configured.
- Manually connect to a network (see Section 2.2.1 on page 32).
- Configure a profile to have the wireless client automatically connect to a specific network or peer computer (see Section 2.2.2 on page 34).

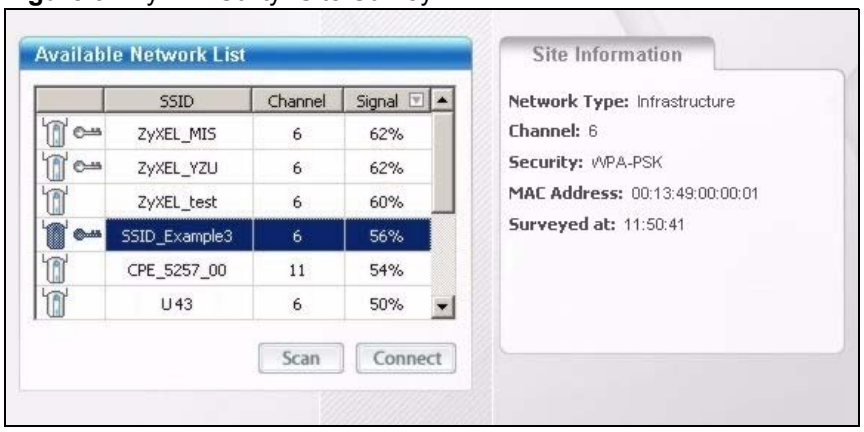
2.2.1 Manually Connecting to a Wireless LAN

This example illustrates how to manually connect your wireless client to an access point (AP) configured for WPA-PSK security and connected to the Internet. Before you connect to the access point, you must know its Service Set IDentity (SSID) and WPA-PSK pre-shared key. In this example, the AP's SSID is "SSID_Example3" and its pre-shared key is "ThisismyWPA-PSKpre-sharedkey".

After you install the ZyXEL utility and then insert the wireless client, follow the steps below to connect to a network using the **Site Survey** screen.

1 Open the ZyXEL utility and click the **Site Survey** tab to open the screen shown next.

Figure 9 ZyXEL Utility: Site Survey



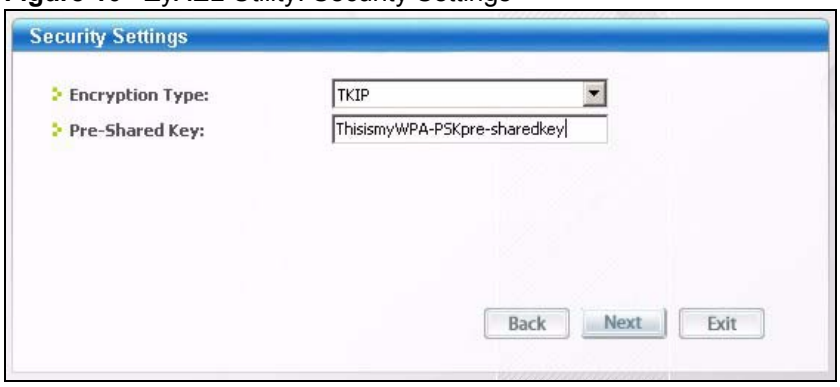
2 The wireless client automatically searches for available wireless networks. Click **Scan** if you want to search again. If no entry displays in the **Available Network List**, that means there is no wireless network available within range. Make sure the AP or peer computer is turned on, or move the wireless client closer to the AP or peer computer. See Table 4.3 on page 49 for detailed field descriptions.

3 To connect to an AP or peer computer, either click an entry in the list and then click **Connect** or double-click an entry (**SSID_Example3** in this example).

4 When you try to connect to an AP with security configured, a window will pop up prompting you to specify the security settings. Enter the pre-shared key and leave the encryption type at the default setting.

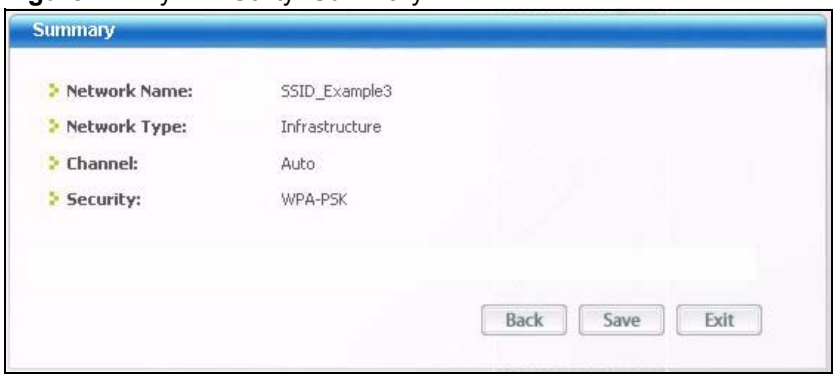
Use the **Next** button to move on to the next screen. You can use the **Back** button at any time to return to the previous screen, or the **Exit** button to return to the **Site Survey** screen.

Figure 10 ZyXEL Utility: Security Settings



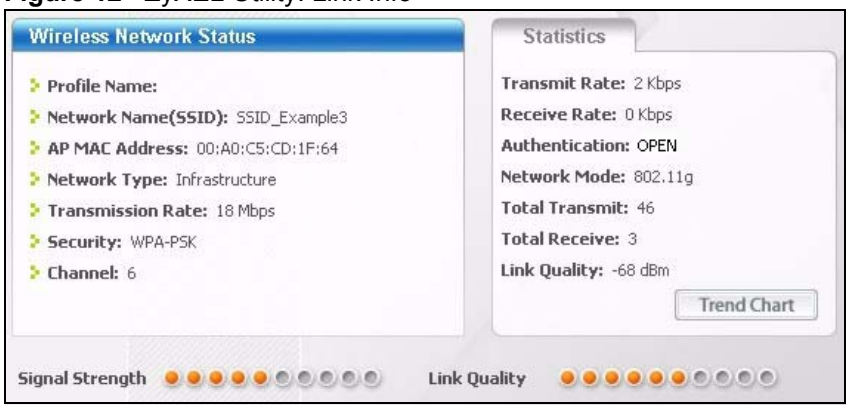
5 The **Summary** window appears. Check your settings and click **Save** to continue.

Figure 11 ZyXEL Utility: Summary



6 The ZyXEL utility returns to the **Link Info** screen while it connects to the wireless network using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection. Check the network information in the **Link Info** screen to verify that you have successfully connected to the selected network. If the wireless client is not connected to a network, the fields in this screen remain blank. See Table 4.2 on page 47 for detailed field descriptions.

Figure 12 ZyXEL Utility: Link Info



7 Open your Internet browser and enter http://www.zyxel.com or the URL of any other web site in the address bar. If you are able to access the web site, your wireless connection is successfully configured. If you cannot access the web site, check the

Troubleshooting section of this User's Guide or contact your network administrator if necessary.

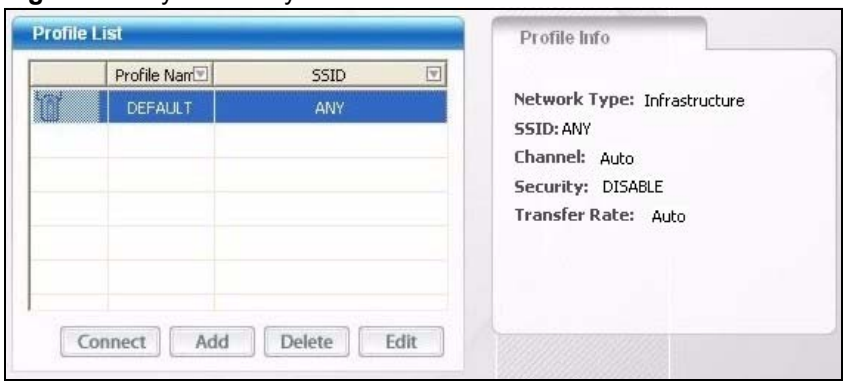
2.2.2 Creating and Using a Profile

A profile lets you automatically connect to the same wireless network every time you use the ZyXEL utility. You can also configure different profiles for different networks, for example if you connect a notebook computer to wireless networks at home and at work.

This example illustrates how to set up a profile and connect the wireless client to an access point configured for WPA-PSK security. In this example, the AP's SSID is "SSID_Example3" and its pre-shared key is "ThisismyWPA-PSKpre-sharedkey". You have chosen the profile name "PN_Example3".

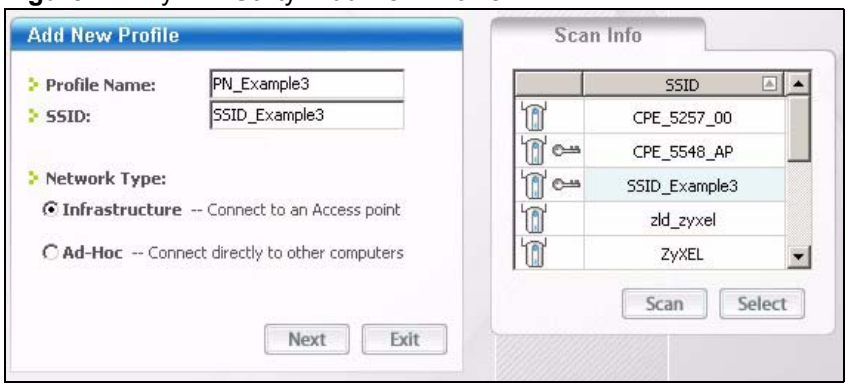
1 Open the ZyXEL utility and click the **Profile** tab to open the screen as shown. Click **Add** to configure a new profile.

Figure 13 ZyXEL Utility: Profile



2 The **Add New Profile** screen appears. The wireless client automatically searches for available wireless networks, which are displayed in the **Scan Info** box. You can also configure your profile for a wireless network that is not in the list.

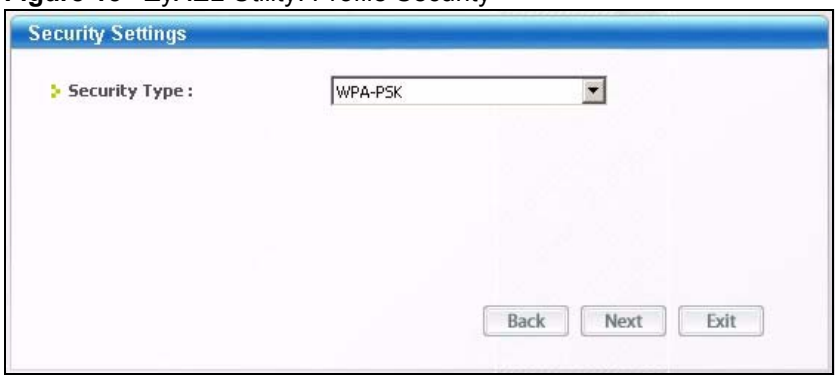
Figure 14 ZyXEL Utility: Add New Profile



3 Give the profile a descriptive name (of up to 32 printable ASCII characters). Select **Infrastructure** and either manually enter or select the AP's SSID in the **Scan Info** table and click **Select**.

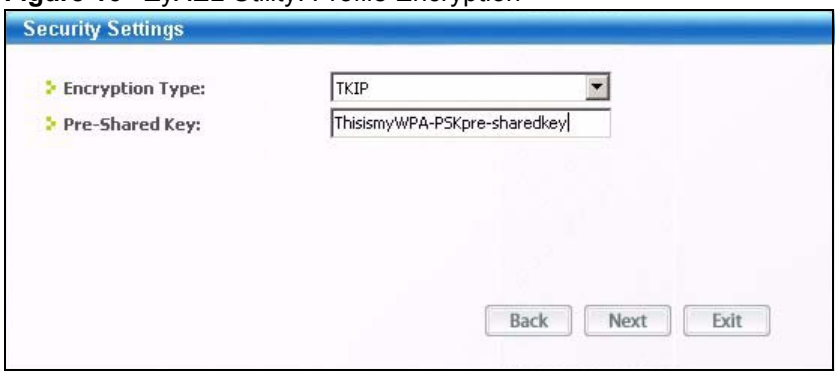
4 Choose the same encryption method as the AP to which you want to connect (In this example, WPA-PSK).

Figure 15 ZyXEL Utility: Profile Security



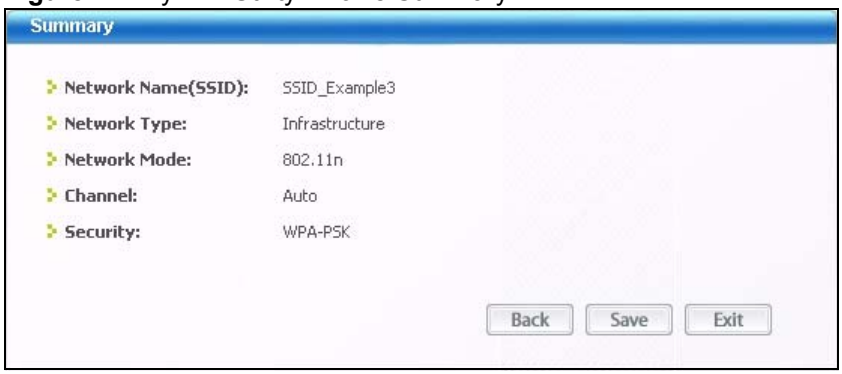
5 This screen varies depending on the encryption method you selected in the previous screen. In this example, enter the pre-shared key and leave the encryption type at the default setting.

Figure 16 ZyXEL Utility: Profile Encryption



6 Verify the profile settings in the ready-only screen. Click **Save** to save and go to the next screen.

Figure 17 ZyXEL Utility: Profile Summary



7 Click **Activate Now** to use the new profile immediately. Otherwise, click the **Activate Later** button to go back to the **Profile List** screen.

If you clicked **Activate Later** you can select the profile from the list in the **Profile** screen and click **Connect** to activate it.

Only one profile can be activated and used at any given time.

Figure 18 ZyXEL Utility: Profile Activate

8 When you activate the new profile, the ZyXEL utility goes to the **Link Info** screen while it connects to the AP using your settings. When the wireless link is established, the ZyXEL utility icon in the system tray turns green and the **Link Info** screen displays details of the active connection.

9 Make sure the selected AP in the active profile is on and connected to the Internet. Open your Internet browser, enter http://www.zyxel.com or the URL of any other web site in the address bar and press ENTER. If you are able to access the web site, your new profile is successfully configured.

10 If you cannot access the Internet, go back to the **Profile** screen. Select the profile you are using and click **Edit**. Check the details you entered previously. Also, refer to the Troubleshooting section of this User's Guide or contact your network administrator if necessary.

3

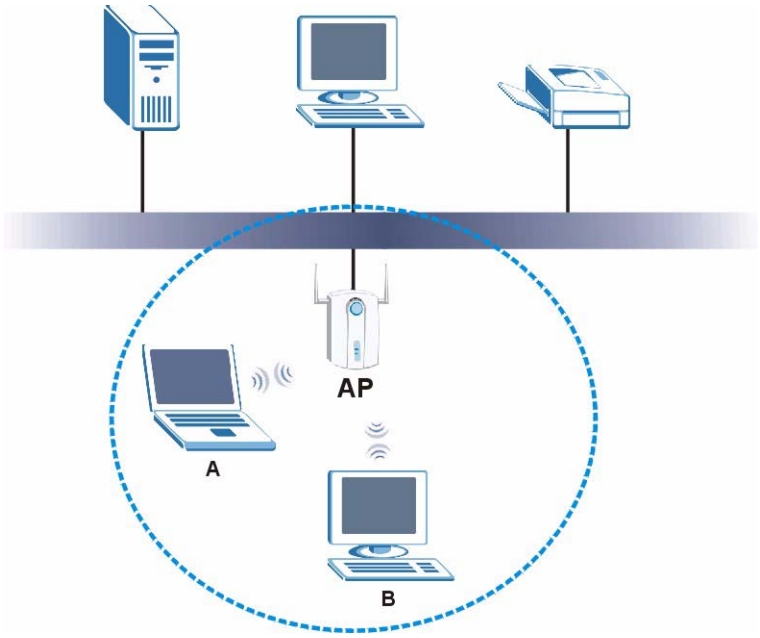
Wireless LANs

This chapter provides background information on wireless Local Area Networks.

3.1 Wireless LAN Overview

The following figure provides an example of a wireless network with an AP. See Figure 3 on page 24 for an Ad Hoc network example.

Figure 19 Example of a Wireless Network



The wireless network is the part in the blue circle. In this wireless network, devices **A** and **B** are called wireless clients. The wireless clients use the access point (AP) to interact with other devices (such as the printer) or with the Internet

Every wireless network must follow these basic guidelines.

- Every device in the same wireless network must use the same SSID.
  The SSID is the name of the wireless network. It stands for Service Set IDentity.
- If two wireless networks overlap, they should use a different channel.

Like radio stations or television channels, each wireless network uses a specific channel, or frequency, to send and receive information.

- Every device in the same wireless network must use security compatible with the AP or peer computer.

  Security stops unauthorized devices from using the wireless network. It can also protect the information that is sent in the wireless network.

3.2 Wireless LAN Security

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

If you do not enable any wireless security on your NWD310N, the NWD310N's wireless communications are accessible to any wireless networking device that is in the coverage area.

You can use only WEP encryption if you set the NWD310N to Ad-hoc mode.

See the appendices for more detailed information about wireless security.

3.2.1 User Authentication and Encryption

You can make every user log in to the wireless network before they can use it. This is called user authentication. However, every wireless client in the wireless network has to support IEEE 802.1x to do this.

Wireless networks can use encryption to protect the information that is sent in the wireless network. Encryption is like a secret code. If you do not know the secret code, you cannot understand the message.

3.2.1.1 WEP

3.2.1.1.1 Data Encryption

WEP (Wired Equivalent Privacy) encryption scrambles all data packets transmitted between the NWD310N 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 NWD310N.

- 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 NWD310N allows you to configure up to four 64-bit, 128-bit or 152-bit WEP keys. Only one key is used as the default key at any one time.

3.2.1.1.2 Authentication Type

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

- **Open** mode is implemented for ease-of-use and when security is not an issue. The wireless station and the AP or peer computer do not share a secret key. Thus the wireless stations can associate with any AP or peer computer and listen to any transmitted data that is not encrypted.
- **Shared** mode involves a shared secret key to authenticate the wireless station to the AP or peer computer. This requires you to enable the wireless LAN security and use same settings on both the wireless station and the AP or peer computer.
- **Auto** authentication mode allows the NWD310N to switch between the open system and shared key modes automatically. Use the auto mode if you do not know the authentication mode of the other wireless stations.

3.2.1.2 IEEE 802.1x

The IEEE 802.1x standard outlines enhanced security methods for both the authentication of wireless stations and encryption key management. Authentication can be done using an external RADIUS server.

3.2.1.2.1 EAP Authentication

EAP (Extensible Authentication Protocol) is an authentication protocol that runs on top of the IEEE 802.1x transport mechanism in order to support multiple types of user authentication. By using EAP to interact with an EAP-compatible RADIUS server, an access point helps a wireless station and a RADIUS server perform authentication.

The type of authentication you use depends on the RADIUS server and an intermediary AP(s) that supports IEEE 802.1x. The NWD310N supports EAP-TLS, EAP-TTLS (at the time of writing, TTLS is not available in Windows Vista) and EAP-PEAP. Refer to Appendix B on page 103 for descriptions.

For EAP-TLS authentication type, you must first have a wired connection to the network and obtain the certificate(s) from a certificate authority (CA). Certificates (also called digital IDs) can be used to authenticate users and a CA issues certificates and guarantees the identity of each certificate owner.

3.2.1.3 WPA and WPA2

Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA.

Key differences between WPA(2) and WEP are improved data encryption and user authentication.

Both WPA and WPA2 improve data encryption by using Temporal Key Integrity Protocol (TKIP), Message Integrity Check (MIC) and IEEE 802.1x. WPA and WPA2 use Advanced Encryption Standard (AES) in the Counter mode with Cipher block chaining Message authentication code Protocol (CCMP) to offer stronger encryption than TKIP.

If both an AP and the wireless clients support WPA2 and you have an external RADIUS server, use WPA2 for stronger data encryption. If you don't have an external RADIUS server, you should use WPA2-PSK (WPA2-Pre-Shared Key) that only requires a single (identical) password entered into each access point, wireless gateway and wireless client. As long as the passwords match, a wireless client will be granted access to a WLAN.

If the AP or the wireless clients do not support WPA2, just use WPA or WPA-PSK depending on whether you have an external RADIUS server or not.

Select WEP only when the AP and/or wireless clients do not support WPA or WPA2. WEP is less secure than WPA or WPA2.

3.3 WiFi Protected Setup

Your NWD310N supports WiFi Protected Setup (WPS), which is an easy way to set up a secure wireless network. WPS is an industry standard specification, defined by the WiFi Alliance.

WPS allows you to quickly set up a wireless network with strong security, without having to configure security settings manually. Each WPS connection works between two devices. Both devices must support WPS (check each device's documentation to make sure).

Depending on the devices you have, you can either press a button (on the device itself, or in its configuration utility) or enter a PIN (a unique Personal Identification Number that allows one device to authenticate the other) in each of the two devices. When WPS is activated on a device, it has two minutes to find another device that also has WPS activated. Then, the two devices connect and set up a secure network by themselves.

3.3.1 Push Button Configuration

WPS Push Button Configuration (PBC) is initiated by pressing a button on each WPS-enabled device, and allowing them to connect automatically. You do not need to enter any information.

Not every WPS-enabled device has a physical WPS button. Some may have a WPS PBC button in their configuration utilities instead of or in addition to the physical button.

Take the following steps to set up WPS using the button.

1. Ensure that the two devices you want to set up are within wireless range of one another.
2. Look for a WPS button on each device. If the device does not have one, log into its configuration utility and locate the button (see the device's User's Guide for how to do this - for the NWD310N, see Section 4.5.1 on page 62).
3. Press the button on one of the devices (it doesn't matter which).
4. Within two minutes, press the button on the other device. The registrar sends the network name (SSID) and security key through an secure connection to the enrollee.

If you need to make sure that WPS worked, check the list of associated wireless clients in the AP's configuration utility. If you see the wireless client in the list, WPS was successful.

3.3.2 PIN Configuration

Each WPS-enabled device has its own PIN (Personal Identification Number). This may either be static (it cannot be changed) or dynamic (in some devices you can generate a new PIN by clicking on a button in the configuration interface).

Use the PIN method instead of the push-button configuration (PBC) method if you want to ensure that the connection is established between the devices you specify, not just the first two devices to activate WPS in range of each other. However, you need to log into the configuration interfaces of both devices to use the PIN method.

When you use the PIN method, you must enter the PIN from one device (usually the wireless client) into the second device (usually the Access Point or wireless router). Then, when WPS is activated on the first device, it presents its PIN to the second device. If the PIN matches, one device sends the network and security information to the other, allowing it to join the network.

Take the following steps to set up a WPS connection between an access point or wireless router (referred to here as the AP) and a client device using the PIN method.

1. Ensure WPS is enabled on both devices.
2. Access the WPS section of the AP's configuration interface. See the device's User's Guide for how to do this.
3. Look for the client's WPS PIN; it will be displayed either on the device, or in the WPS section of the client's configuration interface (see the device's User's Guide for how to find the WPS PIN - for the NWD310N, see Section 4.5 on page 61).
4. Enter the client's PIN in the AP's configuration interface.

If the client device's configuration interface has an area for entering another device's PIN, you can either enter the client's PIN in the AP, or enter the AP's PIN in the client - it does not matter which.

5. Start WPS on both devices within two minutes.

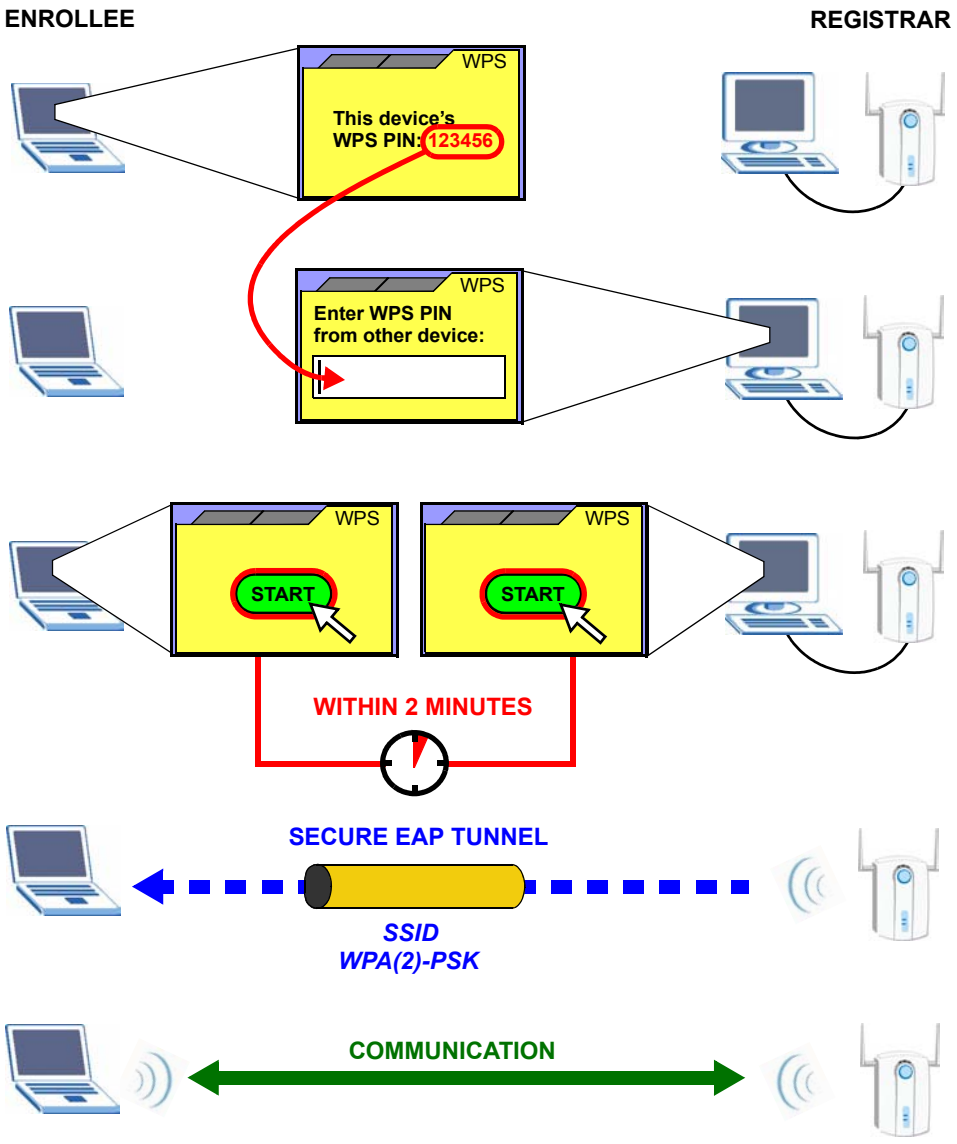
Use the configuration utility to activate WPS, not the push-button on the device itself.

6. On a computer connected to the wireless client, try to connect to the Internet. If you can connect, WPS was successful.

   If you cannot connect, check the list of associated wireless clients in the AP's configuration utility. If you see the wireless client in the list, WPS was successful.

The following figure shows a WPS-enabled wireless client (installed in a notebook computer) connecting to the WPS-enabled AP via the PIN method.

Figure 20 Example WPS Process: PIN Method

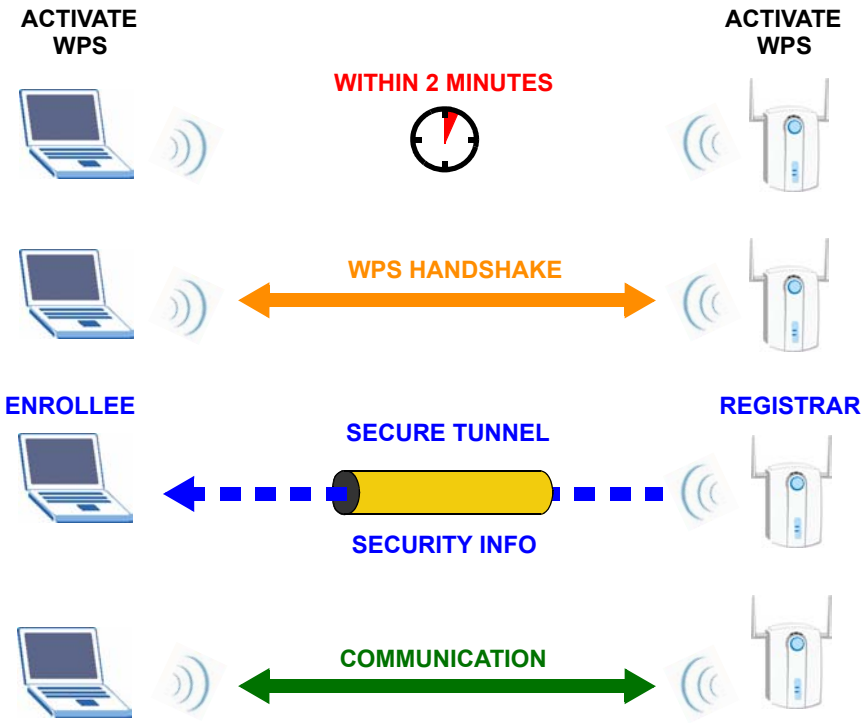


3.3.3 How WPS Works

When two WPS-enabled devices connect, each device must assume a specific role. One device acts as the registrar (the device that supplies network and security settings) and the other device acts as the enrollee (the device that receives network and security settings. The registrar creates a secure EAP (Extensible Authentication Protocol) tunnel and sends the network name (SSID) and the WPA-PSK or WPA2-PSK pre-shared key to the enrollee. Whether WPA-PSK or WPA2-PSK is used depends on the standards supported by the devices. If the registrar is already part of a network, it sends the existing information. If not, it generates the SSID and WPA(2)-PSK randomly.

The following figure shows a WPS-enabled client (installed in a notebook computer) connecting to a WPS-enabled access point.

Figure 21 How WPS works



The roles of registrar and enrollee last only as long as the WPS setup process is active (two minutes). The next time you use WPS, a different device can be the registrar if necessary.

The WPS connection process is like a handshake; only two devices participate in each WPS transaction. If you want to add more devices you should repeat the process with one of the existing networked devices and the new device.

Note that the access point (AP) is not always the registrar, and the wireless client is not always the enrollee. All WPS-certified APs can be a registrar, and so can some WPS-enabled wireless clients.

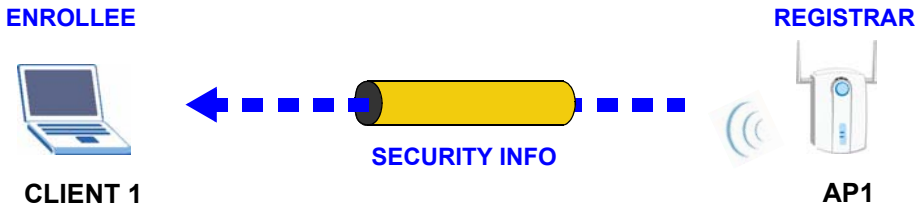
By default, a WPS devices is "unconfigured". This means that it is not part of an existing network and can act as either enrollee or registrar (if it supports both functions). If the registrar is unconfigured, the security settings it transmits to the enrollee are randomly-generated. Once a WPS-enabled device has connected to another device using WPS, it becomes "configured". A configured wireless client can still act as enrollee or registrar in subsequent WPS connections, but a configured access point can no longer act as enrollee. It will be the registrar in all subsequent WPS connections in which it is involved. If you want a configured AP to act as an enrollee, you must reset it to its factory defaults.

3.3.3.1 Example WPS Network Setup

This section shows how security settings are distributed in an example WPS setup.

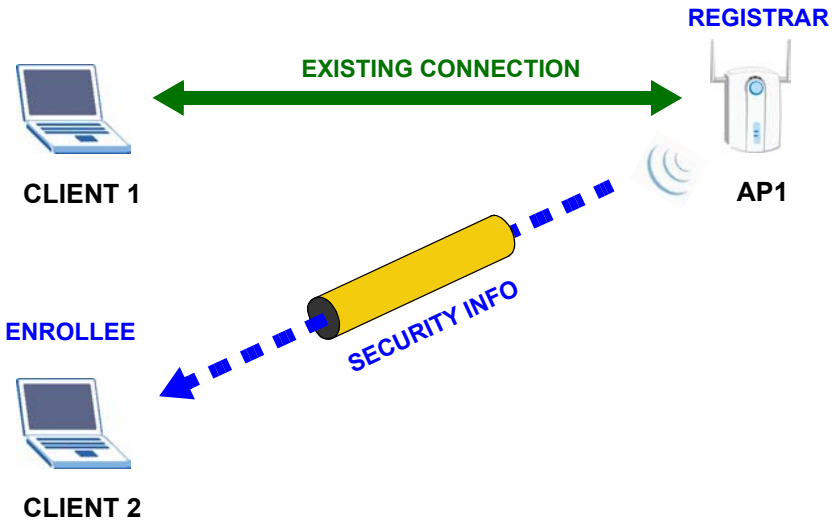
The following figure shows an example network. In step **1**, both **AP1** and **Client 1** are unconfigured. When WPS is activated on both, they perform the handshake. In this example, **AP1** is the registrar, and **Client 1** is the enrollee. The registrar randomly generates the security information to set up the network, since it is unconfigured and has no existing information.

Figure 22 WPS: Example Network Step 1



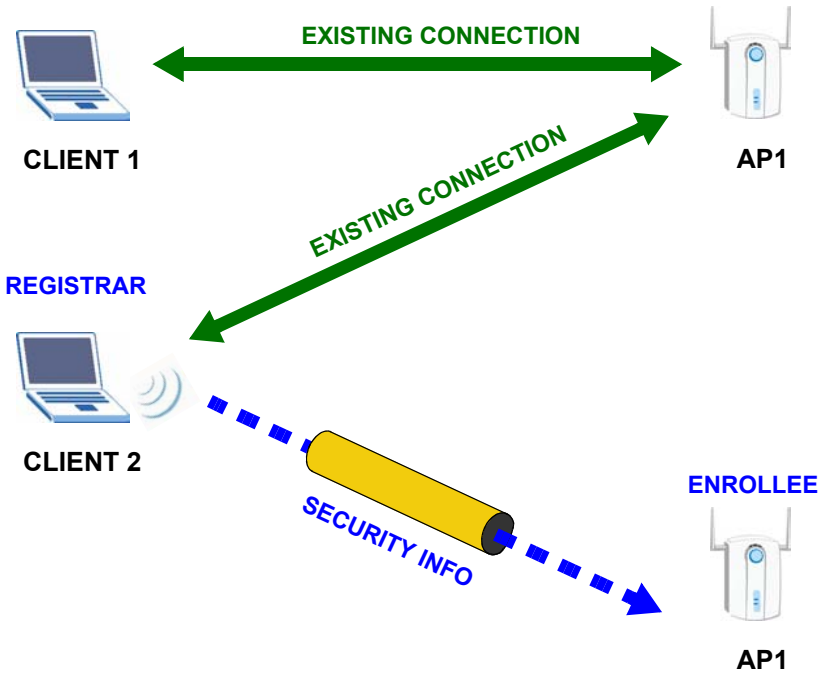
In step **2**, you add another wireless client to the network. You know that **Client 1** supports registrar mode, but it is better to use **AP1** for the WPS handshake with the new client since you must connect to the access point anyway in order to use the network. In this case, **AP1** must be the registrar, since it is configured (it already has security information for the network). **AP1** supplies the existing security information to **Client 2**.

Figure 23 WPS: Example Network Step 2



In step 3, you add another access point (**AP2**) to your network. **AP2** is out of range of **AP1**, so you cannot use **AP1** for the WPS handshake with the new access point. However, you know that **Client 2** supports the registrar function, so you use it to perform the WPS handshake instead.

Figure 24 WPS: Example Network Step 3



3.3.4 Limitations of WPS

WPS has some limitations of which you should be aware.

- WPS works in Infrastructure networks only (where an AP and a wireless client communicate). It does not work in Ad-Hoc networks (where there is no AP).
- When you use WPS, it works between two devices only. You cannot enroll multiple devices simultaneously, you must enroll one after the other.

  For instance, if you have two enrollees and one registrar you must set up the first enrollee (by pressing the WPS button on the registrar and the first enrollee, for example), then check that it successfully enrolled, then set up the second device in the same way.
- WPS works only with other WPS-enabled devices. However, you can still add non-WPS devices to a network you already set up using WPS.

  WPS works by automatically issuing a randomly-generated WPA-PSK or WPA2-PSK pre-shared key from the registrar device to the enrollee devices (see Section 4.3.1.2 on page 52 for information on pre-shared keys). Whether the network uses WPA-PSK or WPA2-PSK depends on the device. You can check the configuration interface of the registrar device to discover the key the network is using (if the device supports this feature). Then, you can enter the key into the non-WPS device and join the network as normal (the non-WPS device must also support WPA-PSK or WPA2-PSK).
- When you use the PBC method, there is a short period (from the moment you press the button on one device to the moment you press the button on the other device) when any WPS-enabled device could join the network. This is because the registrar has no way of identifying the “correct” enrollee, and cannot differentiate between your enrollee and a rogue device. This is a possible way for a hacker to gain access to a network.

You can easily check to see if this has happened. WPS works between only two devices simultaneously, so if another device has enrolled your device will be unable to enroll, and will not have access to the network. If this happens, open the access point's configuration interface and look at the list of associated clients (usually displayed by MAC address). It does not matter if the access point is the WPS registrar, the enrollee, or was not involved in the WPS handshake; a rogue device must still associate with the access point to gain access to the network. Check the MAC addresses of your wireless clients (usually printed on a label on the bottom of the device). If there is an unknown MAC address you can remove it or reset the AP.

4

Wireless Configuration

This chapter shows you how to configure your NWD310N.

4.1 ZyXEL Utility Screen Summary

This section describes the ZyXEL utility screens.

Figure 25 ZyXEL Utility Menu Summary

The following table describes the menus.

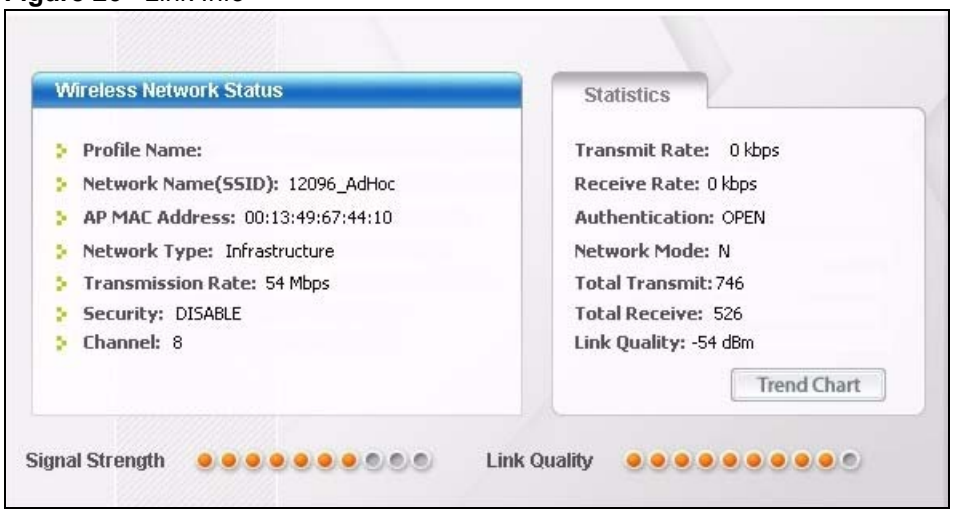
Table 4 ZyXEL Utility Menu Summary

TAB	DESCRIPTION
Link Info	Use this screen to see your current connection status, configuration and data rate statistics.
Site Survey	Use this screen to • scan for a wireless network • configure wireless security (if activated on the selected network). • connect to a wireless network.
Profile	Use this screen to add, delete, edit or activate a profile with a set of wireless and security settings.
Adapter	Use this screen to configure preamble type, enable power saving and use WiFi Protected Setup (WPS).

4.2 The Link Info Screen

When the ZyXEL utility starts, the **Link Info** screen displays, showing the current configuration and connection status of your NWD310N.

Figure 26 Link Info



The following table describes the labels in this screen.

Table 5 Link Info

LABEL	DESCRIPTION
Wireless Network Status	
Profile Name	This is the name of the profile you are currently using.
Network Name (SSID)	The SSID identifies the wireless network to which a wireless station is associated. This field displays the name of the wireless device to which the NWD310N is associated.
AP MAC Address	This field displays the MAC address of the AP or peer computer to which the NWD310N is associated.
Network Type	This field displays the network type (**Infrastructure** or **Ad-Hoc**) of the wireless network.
Transmission Rate	This field displays the current transmission rate of the NWD310N in megabits per second (Mbps).
Security	This field displays whether data encryption is activated (**WEP** / **802.1x** / **WPA** / **WPA-PSK** / **WPA2** / **WPA2-PSK**) or inactive (**DISABLE**).
Channel	This field displays the radio channel the NWD310N 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 NWD310N.
Network Mode	This field displays the wireless standard (**802.11b**, **802.11g** or **802.11n**) of the AP or peer computer.
Total Transmit	This field displays the total number of data frames transmitted.
Total Receive	This field displays the total number of data frames received.
Link Quality	This field displays the signal strength of the NWD310N.
Trend Chart	Click this button to display the real-time statistics of the data rate in kilobits per second (Kbps).

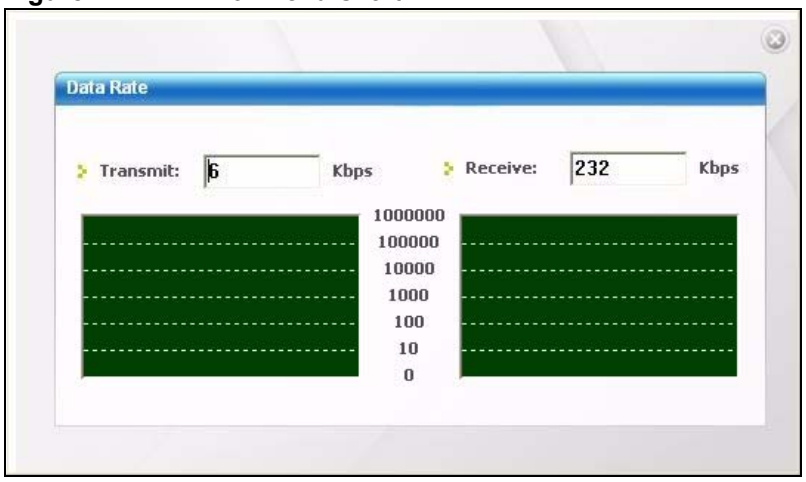
Table 5 Link Info (continued)

LABEL	DESCRIPTION
Signal Strength	The status bar shows the strength of the signal. The signal strength mainly depends on the antenna output power and the distance between your NWD310N and the AP or peer computer.
Link Quality	The status bar shows the quality of wireless connection. This refers to the percentage of packets transmitted successfully. If there are too many wireless stations in a wireless network, collisions may occur which could result in a loss of messages even though you have high signal strength.

4.2.1 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 27 Link Info: Trend Chart



The following table describes the labels in this screen.

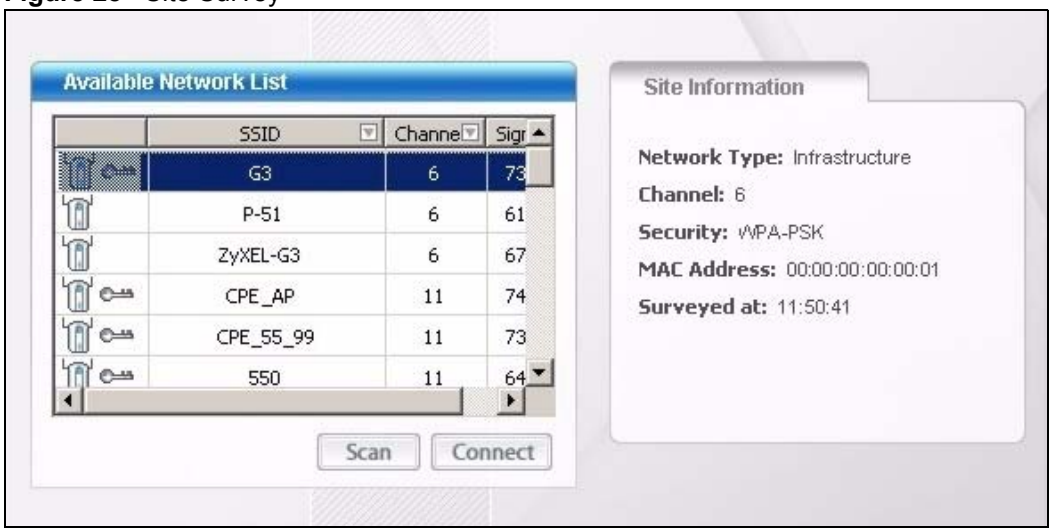
Table 6 Link Info: Trend Chart

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

4.3 The Site Survey Screen

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

Figure 28 Site Survey



The following table describes the labels in this screen.

Table 7 Site Survey

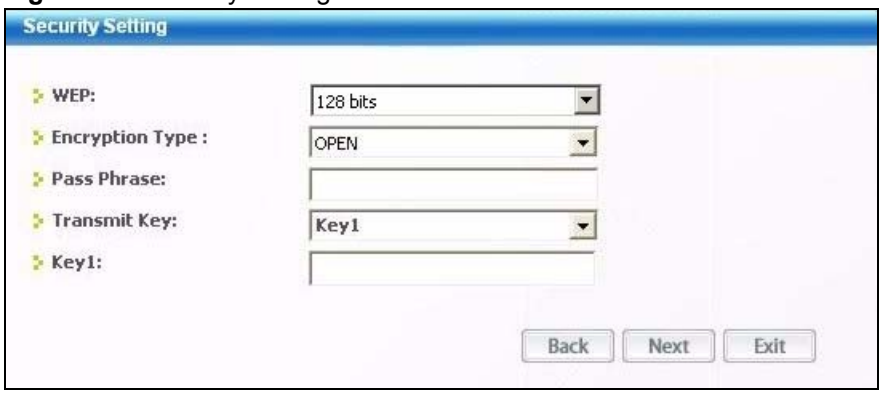
LABEL	DESCRIPTION
Available Network List	Click a column heading to sort the entries.
, , or	denotes that the wireless device is in infrastructure mode and the wireless security is activated. denotes that the wireless device is in infrastructure mode but the wireless security is deactivated. denotes that the wireless device is in Ad-Hoc mode and the wireless security is activated. 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.
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 Information	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.
Network Mode	This field displays the wireless standard (**802.11b**, **802.11g** or **802.11n**) used by the selected wireless device.
Channel	This field displays the channel number used by each wireless device.
Security	This field shows whether data encryption is activated (**WEP**, **WPA**, **WPA-PSK**, **WPA2**, **WPA2-PSK** or **802.1x**) 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 was scanned.

4.3.1 Security Settings

When you configure the NWD310N to connect to a network with wireless security activated and the security settings are disabled on the NWD310N, the screen varies according to the encryption method used by the selected network.

4.3.1.1 WEP Encryption

Figure 29 Security Setting: WEP



The following table describes the labels in this screen.

Table 8 Security Setting: WEP

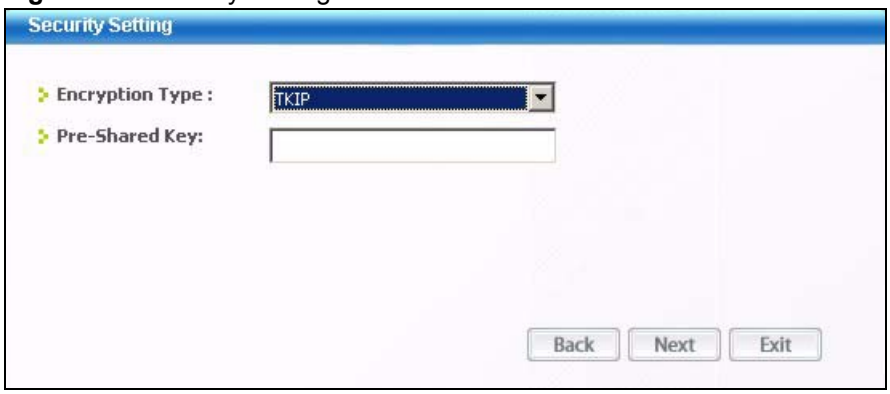
LABEL	DESCRIPTION
Security Settings	
WEP	Select **64 Bits** or **128 Bits** to activate WEP encryption and then fill in the related fields.
Encryption Type	Select an authentication method. Choices are **Open** and **Shared**. Refer to Section 3.2.1.1.2 on page 39 for more information.
Pass Phrase	Enter a passphrase of up to 32 case-sensitive printable characters. As you enter the passphrase, the NWD310N automatically generates four different WEP keys and displays the first in the key field below. Refer to Section 3.2.1.1.1 on page 38 for more information.
Transmit Key	Select a default WEP key to use for data encryption. The key displays in the adjacent field.
Key x (where x is a number between 1 and 4)	Select this option if you want to manually enter the WEP keys. Enter the WEP key in the field provided. If you select **64 Bits** in the **WEP** field. Enter either 10 hexadecimal digits in the range of “A-F”, “a-f” and “0-9” (for example, 11AA22BB33) for HEX key type. or Enter 5 ASCII characters (case sensitive) ranging from “a-z”, “A-Z” and “0-9” (for example, MyKey) for ASCII key type. If you select **128 Bits** in the **WEP** field, Enter either 26 hexadecimal digits in the range of “A-F”, “a-f” and “0-9” (for example, 00112233445566778899AABBCC) for HEX key type or Enter 13 ASCII characters (case sensitive) ranging from “a-z”, “A-Z” and “0-9” (for example, MyKey12345678) for ASCII key type. Note: The values for the WEP keys must be set up exactly the same on all wireless devices in the same wireless LAN. ASCII WEP keys are case sensitive.

Table 8 Security Setting: WEP (continued)

LABEL	DESCRIPTION
Back	Click **Back** to go to the **Site Survey** screen to select and connect to another network.
Next	Click **Next** to confirm your selections and advance to the **Summary** screen. Refer to Section 4.3.3 on page 55.
Exit	Click **Exit** to return to the **Site Survey** screen without saving.

4.3.1.2 WPA-PSK/WPA2-PSK

Figure 30 Security Setting: WPA-PSK/WPA2-PSK



The following table describes the labels in this screen.

Table 9 Security Setting: WPA-PSK/WPA2-PSK

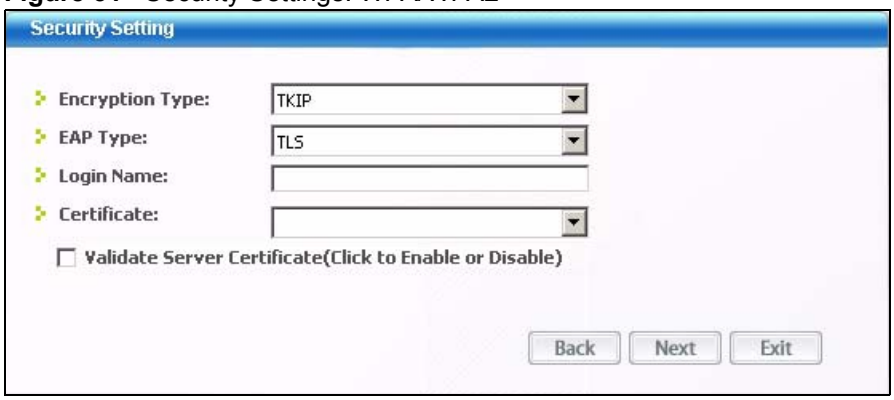
LABEL	DESCRIPTION
Encryption Type	The encryption mechanisms used for WPA/WPA2 and WPA-PSK/WPA2-PSK are the same. The only difference between the two is that WPA-PSK/WPA2-PSK uses a simple common password, instead of user-specific credentials. Select the encryption type (**TKIP** or **AES**) for data encryption. Refer to Section 3.2.1.3 on page 39 for more information.
Pre-Shared Key	Type a pre-shared key (same as the AP or peer device) of between 8 and 63 case-sensitive ASCII characters (including spaces and symbols) or 64 hexadecimal characters.
Back	Click **Back** to go to the **Site Survey** screen to select and connect to another network.
Next	Click **Next** to confirm your selections and advance to the **Summary** screen. Refer to Section 4.3.3 on page 55.
Exit	Click **Exit** to return to the **Site Survey** screen without saving.

4.3.1.3 WPA/WPA2

The screen that displays when you select **WPA** or **WPA2** differs, depending on the **EAP Type** you select (**TLS**, **PEAP** or **TTLS**).

The procedure to configure WPA or WPA2 is different in Windows Vista. See Section 4.6 on page 64 for information on setting up your NWD310N to use WPA or WPA2 in Vista.

Figure 31 Security Settings: WPA/WPA2



The following table describes the labels in this screen.

Table 10 Security Setting: WPA/WPA2

LABEL	DESCRIPTION
Encryption Type	The encryption mechanisms used for WPA/WPA2 and WPA-PSK/WPA2-PSK are the same. The only difference between the two is that WPA-PSK/WPA2-PSK uses a simple common password, instead of user-specific credentials. Select the encryption type (**TKIP** or **AES**) for data encryption. Refer to Section 3.2.1.3 on page 39 for more information.
EAP Type	The type of authentication you use depends on the RADIUS server or AP. Select an authentication method from the drop down list. Options are **TLS**, **PEAP** and **TTLS** (at the time of writing, TTLS is not available in Windows Vista).
Login Name	Enter a user name. This is the user name that you or an administrator set up on a RADIUS server.
Password	This field is not available when you select **TLS** in the **EAP Type** field. Enter the password associated with the user name above.
Certificate	This field is only available when you select **TLS** in the **EAP Type** field. Click **Browse** to select a certificate. Note: 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.
Validate Server Certificate	Select this to verify the certificate of the authentication server. If you select this and click **Next**, the **Server Certificate Setting** screen displays.
PEAP Inner EAP	This field is only available when you select **PEAP** in the **EAP Type** field. The PEAP method used by the RADIUS server or AP for client authentication is **MS CHAP v2**.
TTLS Protocol	This field is available only when you select **TTLS** in the **EAP Type** field. Select a TTLS protocol that the RADIUS server uses. Options are **CHAP**, **MS-CHAP**, **MS-CHAP-V2** and **PAP**.
Back	Click **Back** to go to the **Site Survey** screen to select and connect to another network.
Next	Click **Next** to confirm your selections and advance to the **Summary** screen (refer to Section 4.3.3 on page 55.) If you selected **Validate Server Certificate**, the **Server Certificate Setting** screen displays (refer to Section 4.3.2 on page 55).
Exit	Click **Exit** to return to the **Site Survey** screen without saving.

4.3.1.4 IEEE 802.1x

Configure IEEE 802.1x security with various authentication methods in this screen.

The procedure to configure 802.1x is different in Windows Vista. See Section 4.6 on page 64 for information on setting up your NWD310N to use 802.1x in Vista.

Figure 32 Security Setting: 802.1x

The following table describes the labels in this screen.

Table 11 Security Settings: IEEE 802.1x

LABEL	DESCRIPTION
Encryption Type	Select **WEP** if the access point is configured to use 802.1x with WEP encryption. A dynamic WEP key is generated automatically. Otherwise, select **Disable** (at the time of writing, this is not available in Windows Vista).
EAP Type	The type of authentication you use depends on the RADIUS server or AP. Select an authentication method from the drop down list. Options are **TLS**, **PEAP** and **TTLS** (at the time of writing, TTLS is not available in Windows Vista).
Login Name	Enter a user name. This is the user name that you or an administrator set up on a RADIUS server.
Password	This field is not available when you select **TLS** in the **EAP Type** field. Enter the password associated with the user name above.
Certificate	This field is only available when you select **TLS** in the **EAP Type** field. Click **Browse** to select a certificate. Note: 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.
Validate Server Certificate	Select this to verify the certificate of the authentication server. If you select this and click **Next**, the **Server Certificate Setting** screen displays.
PEAP Inner EAP	This field is only available when you select **PEAP** in the **EAP Type** field. The PEAP method used by the RADIUS server or AP for client authentication is **MS CHAP v2**.

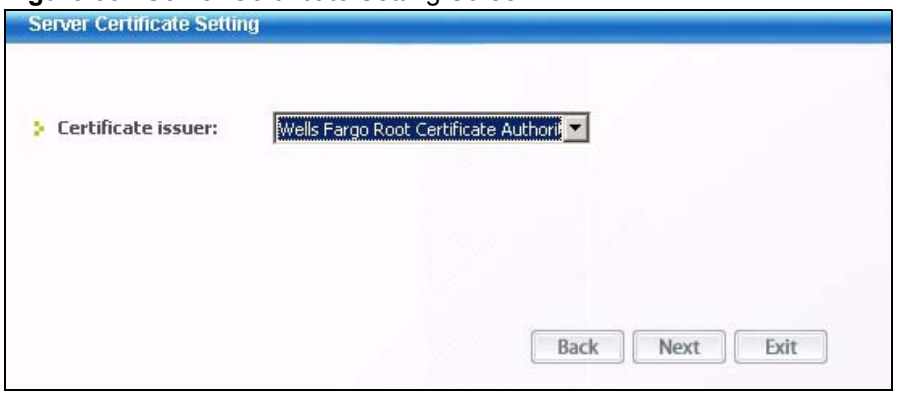
Table 11 Security Settings: IEEE 802.1x

LABEL	DESCRIPTION
Back	Click **Back** to go to the **Site Survey** screen to select and connect to another network.
Next	Click **Next** to confirm your selections and advance to the **Summary** screen (refer to Section 4.3.3 on page 55.) If you selected **Validate Server Certificate**, the **Server Certificate Setting** screen displays (refer to Section 4.3.2 on page 55).
Exit	Click **Exit** to return to the **Site Survey** screen without saving.

4.3.2 Server Certificate Setting Screen

This screen displays if you selected **Validate Server Certificate** in the **WPA**, **WPA2** or **802.1x** screens.

Figure 33 Server Certificate Setting Screen



The following table describes the labels in this screen.

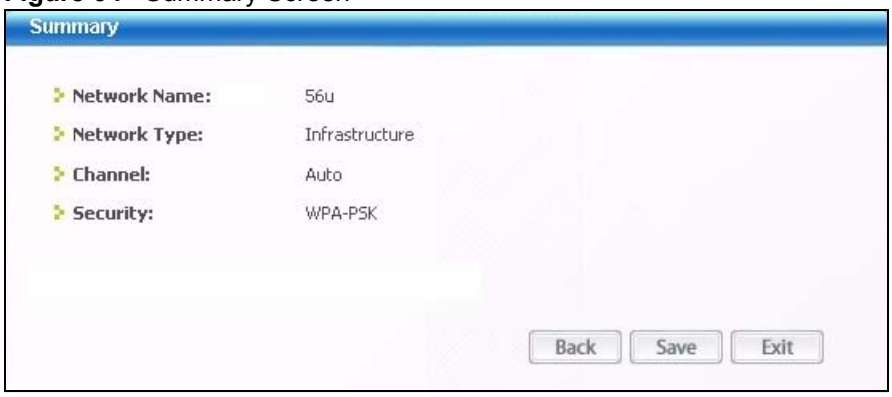
Table 12 Server Certificate Setting

LABEL	DESCRIPTION
Certificate Issuer	Select the name of the certificate authority from the list.
Back	Click **Back** to return to the previous screen.
Next	Click **Next** to continue to the **Summary** screen.
Exit	Click **Exit** to return to the **Site Survey** screen without saving.

4.3.3 Summary Screen

Use this screen to confirm and save the security settings.

Figure 34 Summary Screen



The following table describes the labels in this screen.

Table 13 Summary Screen

LABEL	DESCRIPTION
Network Name (SSID)	This field displays the SSID previously entered.
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 the profile.
Security	This field shows whether data encryption is activated (**WEP**, **WPA**, **WPA-PSK**, **WPA2**, **WPA2-PSK**, **802.1x**) or inactive (**DISABLE**).
Back	Click **Back** to return to the previous screen.
Save	Click **Save** to save the changes back to the NWD310N and display the **Link Info** screen.
Exit	Click **Exit** to discard changes and return to the **Site Survey** screen.

4.4 The Profile Screen

A profile is a set of wireless parameters that you need to connect to a wireless network. With a profile activated, each time you start the NWD310N, it automatically scans for the specific SSID and joins that network with the pre-defined wireless security settings. If the specified network is not available, the NWD310N cannot connect to a network.

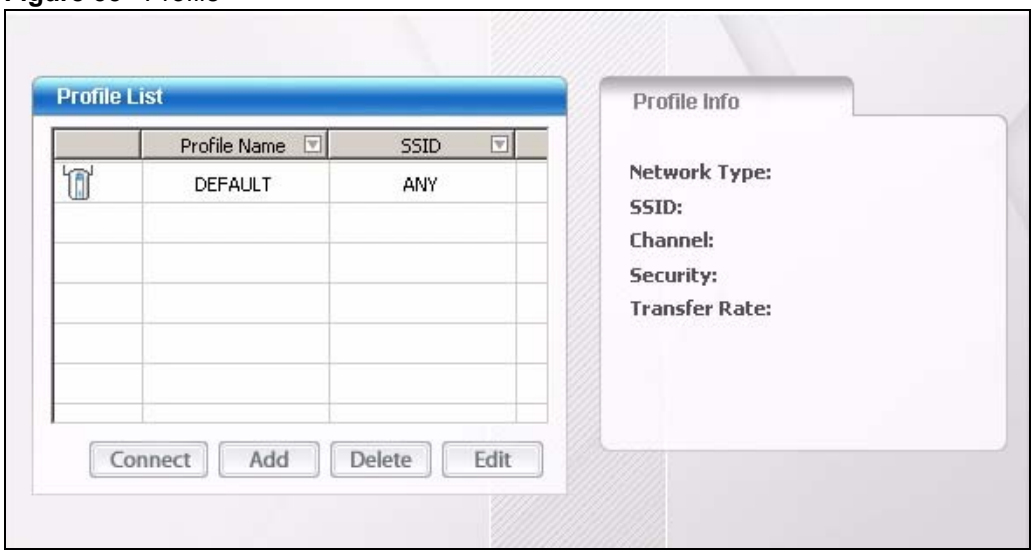
If you do not configure and activate a profile, each time you start the NWD310N, the NWD310N uses the default profile to connect to any available network that has no security enabled.

The default profile is a profile that allows you to connect to any SSID that has no security enabled.

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 35 Profile



The following table describes the labels in this screen.

Table 14 Profile

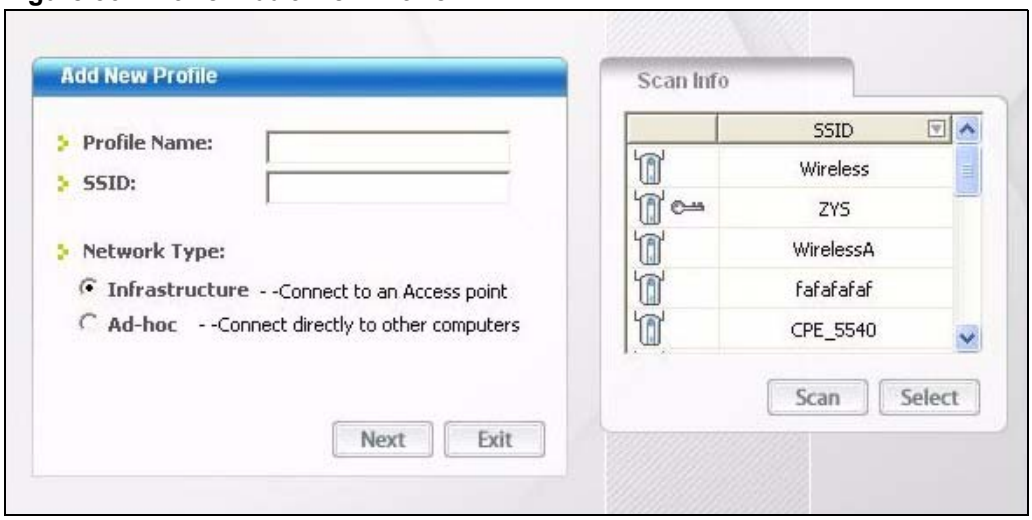
LABEL	DESCRIPTION
Profile List	Click a column heading to sort the entries.
, , or	denotes that the wireless device is in infrastructure mode and the wireless security is activated. denotes that the wireless device is in infrastructure mode but the wireless security is deactivated. denotes that the wireless device is in Ad-Hoc mode and the wireless security is activated. 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 and activate 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	The following fields display detailed 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 network's Service Set IDentity (the name of the network).
Channel	This field displays the channel number used by the profile.
Security	This field shows whether data encryption is activated (**WEP**, **WPA**, **WPA-PSK**, **WPA2**, **WPA2-PSK** or **802.1x**) or inactive (**DISABLE**).
Transfer Rate	This field displays the transmission speed of the selected profile in megabits per second (Mbps).

4.4.1 Adding a New Profile

Follow the steps below to add a new profile.

1 Click **Add** in the **Profile** screen. An **Add New Profile** screen displays as shown next.

Figure 36 Profile: Add a New Profile



The following table describes the labels in this screen.

Table 15 Profile: Add a 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. Otherwise, enter **Any** to have the NWD310N associate to any AP or roam between any infrastructure wireless networks.
Network Type	Select **Infrastructure** to associate to an AP. Select **Ad-Hoc** to associate to a peer computer.
Next	Click **Next** to go to the next screen.
Exit	Click **Exit** to go back to the previous screen without saving.
Scan Info	This table displays the information of the available wireless networks within the transmission range.
, , or	denotes that the wireless device is in infrastructure mode and the wireless security is activated. denotes that the wireless device is in infrastructure mode but the wireless security is deactivated. denotes that the wireless device is in Ad-Hoc mode and the wireless security is activated. 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 AP or peer device.

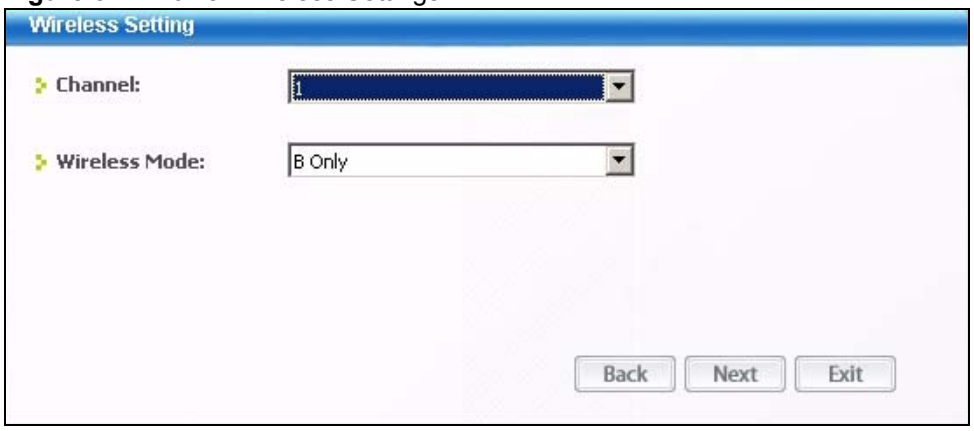
Table 15 Profile: Add a New Profile (continued)

LABEL	DESCRIPTION
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 NWD310N associates to the selected wireless network only.

2 If you select the **Infrastructure** network type in the previous screen, skip to step 3. If you select the **Ad-Hoc** network type in the previous screen, a screen displays as follows. Select a **Channel** number and **Wireless Mode** and click **Next** to continue.

To associate to an ad-hoc network, you must use the same channel as the peer computer.

Figure 37 Profile: Wireless Settings



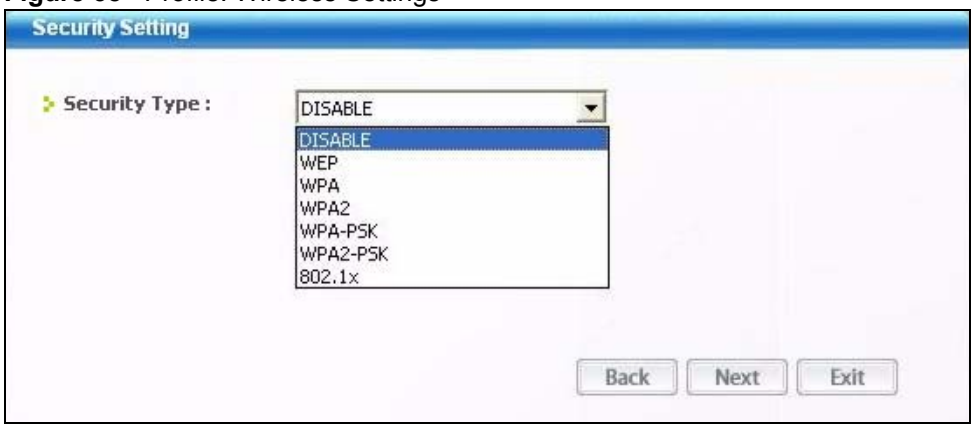
The following table describes the labels in this screen.

Table 16 Profile: Wireless Settings

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	This is the wireless standard the NWD310N uses. In Ad-Hoc mode, you can use only 802.11b or 802.11g.

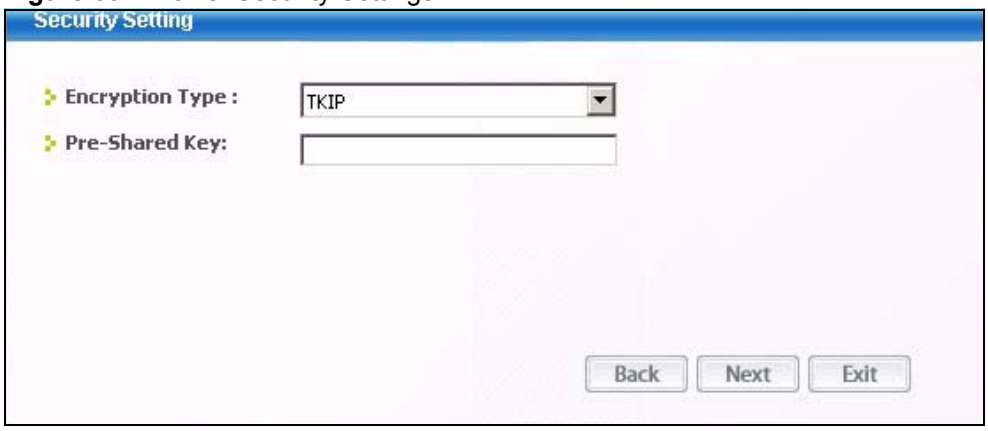
3 If you selected **Infrastructure** network type in the first screen, select **WEP**, **WPA**, **WPA2**, **WPA-PSK**, **WPA2-PSK** or **802.1x** from the drop-down list box to enable data encryption. If you selected **Ad-Hoc** network type in the first screen, you can use only **WEP** encryption method. Otherwise, select **DISABLE** to allow the NWD310N to communicate with the access points or other peer wireless computers without any data encryption, and skip to step 5.

Figure 38 Profile: Wireless Settings



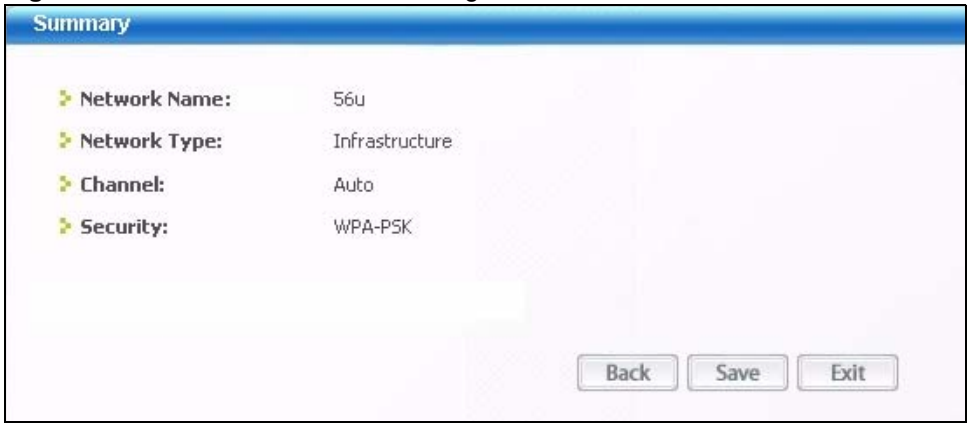
4 The screen varies depending on the encryption method you select in the previous screen. The settings must be exactly the same on the AP or other peer wireless computers as they are on the NWD310N. Refer to Section 4.3.1 on page 51 for detailed information on wireless security configuration.

Figure 39 Profile: Security Settings



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 40 Profile: Confirm New Settings



6 To use this network profile, click the **Activate Now** button. Otherwise, click the **Activate Later** button. You can activate only one profile at a time.

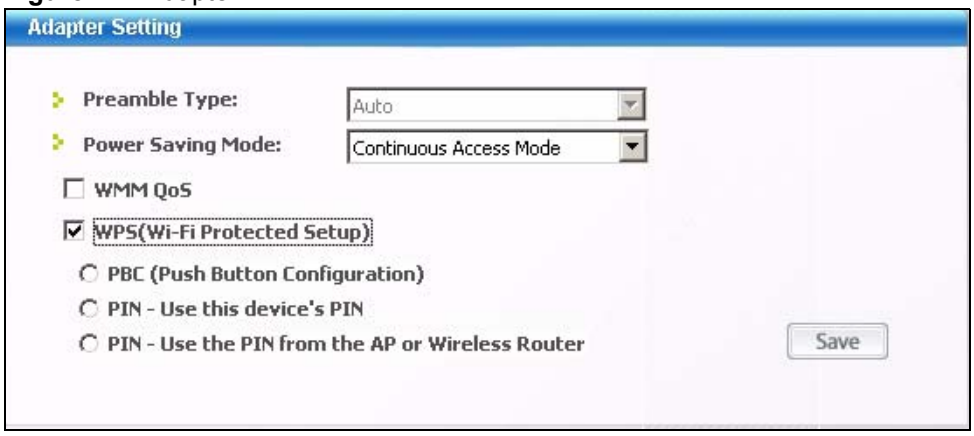
Once you activate a profile, the ZyXEL utility will use that profile the next time it is started.

Figure 41 Profile: Activate the Profile

4.5 The Adapter Screen

To set the other advanced features on the NWD310N, click the **Adapter** tab.

Figure 42 Adapter



The following table describes the labels in this screen.

Table 17 Adapter

LABEL	DESCRIPTION
Adapter Setting	
Preamble Type	Preamble is used to signal that data is coming to the receiver. Short preamble increases performance as less time sending preamble means more time for sending data. All IEEE 802.11b/g compliant wireless adapters support long preamble, but not all support short preamble. The NWD310N automatically uses short preamble when the access point supports it; otherwise the NWD310N uses long preamble. At the time of writing, this field is not available in Windows Vista.

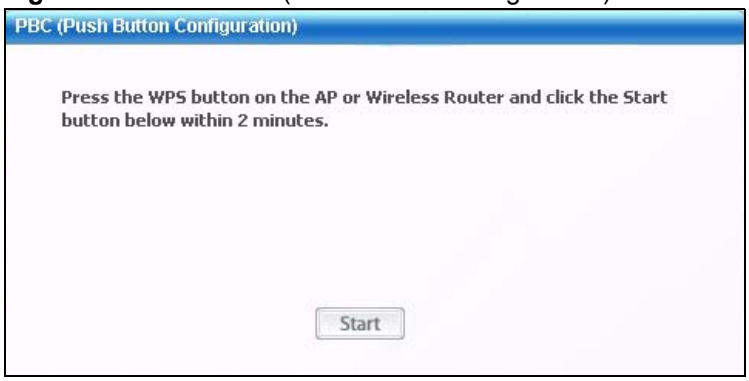
Table 17 Adapter (continued)

LABEL	DESCRIPTION
Power Saving Mode	Select **Fast Power Save** to save power. This forces the NWD310N to go to sleep mode when it is not transmitting data. When you select **Continuous Access Mode**, the NWD310N will never go to sleep mode. At the time of writing, this field is not available in Windows Vista.
WMM QoS	Select this to enable Wi-fi MultiMedia Quality of Service on the NWD310N. At the time of writing, this field is not available in Windows Vista.
WPS (WiFi Protected Setup)	Select this to enable Wi-fi Protected Setup on the NWD310N.
PBC (Push Button Configuration)	Select this to use the PBC (Push-Button Configuration) WPS mode. When you use the PBC mode you do not use a PIN. When you select this, the **PBC (Push Button Configuration** screen appears (see Section 4.5.1 on page 62).
PIN - Use This Device's PIN	Select this to use the PIN (Personal Identification Number) WPS mode. Use this option when you want to enter the NWD310N's PIN in another WPS-enabled device. When you select this, the **PIN - Use this Device's PIN** screen appears (see Section 4.5.2 on page 63).
PIN - Use the PIN From the AP or Wireless Router	Select this to use the PIN (Personal Identification Number) WPS mode. Use this option when you want to enter the PIN from another WPS-enabled device in the NWD310N. When you select this, the **PIN - Use the PIN From the AP or Wireless Router** screen appears (see Section 4.5.3 on page 63).
Save	Click **Save** to save the changes to the NWD310N and return to the **Link Info** screen.

4.5.1 WPS: PBC (Push Button Configuration)

This screen allows you to use the WPS Push Button Configuration mode. See Section 3.3.1 on page 40 for more information. Select **WPS** and **PBC (Push Button Configuration)** in the **Adapter** screen. The following screen displays.

Figure 43 WPS: PBC (Push Button Configuration)

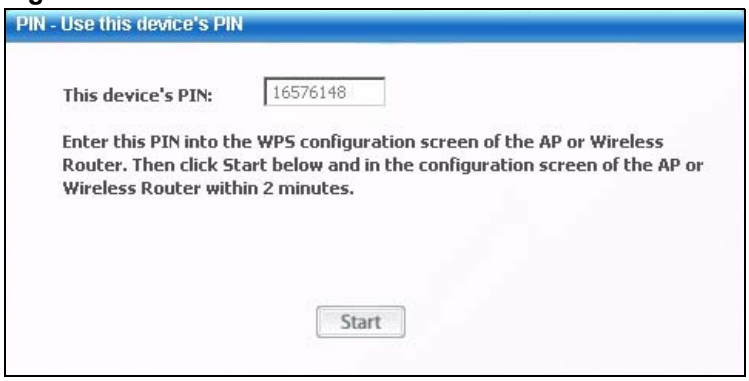


Press **Start** when you want to begin the WPS process. You must also press the button on the other device within two minutes.

4.5.2 WPS: PIN - Use this Device's PIN

This screen allows you to use the WPS Personal Identification Number mode, by entering the NWD310N's unique PIN in the configuration utility of the other WPS-enabled device. See Section 3.3.2 on page 41 for more information. Select **WPS** and **PIN - Use this Device's PIN** in the **Adapter** screen. The following screen displays.

Figure 44 WPS: PIN - Use this Device's PIN



The following table describes the labels in this screen.

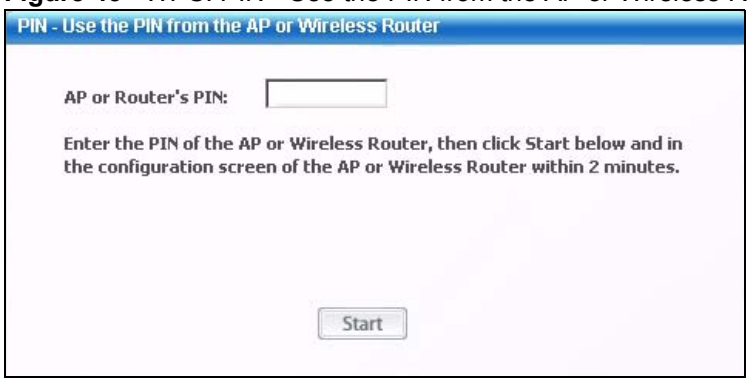
Table 18 WPS: PIN - Use this Device's PIN

LABEL	DESCRIPTION
This device's PIN	This is the NWD310N's Personal Identification Number (PIN). This field is read-only. Enter the number that displays in this field into the configuration interface of the other WPS-enabled device. Note: Each time this screen displays, the PIN is different. The PIN is valid for only one WPS transaction.
Start	Click this to start WPS. You must start WPS on the other WPS-enabled device within two minutes.

4.5.3 WPS: PIN - Use the PIN from the AP or Wireless Router

This screen allows you to use the WPS Personal Identification Number mode, by entering the PIN from another WPS-enabled device into the NWD310N's utility. See Section 3.3.2 on page 41 for more information. Select **WPS** and **PIN - Use the PIN from the AP or Wireless Router** in the **Adapter** screen. The following screen displays.

Figure 45 WPS: PIN - Use the PIN from the AP or Wireless Router



The following table describes the labels in this screen.

Table 19 WPS: PIN - Use the PIN from the AP or Wireless Router

LABEL	DESCRIPTION
AP or Router's PIN	Enter the PIN from your AP or wireless router in this field before you click **Start**.
Start	Click this to start WPS. You must start WPS on the other WPS-enabled device within two minutes.

4.6 Security Settings in Windows Vista

When you use the NWD310N in Windows Vista, the procedure for setting up WPA, WPA2 and 802.1x security settings is different from that of other operating systems (other security types are not affected).

The procedures for setting up WPA, WPA2 or 802.1x in Vista are the same. However, the procedure differs depending on whether you use PEAP (Protected Extensible Authentication Protocol) or TLS (Transport Layer Security) encryption. Consult your network administrator if you are unsure which type of encryption to use.

See section Section 4.6.1 on page 64 to use PEAP, or see section Section 4.6.2 on page 65 to use TLS.

TTLS (Tunneled TLS) is not available when using Windows Vista, at the time of writing.

4.6.1 Using PEAP in Vista

Take the following steps to set up WPA, WPA2 or 802.1x security using PEAP in Windows Vista.

1 Either select the AP to which you want to connect in the **Site Survey** screen (see Section 4.3 on page 49), or configure a profile in the normal way (see Section 4.4 on page 56).

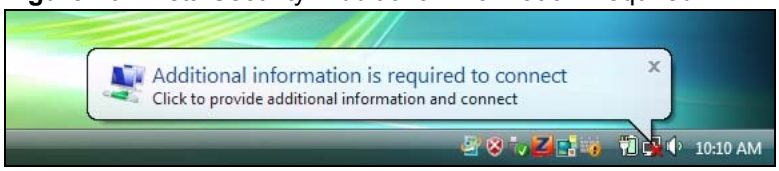
2 In the **WPA**, **WPA2** or **802.1x** security screen (see Section 4.3.1.3 on page 52 and Section 4.3.1.4 on page 54), select **PEAP** as the **EAP Type**. Note that the **Login Name** and **Password** fields are greyed-out (not available).

3 Click **Next**.

4 In the **Summary** screen that appears, click **Save**.

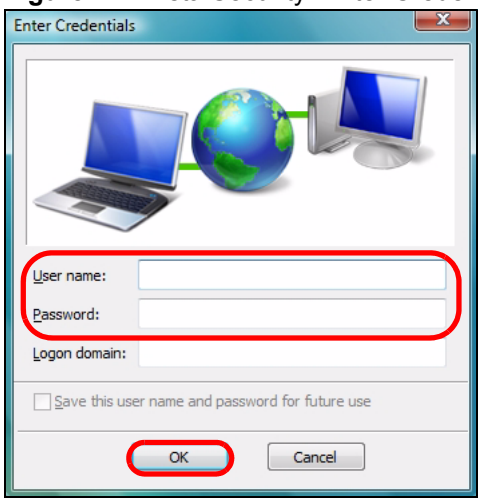
5 A message similar to the following appears in the bottom-right of your screen. Click the message.

Figure 46 Vista Security: Additional Information Required



6 The **Enter Credentials** screen displays. Enter your **User name** and **Password** for the network to which you want to connect.

Figure 47 Vista Security: Enter Credentials



If you are not sure what to enter, contact your network administrator.

7 Click **OK**. The **Enter Credentials** screen disappears and the NWD310N tries to connect to the network. The ZyXEL utility's **Link Info** screen displays, showing the connection status (see Section 4.2 on page 47). If the **Link Info** screen displays an active connection, you have successfully completed the procedure.

4.6.2 Using TLS in Vista

Take the following steps to set up WPA, WPA2 or 802.1x security using TLS in Windows Vista.

1 Either select the AP to which you want to connect in the **Site Survey** screen (see Section 4.3 on page 49), or configure a profile (see Section 4.4 on page 56) in the normal way.

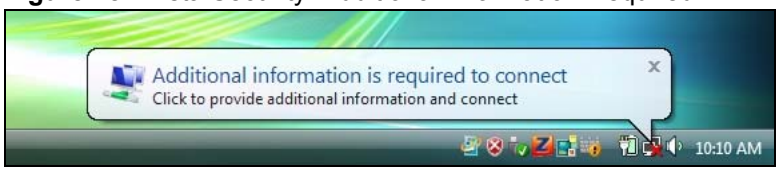
2 In the **WPA**, **WPA2** or **802.1x** security screen, select **TLS** as the **EAP Type**. Note that the **Login Name**, **Certificate** and **Validate Server Certificate** fields are not available (greyed-out).

3 Click **Next**.

4 In the **Summary** screen, click **Save**.

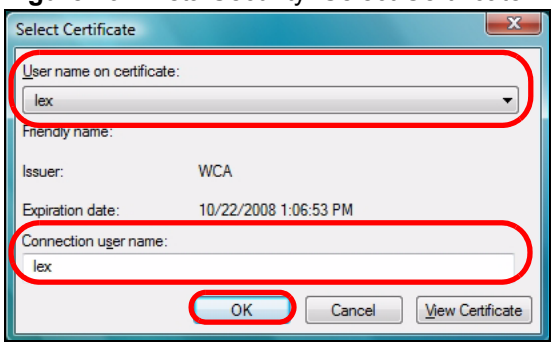
A message similar to the following appears in the bottom-right of your screen. Click the message.

Figure 48 Vista Security: Additional Information Required



5 The **Select Certificate** screen displays. Select the certificate you want to use, and enter your username.

Figure 49 Vista Security: Select Certificate



If you do not have the right certificate, or are not sure which certificate you should use, contact your network administrator.

6 Click **OK**. The **Select Certificate** screen disappears and the NWD310N tries to connect to the network. The ZyXEL utility's **Link Info** screen displays, showing the connection status (see Section 4.2 on page 47). If the **Link Info** screen displays an active connection, you have successfully completed the procedure.

5

Maintenance

This chapter describes how to uninstall or upgrade the ZyXEL utility.

5.1 The About Screen

The **About** screen displays driver and utility version numbers of the NWD310N. To display the screen as shown below, click the about ( ) button.

Figure 50 About

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

Table 20 About

LABEL	DESCRIPTION
Driver Version	This field displays the version number of the NWD310N 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.

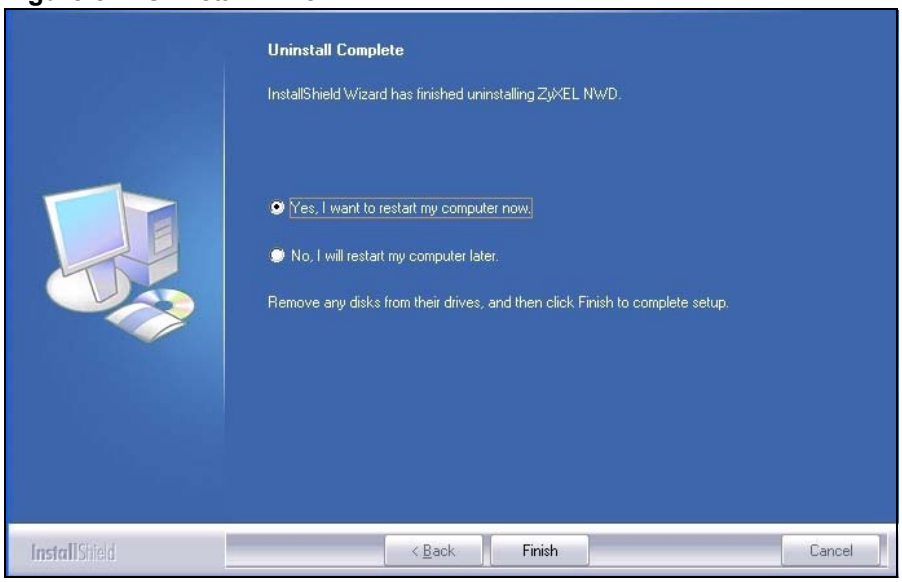
Before you uninstall the ZyXEL utility, take note of your current wireless configurations.

1 Click **Start**, **(All) Programs**, **ZyXEL Wireless N PCI Utility**, **Uninstall ZyXEL Wireless N PCI Adapter Utility**.
2 When prompted, click **OK** or **Yes** to remove the driver and the utility software.

Figure 51 Uninstall: Confirm

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

Figure 52 Uninstall: Finish



5.3 Upgrading the ZyXEL Utility

Before you uninstall the ZyXEL utility, take note of your current wireless configurations.

To perform the upgrade, follow the steps below.

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

2. Follow the steps in Section 5.2 on page 67 to remove the current ZyXEL utility from your computer.
3. Restart your computer when prompted.
4. Disconnect the NWD310N from your computer.
5. Double-click on the setup program for the new utility to start the ZyXEL utility installation.
6. Insert the NWD310N and check the version numbers in the **About** screen to make sure the new utility is installed properly.

PART II
Troubleshooting and Specifications

6

Troubleshooting

This chapter offers some suggestions to solve problems you might encounter. The potential problems are divided into the following categories.

- Power, Hardware Connections, and LEDs
- Accessing the Utility
- Link Quality
- Problems Communicating with Other Computers

6.1 Power, Hardware Connections, and LEDs

The NWD310N does not turn on. None of the LEDs turn on.

1. Make sure the NWD310N is correctly installed (refer to your Quick Start Guide).
2. Restart the computer to which the NWD310N is attached.
3. If the problem continues, contact the vendor.

One of the LEDs does not behave as expected.

1. Make sure you understand the normal behavior of the LED. See Section 1.1 on page 21.
2. Check the hardware connections. See the Quick Start Guide and Section 1.1 on page 21.
3. Restart the computer to which the NWD310N is attached.
4. If the problem continues, contact the vendor.

6.2 Accessing the Utility

I cannot access the Utility

1. Make sure the NWD310N is properly inserted and the LEDs are on. Refer to the Quick Start Guide for the LED descriptions.
2. Use the **Device Manager** to check for possible hardware conflicts. Click **Start**, **Settings**, **Control Panel**, **System**, **Hardware** and **Device Manager**. Verify the status of the NWD310N under **Network Adapter** (steps may vary depending on the version of Windows).
3. Install the NWD310N in another computer.
4. If the error persists, you may have a hardware problem. In this case, you should contact your vendor.

6.3 Link Quality

The link quality and/or signal strength is poor.

1. Scan for and connect to another AP with a better link quality using the **Site Survey** screen.
2. Move your computer closer to the AP or the peer computer(s) within the transmission range.
3. There may be too much radio interference (for example from a microwave oven, or another AP using the same channel) around your wireless network. Lower the output power of each AP.
4. Make sure there are not too many wireless stations connected to a wireless network.

6.4 Problems Communicating with Other Computers

The computer with the NWD310N installed cannot communicate with the other computer(s).

In Infrastructure Mode

- Make sure that the AP and the associated computers are turned on and working properly.
- Make sure the NWD310N computer and the associated AP use the same SSID.
- Change the AP and the associated wireless clients to use another radio channel if interference is high.
- Make sure that the computer and the AP share the same security option and key. Verify the settings in the **Profile Security Setting** screen.
- If you are using WPA(2) or WPA(2)-PSK security, try changing your encryption type from TKIP to AES or vice versa.

In Ad-Hoc (IBSS) Mode

- Verify that the peer computer(s) is turned on.
- Make sure the NWD310N computer and the peer computer(s) are using the same SSID and channel.
- Make sure that the computer and the peer computer(s) share the same security settings.
- Change the wireless clients to use another radio channel if interference is high.

7

Product Specifications

Table 21 Product Specifications

PHYSICAL AND ENVIRONMENTAL	
Product Name	NWD310N Draft 2.0 802.11n Wireless PCI Adapter
Interface	PCI bus 2.3
Standards	IEEE 802.11b IEEE 802.11g IEEE 802.11n (Draft 2.0)
Operating Temperature	0 ~ 55 degrees Celsius
Storage Temperature	-10 ~ 65 degrees Celsius
Operating Humidity	20 ~ 95 % (non-condensing)
Storage Humidity	20 ~ 95 % (non-condensing)
Power Consumption	TX: < 750 mA RX: < 650mA
Voltage	3.3 V
Weight	40 g
Dimensions	122 x 121 x 221 mm
RADIO SPECIFICATIONS	
Media Access Protocol	IEEE 802.11
Frequency	Industrial Scientific Medical Band 2.4 ~ 2.4835 GHz
Operating Channels	North American and Taiwan: 11 Europe: 13
Data Rate	IEEE 802.11b: 11Mbps with automatic fallback to 5.5, 2, 1 Mbps IEEE 802.11g: 54Mbps with automatic fallback to 48, 36, 24, 18, 12, 9, 6 Mbps IEEE 802.11n (draft): up to 300 Mbps
Modulation	IEEE 802.11b: CCK (11 and 5.5 Mbps), DQPSK (2 Mbps) and DBPSK (1 Mbps) IEEE 802.11g: OFDM with BPSK, QPSK and 16/64-QAM sub-Carrier modulations IEEE 802.11n (draft):
Average Output Power	Tolerance: +/- 1.5dBm IEEE 802.11b: 18 dBm at 11 Mbps IEEE 802.11g: 15 dBm at 54 Mbps IEEE 802.11n (draft): 15 dBm at HT20, 13 dBm at HT40

Table 21 Product Specifications (continued)

Receiver Sensitivity	Tolerance: +/- 1 dBm IEEE 802.11b: -84 dBm at 11 Mbps IEEE 802.11g: -72 dBm at 54 Mbps IEEE 802.11n (draft): -70 dBm at HT20, -67 dBm at HT40
SOFTWARE SPECIFICATIONS	
Device Drivers	Windows Vista Windows XP 64-bit Windows XP Windows 2000 MAC OS 10.3 & 10.4
Security	64/128/152-bit WEP WPA/WPA-PSK/WPA2/WPA2-PSK IEEE 802.1x WPS (WiFi Protected Setup) Certified
Roaming	IEEE 802.11b/g/n compliant

PART III Appendices and Index

The appendices provide general information. Some details may not apply to your NWD310N.

A

Setting up Your Computer's IP Address

The purpose of this appendix is to show you how to configure an IP address on your computer depending on what operating system you have. It does NOT mean that your NWD310N supports all these operating systems. To see what operating systems your NWD310N supports, refer to Chapter 7 on page 77.

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

Windows 95/98/Me/NT/2000/XP/Vista, 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.

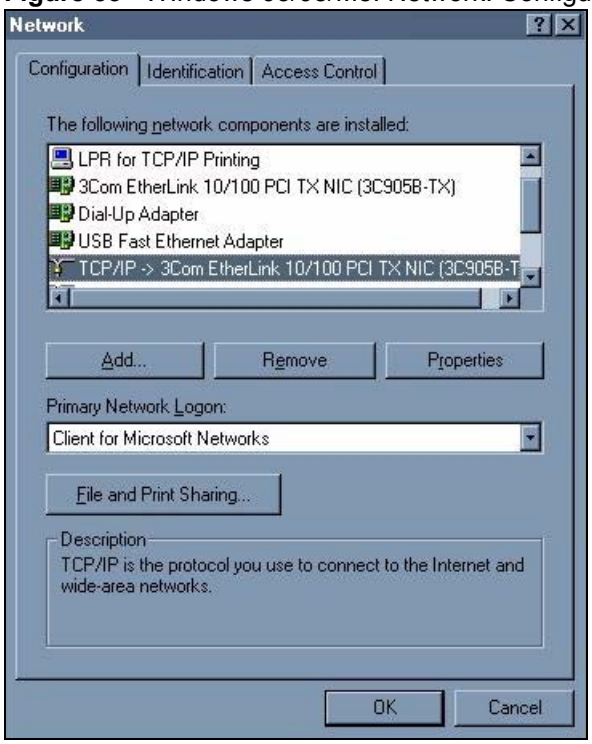
After the appropriate TCP/IP components are installed, configure the TCP/IP settings in order to "communicate" with your network.

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 NWD310N's LAN port.

Windows 95/98/Me

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

Figure 53 WIndows 95/98/Me: Network: Configuration



Installing Components

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:

1. In the **Network** window, click **Add**.
2. Select **Adapter** and then click **Add**.
3. Select the manufacturer and model of your network adapter and then click **OK**.

If you need TCP/IP:

1. In the **Network** window, click **Add**.
2. Select **Protocol** and then click **Add**.
3. Select **Microsoft** from the list of **manufacturers**.
4. Select **TCP/IP** from the list of network protocols and then click **OK**.

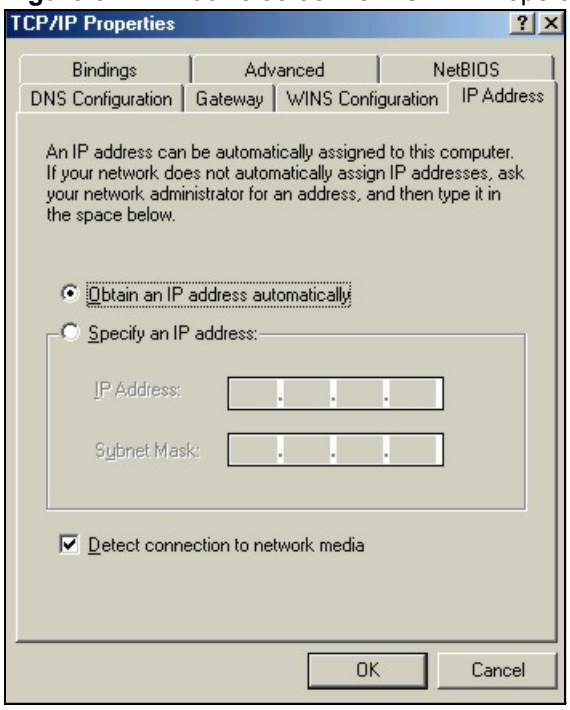
If you need Client for Microsoft Networks:

1. Click **Add**.
2. Select **Client** and then click **Add**.
3. Select **Microsoft** from the list of manufacturers.
4. Select **Client for Microsoft Networks** from the list of network clients and then click **OK**.
5. Restart your computer so the changes you made take effect.

Configuring

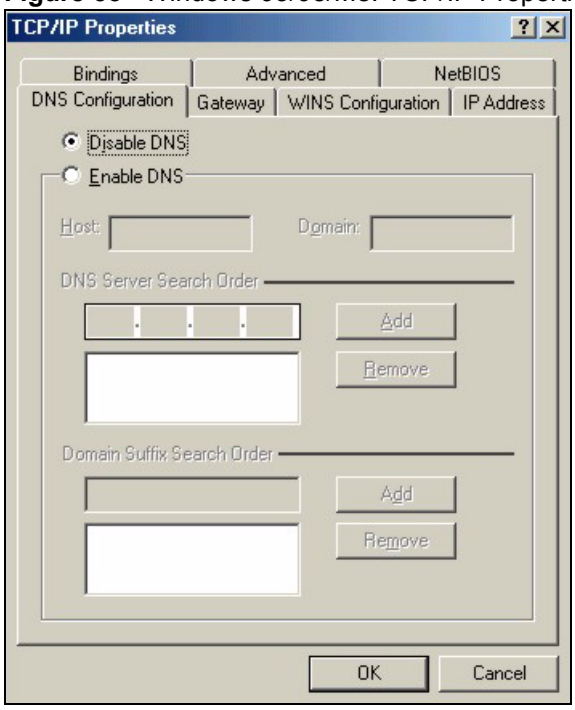
1. In the **Network** window **Configuration** tab, select your network adapter's TCP/IP entry and click **Properties**
2. Click the **IP Address** tab.
   - If your IP address is dynamic, select **Obtain an IP address automatically**.
   - If you have a static IP address, select **Specify an IP address** and type your information into the **IP Address** and **Subnet Mask** fields.

Figure 54 Windows 95/98/Me: TCP/IP Properties: IP Address



3. 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).

Figure 55 Windows 95/98/Me: TCP/IP Properties: DNS Configuration



4 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**.
5 Click **OK** to save and close the **TCP/IP Properties** window.
6 Click **OK** to close the **Network** window. Insert the Windows CD if prompted.
7 Turn on your NWD310N and restart your computer when prompted.

Verifying Settings

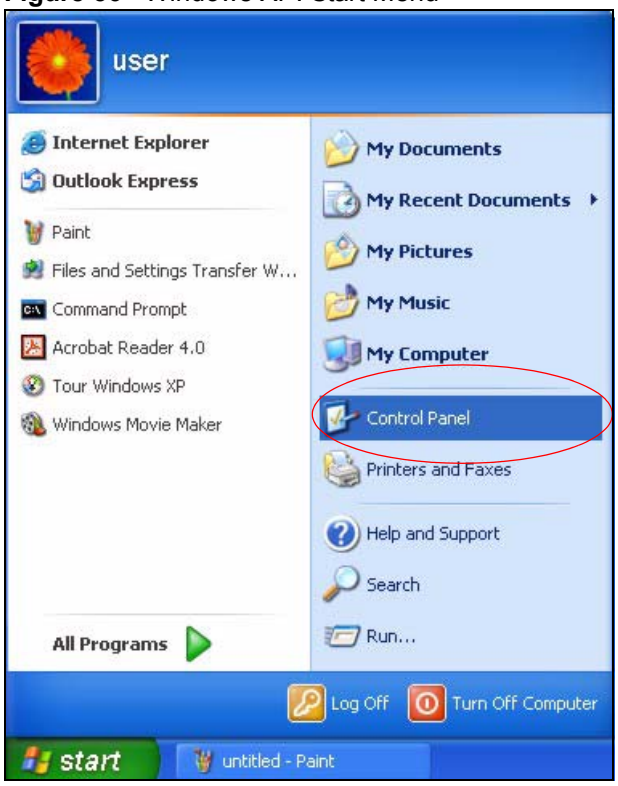
1 Click **Start** and then **Run**.
2 In the **Run** window, type "winipcfg" and then click **OK** to open the **IP Configuration** window.
3 Select your network adapter. You should see your computer's IP address, subnet mask and default gateway.

Windows 2000/NT/XP

The following example figures use the default Windows XP GUI theme.

1 Click **start** (**Start** in Windows 2000/NT), **Settings**, **Control Panel**.

Figure 56 Windows XP: Start Menu

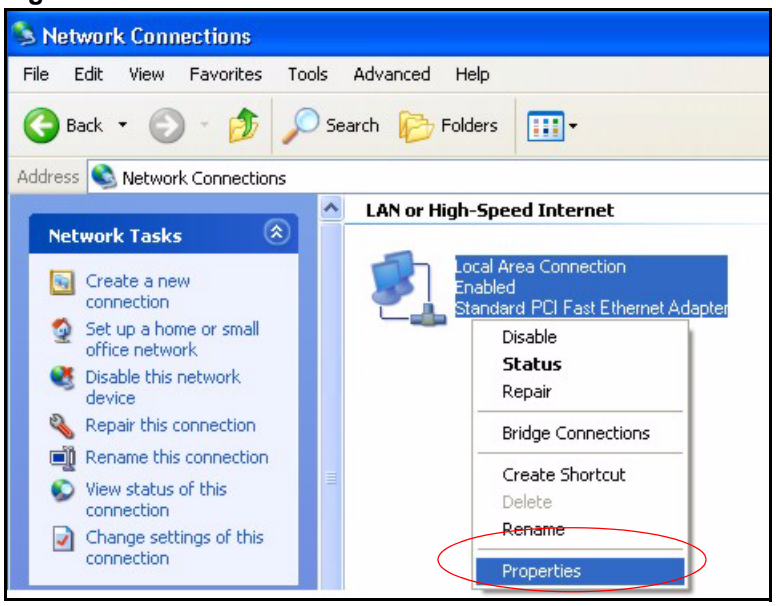


2 In the **Control Panel**, double-click **Network Connections** (**Network and Dial-up Connections** in Windows 2000/NT).

Figure 57 Windows XP: Control Panel

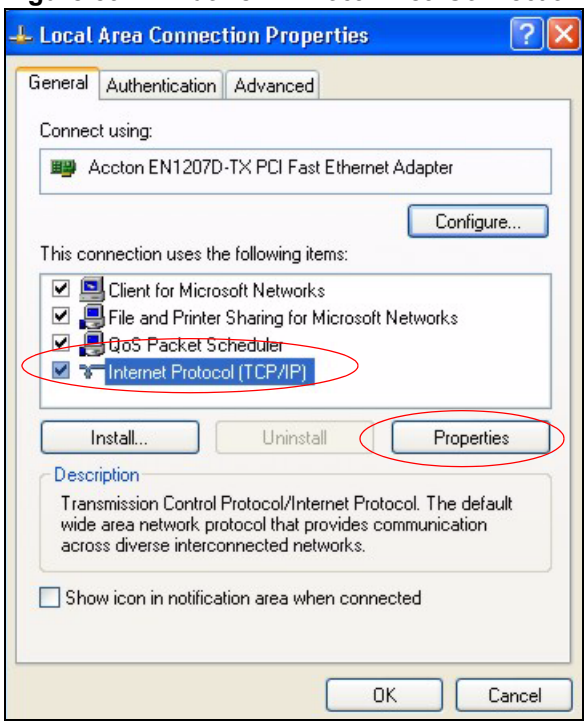
3 Right-click **Local Area Connection** and then click **Properties**.

Figure 58 Windows XP: Control Panel: Network Connections: Properties



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

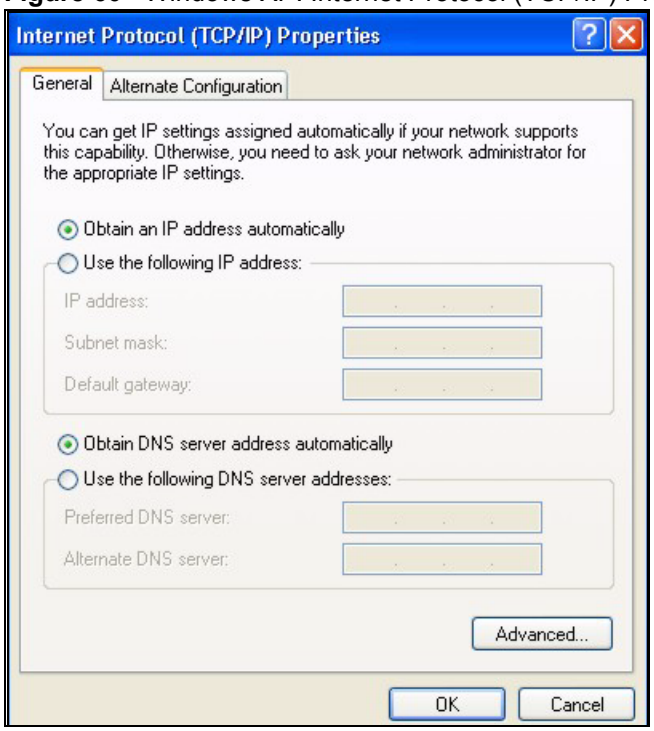
Figure 59 Windows XP: Local Area Connection Properties



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**.

Figure 60 Windows XP: Internet Protocol (TCP/IP) Properties

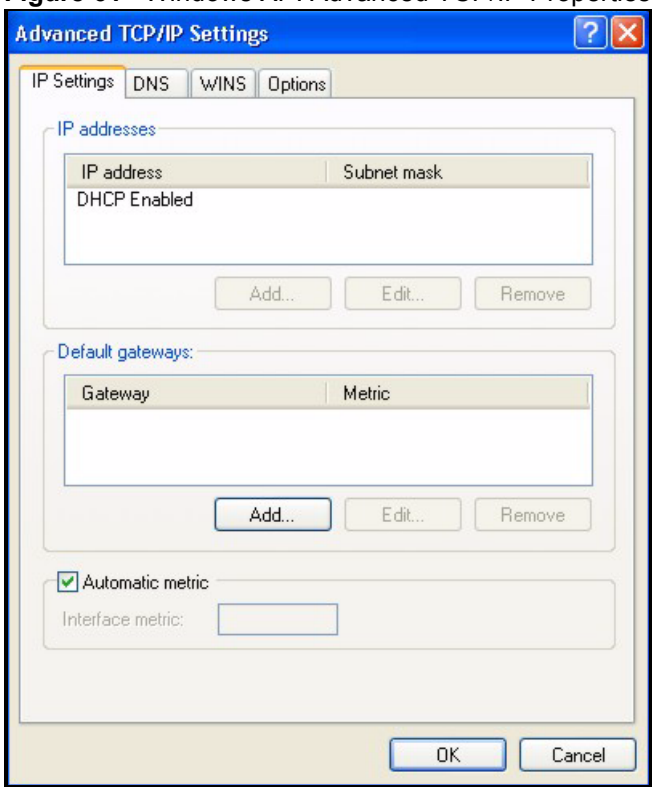


6 If you do not know your gateway's IP address, remove any previously installed gateways in the **IP Settings** tab and click **OK**.

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.

Figure 61 Windows XP: Advanced TCP/IP Properties

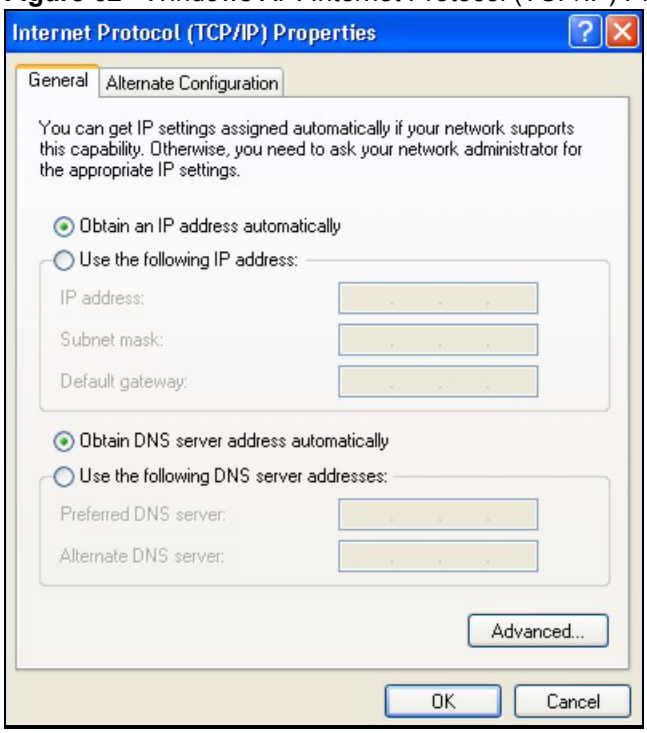


7 In the **Internet Protocol TCP/IP Properties** window (the **General** tab in Windows XP):

- 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.

Figure 62 Windows XP: Internet Protocol (TCP/IP) Properties



8 Click **OK** to close the **Internet Protocol (TCP/IP) Properties** window.

9 Click **Close** (**OK** in Windows 2000/NT) to close the **Local Area Connection Properties** window.

10 Close the **Network Connections** window (**Network and Dial-up Connections** in Windows 2000/NT).

11 Turn on your NWD310N and restart your computer (if prompted).

Verifying Settings

1 Click **Start**, **All Programs**, **Accessories** and then **Command Prompt**.

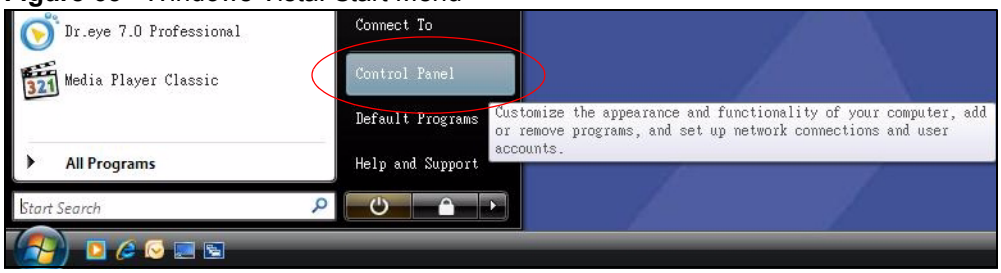
2 In the **Command Prompt** window, type "ipconfig" and then press [ENTER]. You can also open **Network Connections**, right-click a network connection, click **Status** and then click the **Support** tab.

Windows Vista

This section shows screens from Windows Vista Enterprise Version 6.0.

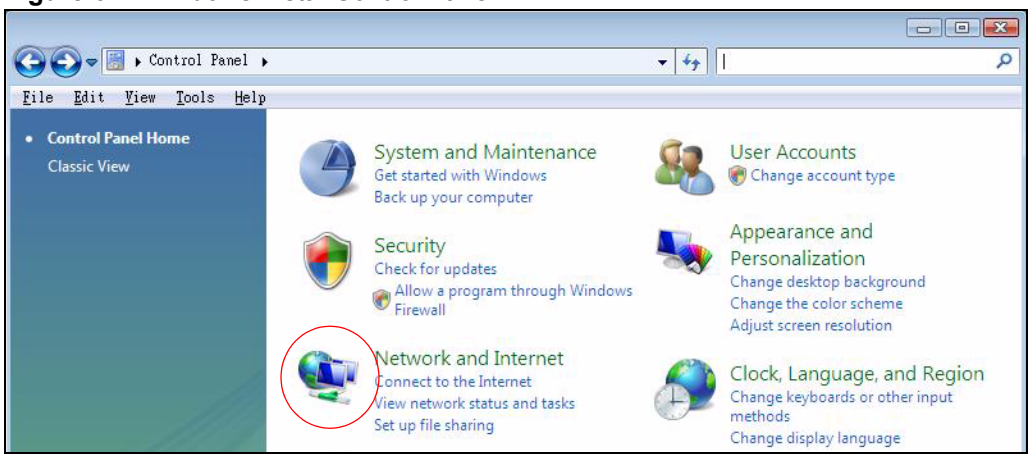
1 Click the **Start** icon, **Control Panel**.

Figure 63 Windows Vista: Start Menu



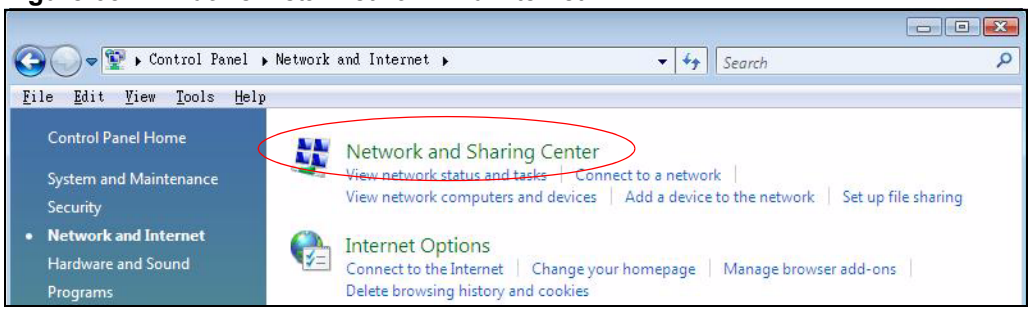
2 In the **Control Panel**, double-click **Network and Internet**.

Figure 64 Windows Vista: Control Panel



3 Click **Network and Sharing Center**.

Figure 65 Windows Vista: Network And Internet



4 Click **Manage network connections**.

Figure 66 Windows Vista: Network and Sharing Center