User Manual for the NETGEAR RangeMax™ Wireless PC Card WPN511

NETGEAR

Technical Support

Please refer to the support information card that shipped with your product. By registering your product at *http://www.netgear.com/register*, we can provide you with faster expert technical support and timely notices of product and software upgrades.

NETGEAR, INC. Support Information

Phone: 1-888-NETGEAR, for US & Canada only. For other countries, see your Support information card.

E-mail: support@netgear.com

Web site: *http://www.netgear.com*

Statement of Conditions

In the interest of improving internal design, operational function, and/or reliability, NETGEAR reserves the right to make changes to the products described in this document without notice.

NETGEAR does not assume any liability that may occur due to the use or application of the product(s) or circuit layout(s) described herein.

Certificate of the Manufacturer/Importer

It is hereby certified that the Model WPN511 Wireless PC Card has been suppressed in accordance with the conditions set out in the BMPT- AmtsblVfg 243/1991 and Vfg 46/1992. The operation of some equipment (for example, test transmitters) in accordance with the regulations may, however, be subject to certain restrictions. Please refer to the notes in the operating instructions.

Federal Office for Telecommunications Approvals has been notified of the placing of this equipment on the market and has been granted the right to test the series for compliance with the regulations.

VCCI Statement

This equipment is in the Class B category (information equipment to be used in a residential area or an adjacent area thereto) and conforms to the standards set by the Voluntary Control Council for Interference by Data Processing Equipment and Electronic Office Machines aimed at preventing radio interference in such residential areas. When used near a radio or TV receiver, it may become the cause of radio interference. Read instructions for correct handling.

FCC Information to User

This product does not contain any user serviceable components and is to be used with approved antennas only. Any product changes or modifications will invalidate all applicable regulatory certifications and approvals

FCC Guidelines for Human Exposure

In order to comply with RF exposure limits established in the ANSI C95.1 standards, the user is advised to maintain a distance of at least 1 inch (2.5 cm) from the antenna of this device while it is in use.

Declaration Of Conformity

We NETGEAR, Inc., 4500 Great America Parkway, Santa Clara, CA 95054, declare under our sole responsibility that the model WPN511 Cardbus Card Wireless Adapter complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

• This device may not cause harmful interference, and

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

Regulatory Compliance Information

This section includes user requirements for operating this product in accordance with National laws for usage of radio spectrum and operation of radio devices. Failure of the end-user to comply with the applicable requirements may result in unlawful operation and adverse action against the end-user by the applicable National regulatory authority.
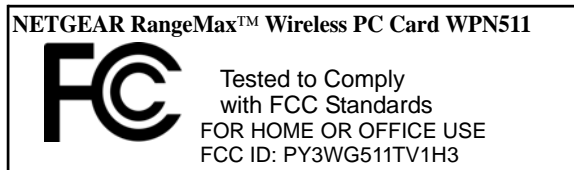
NOTE: This product's firmware limits operation to only the channels allowed in a particular Region or Country. Therefore, all options described in this user's guide may not be available in your version of the product.

FCC Requirements for Operation in the United States

Radio Frequency Interference Warnings & Instructions

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

• Reorient or relocate the receiving antenna

• Increase the separation between the equipment and the receiver

• Connect the equipment into an electrical outlet on a circuit different from that which the radio receiver is connected

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

NETGEAR RangeMax™ Wireless PC Card WPN511
FC   Tested to Comply with FCC Standards FOR HOME OR OFFICE USE FCC ID: PY3WG511TV1H3

Modifications made to the product, unless expressly approved by NETGEAR, Inc., could void the user's right to operate the equipment.

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Export Restrictions

This product or software contains encryption code which may not be exported or transferred from the US or Canada without an approved US Department of Commerce export license.

Canadian Department of Communications Radio Interference Regulations

This digital apparatus (NETGEAR RangeMax™ Wireless PC Card WPN511) does not exceed the Class B limits for radio-noise emissions from digital apparatus as set out in the Radio Interference Regulations of the Canadian Department of Communications.

Canada ID: 4054A-WG51TV13

Product and Publication Details

Model Number:	WPN511
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Chapter 1
About This Manual

Congratulations on your purchase of the NETGEAR RangeMax™ Wireless PC Card WPN511. The WPN511 provides connection for multiple personal computers to the Internet through an external broadband access device (such as a cable modem or DSL modem).

Audience, Scope, Conventions

This manual uses the following typographical conventions:

Table 1-1.   **Typographical conventions**

italics	Emphasis.
bold	User input.
SMALL CAPS	File and directory names.

This manual uses the following formats to highlight special messages:

→	**Note:** This format is used to highlight information of importance or special interest.

This manual is written according to these specifications:

Table 1-2.   **Manual Specifications**

Product Version	NETGEAR RangeMax™ Wireless PC Card WPN511
Manual Part Number	202-10077-01
Manual Publication Date	February 2005

→	**Note:** Product updates are available on the NETGEAR Web site at *http://www.netgear.com/support/main.asp*.

How to Print this Manual

To print this manual you can choose one of the following several options, according to your needs.

- **Printing a Chapter**. Use the   PDF of This Chapter   link at the top right of any page.

    – Click "PDF of This Chapter" link at the top right of any page in the chapter you want to print. A new browser window opens showing the PDF version of the chapter you were viewing.
    – Click the print icon in the upper left of the window.
    – **Tip**: If your printer supports printing two pages on a single sheet of paper, you can save paper and printer ink by selecting this feature.

- **Printing the Full Manual**. Use the PDF button in the toolbar at the top right of the browser window.

    – Click PDF button. A new browser window opens showing the PDF version of the chapter you were viewing.
    – Click the print icon in the upper left of the window.
    – **Tip**: If your printer supports printing two pages on a single sheet of paper, you can save paper and printer ink by selecting this feature.

Chapter 2
Introduction

This chapter introduces the features, package contents, and appearance of the NETGEAR RangeMax™ Wireless PC Card WPN511.

About the NETGEAR RangeMax™ Wireless PC Card WPN511

The NETGEAR RangeMax™ Wireless PC Card WPN511 gives you ultimate mobility in your office or while you are traveling. It frees you from traditional Ethernet wiring and helps you create a wireless network for sharing your broadband cable or DSL Internet access among multiple PCs in and around your home. It is designed for notebook computers running Microsoft® Windows®. It is both 16-bit PCMCIA and 32-bit CardBus compatible and works in any available PCMCIA or CardBus slot.

Its auto-sensing capability allows high packet transfer at up to 108 Mbps for maximum throughput or dynamic range shifting to lower speeds due to distance or operating limitations in an environment with a lot of electromagnetic interference.

The WPN511 Wireless PC Card provides reliable, standards-based 802.11b 11 Mbps WLAN connectivity that is protected with industry-standard security. In addition, it offers the faster speeds of the soon-to-be ratified 802.11g standard. It works with Windows 98, Me, 2000, and XP operating systems.

Key Features and Related NETGEAR Products

The WPN511 Wireless PC Card provides the following features:

- Reliable IEEE 802.11g and b standards-based wireless technology.
- Supports roaming between access points when configured in Infrastructure mode.
- 108 Mbps high speed data transfer. Wireless nodes negotiate to operate in the optimal data transfer rate. In a noisy environment or when the distance between the wireless nodes is far, the wireless nodes automatically fall back to operate at lower transfer rates.

- High level of data encryption using128-bit Shared Key WEP data encryption method. A lower level of data encryption or no data encryption is available to simplify your network setup or to improve data transfer rate.

What's in the Box?

The product package should contain the following items:

- NETGEAR RangeMax™ Wireless PC Card WPN511
- Installation Guide for the NETGEAR RangeMax™ Wireless PC Card WPN511
- *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD*, including:
  - Driver and Configuration Utility Software
  - User Manual for the NETGEAR RangeMax™ Wireless PC Card WPN511
  - Animated Network Properties Configuration Tutorial
  - PC Networking Tutorial
- Warranty card
- Support information card

If any of the parts are incorrect, missing, or damaged, contact your NETGEAR dealer. Keep the carton, including the original packing materials, in case you need to return the product for repair.

The NETGEAR RangeMax™ Wireless PC Card WPN511 has two interfaces:

- The PCMCIA Type II connector connects to any notebook PC with an available PCMCIA or CardBus slot.

- The wireless interface of the NETGEAR RangeMax™ Wireless PC Card WPN511 remains outside of the notebook PC chassis when the wireless PC card is inserted into a notebook. The LED indicates the wireless link condition and signal quality of the NETGEAR RangeMax™ Wireless PC Card WPN511 with another wireless node or the associated access point.

A Road Map for 'How to Get There From Here'

The introduction and adoption of any new technology can be a difficult process. Wireless technology has removed one of the barriers to networking—running wires. It allows more people to try networking while at the same time exposes them to the inherent complexity of networking. General networking concepts, setup, and maintenance can be difficult to understand. In addition, wireless technology adds issues, such as range, interference, signal quality, and security to the picture.

To help overcome potential barriers to successfully using wireless networks, the table below identifies how to accomplish such things as connecting to a wireless network, assuring appropriate security measures are taken, browsing the Internet through your wireless connection, exchanging files with other computers and using printers in the combined wireless and wired network.

Table 2-1.   A Road Map for How to Get There From Here ...

If I Want To ... ?	What Do I Do?	What's Needed?	How Do I?
Connect to a wireless network	1. Identify the wireless network name (SSID) and, if used, the wireless security settings. 2. Set up the NETGEAR RangeMax™ Wireless PC Card WPN511 with the settings from step 1.	1. A wireless network 2. A notebook PC within the operating range of the wireless network. For guidelines about the range of wireless networks, see "Observing Location and Range Guidelines" on page 3-2.	To set up the WPN511, see Chapter 3, "Basic Setup" and follow the instructions provided. To learn about wireless networking technology, see Appendix B, "Wireless Networking Basics" for a general introduction.

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Table 2-1.   A Road Map for How to Get There From Here ...

If I Want To ... ?	What Do I Do?	What's Needed?	How Do I?
Protect my wireless connection from snooping, hacking, or information theft.	1. Assure that the wireless network has security features enabled. 2. Configure my WPN511 with the security settings of the wireless network. 3. Use Windows security features.	1. A wireless network with authentication and WEP encryption enabled. 2. Wireless networking equipment that supports WEP encryption, such as the WPN511 and all NETGEAR wireless networking products.	To learn about wireless networking security, see "Authentication and WEP" on page B-2. To use WEP security features, see "Enabling Wireless Security Features" on page 4-7 and configure your WPN511 accordingly.
Note: Secure Internet sites such as banks and online merchants use encryption security built into browsers like Internet Explorer and Netscape. Any wireless networking security features you might implement are in addition to those already in place on secure Internet sites.			
Connect to the Internet over my wireless network.	1. Activate my wireless link and verify my network connection. 2. Open an Internet browser such as Internet Explorer or Netscape Navigator.	1. An active Internet connection like those from cable or DSL service providers. 2. A wireless network connected to the cable or DSL Internet service through a cable/DSL router as illustrated in "Connecting to an Access Point in Infrastructure Mode" on page 4-2. 3. TCP/IP Internet networking software installed and configured on my notebook PC according to the requirements of the Internet service provider. 4. A browser like Internet Explorer or Netscape Navigator.	To configure your WPN511 in Infrastructure Mode, see "Basic Installation Instructions" on page 3-3, and locate the section for your version of Windows. For assistance with configuring the TCP/IP Internet software on a PC, see "Preparing Your Computers for TCP/IP Networking" on page C-1 or refer to the PC Networking Tutorial on the *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD* and the Help information provided in the Windows system you are using. .

Table 2-1. **A Road Map for How to Get There From Here ...**

If I Want To ... ?	What Do I Do?	What's Needed?	How Do I?
Exchange files between a wirelessly connected notebook computer and other computers in a my combined wireless and wired network.	1. Use the Windows Network Neighborhood feature to browse for computers in the combined wireless and wired network. 2. Browse the hard drive of the target computer in the network in order to locate the directory or files you want to work with. 3. Use the Windows Explorer copy and paste functions to exchange files between the computers.	1. The notebook computer I am using to connect to the wireless network needs to be configured with the Windows Client and File and Print Sharing. 2. The notebook computer I am using to connect to the wireless network needs to be configured with the same Windows Workgroup or Domain settings as the other Windows computers in the combined wireless and wired network. 3. Any Windows networking security access rights such as login user name/ password that have been assigned in the Windows network or for sharing particular files must be provided when Windows prompts for such information. 4. If so-called Windows 'peer' Workgroup networking is being used, the drive, file system directory, or file need to be enabled for sharing.	For assistance with Windows networking software, see Appendix , "Preparing Your Computers for TCP/IP Networking" for configuration scenarios or refer to the Help system included with your version of Windows. Windows Domain settings are usually managed by corporate computer support groups. Windows Workgroup settings are commonly managed by individuals who want to set up small networks in their homes, or small offices. For assistance with setting up Windows networking, refer to the PC Networking Tutorial on the *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD* and the Help information provided in the Windows system you are using.

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Table 2-1.   A Road Map for How to Get There From Here ...

If I Want To ... ?	What Do I Do?	What's Needed?	How Do I?
Use printers in a combined wireless and wired network.	1. Use the Windows Printers and Fax features to locate available printers in the combined wireless and wired network. 2. Use the Windows Add a Printer wizard to add access to a network printer from the notebook PC you are using to wirelessly connect to the network. 3. From the File menu of an application such as Microsoft Word, use the Print Setup feature to direct your print output to the printer in the network.	1. The notebook computer I am using to connect to the wireless network needs to be configured with the Windows Client and File and Print Sharing. 2. The notebook computer I am using to connect to the wireless network needs to be configured with the same Windows Workgroup or Domain settings as the other Windows computers in the combined wireless and wired network. 3. Any Windows networking security access rights such as login user name/ password that have been assigned in the Windows network must be provided when Windows prompts for such information. 4. If so-called Windows 'peer' networking is being used, the printer needs to be enabled for sharing.	Windows Domain settings are usually managed by corporate computer support groups. Windows Workgroup settings are commonly managed by individuals who want to set up small networks in their homes, or small offices. For assistance with setting up Windows networking, refer to the PC Networking Tutorial on the *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD* and the Help information provided in the Windows system you are using. For assistance with setting up printers in Windows, refer to the Help and Support information that comes with the version of the Windows operating systems you are using.

Chapter 3
Basic Setup

This chapter describes how to install your NETGEAR RangeMax™ Wireless PC Card WPN511 and set up basic wireless connectivity on your Wireless Local Area Network (WLAN). Advanced wireless network configuration is covered in Chapter 4, "Configuration" in this manual.

→ **Note:** Indoors, computers can easily connect to 802.11 wireless networks at distances of several hundred feet. Because walls do not always block wireless signals, others outside your immediate area could access your network. It is important to take appropriate steps to secure your network from unauthorized access. The NETGEAR RangeMax™ Wireless PC Card WPN511 provides highly effective security features which are covered in "Enabling Wireless Security Features" on page 4-7 in this manual. Deploy the security features appropriate to your needs.

What You Need Before You Begin

You need to verify your computer meets the minimum system requirements and identify the wireless network configuration settings of the WLAN where you will connect before you can configure your wireless pc card and connect.

Verifying System Requirements

Before installing the NETGEAR RangeMax™ Wireless PC Card WPN511, please make sure that these minimum requirements have been met:

- You must have a notebook PC with a Pentium® 300 MHz or higher compatible processor with an available Cardbus slot.
- A CD drive.
- 5 Mbytes of free hard disk space.
- Windows XP Home, Windows XP Professional, 2000, Me, 98SE or 98
- Some versions of Windows may ask for the original Windows operating system installation files to complete the installation of the WPN511 driver software.

Observing Location and Range Guidelines

Computers can connect over wireless networks indoors at a range which vary significantly based on the physical location of the computer with the NETGEAR RangeMax™ Wireless PC Card WPN511. For best results, avoid potential sources of interference, such as:

• Large metal surfaces

• Microwaves

• 2.4 GHz Cordless phones

In general, wireless devices can communicate through walls. However, if the walls are constructed with concrete, or have metal, or metal mesh, the effective range will decrease if such materials are between the devices.

Two Basic Operating Modes

The WPN511 Wireless PC Card can operate in the following two basic modes:

• **Infrastructure Mode:** An 802.11 networking framework in which devices and computers communicate with each other by first going through an access point (AP). For example, this mode is used when computers in a house connect to an Access Point that is attached to a router which lets multiple computers share a single Cable or DSL broadband Internet connection.

• **Ad-Hoc Mode:** An 802.11 networking framework in which devices or computers communicate directly with each other, without the use of an AP. For example, Ad-Hoc Mode is used when two Windows computers are configured with file and print sharing enabled and you want to exchange files directly between them.

Both of these configuration options are available with the WPN511 Wireless PC Card. Infrastructure configuration procedures for basic network connectivity are covered below. Advanced infrastructure configuration procedures and ad-hoc configuration are covered in Chapter 4, "Configuration" of this manual.

WPN511 Default Wireless Configuration Settings

If this is a new wireless network installation, use the factory default settings to set up the network and verify wireless connectivity. If this is an addition to an existing wireless network, you will need to identify the wireless configuration and security parameters already defined.

Your NETGEAR RangeMax™ Wireless PC Card WPN511 factory default basic settings are:

- Network Name Service Set Identification (SSID): **Any** (First available network)

    Note: In order for the WPN511 Wireless PC Card to communicate with a wireless access point or wireless adapter, all devices must be configured with the same wireless network name (SSID).

- Network Mode (Infrastructure or Ad-hoc): **Infrastructure**

- Data security WEP encryption: **Disabled**

The section below provides instructions for setting up the NETGEAR RangeMax™ Wireless PC Card WPN511 for basic wireless connectivity to an access point. The procedures below provide step-by-step installation instructions for Windows PCs. Use the procedure that corresponds to the version of Windows you are using.

Basic Installation Instructions

Use the procedure below that corresponds to the version of Windows you are using.

For Windows XP Users Installing a WPN511

1

Install the WPN511 driver and configuration utility software.

a. Power on your notebook, let the operating system boot up completely, and log in as needed.

b. Insert the *Resource CD* for the WPN511 into your CD drive. The Resource CD main page shown at the right will load.

c. Click the "Install Driver & Utility" link.

d. Follow the Smart Wizard Install Assistant steps, and click Finish when done to restart your computer.

WPN511 Resource CD main page

Smart Wizard - Install Assistant

Note: If a Windows XP Certification warning appears, click **Continue Anyway** to proceed.

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Install the NETGEAR RangeMax™ Wireless PC Card WPN511.

a. Locate an available CardBus slot on the side of your notebook. Hold the PC Card with the NETGEAR logo facing up and insert it into the CardBus slot.

The Found New Hardware Wizard displays.

Note: Click **Continue Anyway** if you are prompted with a Windows XP Logo testing message.

b. Next you will be prompted to enable the NETGEAR Smart Wireless Settings Utility configuration utility.

Click Yes to accept this option.

If you choose No, you must read the Windows XP documentation for an explanation of how to use the Windows XP wireless network configuration utility

You will also be prompted to choose the country you are located in. Select your location from the list.

c. Click Finish to complete the installation. You will see the WPN511 system tray icon on the lower right portion of the Windows task bar.

Found New Hardware Wizard

Enable NETGEAR Utility Configuration

WPN511 System Tray Icon

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3

Configure your WPN511.

a. Click the WPN511 icon in the Windows system tray to open the WPN511 Smart Wizard Wireless Assistant.

   The Settings tab page opens.

b. Change the Network Name SSID to match your network.

   Tip: Instead of typing in the SSID, you can use the drop-down list or the Networks tab to view the available wireless networks, and choose the one you want.

c. Click **Apply** to activate the connection.

   You can also enter a profile name and click Save Profile to store the current settings.

   Tip: Create profiles called *work* and *home*. Then, activate whichever one you need for your current location.
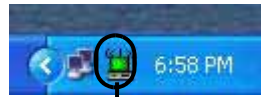
Smart Wizard Wireless Assistant Settings page

Tip: Click Help to view the context-sensitive help information.

Note: The NETGEAR default settings are **Infrastructure mode**, with **Any** (case sensitive) for the wireless network name SSID, and WEP disabled. If your WLAN settings are different from the NETGEAR default settings, you will not connect. Set up your WPN511 accordingly.

This procedure assumes you are connecting to a wireless network which is not using WEP or WPA security. If your network includes WEP or WPA settings, click the Security tab page and configure the WPN511 accordingly. For help with these steps, click the Help button in the Install Assistant to view context- sensitive help information, or see "Enabling Wireless Security Features" on page 4-7.

4

Verify wireless connectivity to your network.

a. Verify that your Connection and Status Monitor information matches your wireless network.

b. Check the two LEDs on the WPN511:

LED 2

LED 1

Table 3-1.   LED Descriptions

LED 1	LED 2	Meaning
Slow blink	OFF	Power save mode (default from power up or reset)
Alternate blink	Alternate blink	Looking for network association Power LED goes ON; Network LED is OFF; then Power LED goes OFF and Network LED goes ON
Slow blink	Slow blink	Associated or joined with network; no activity
Fast blink	Fast blink	Associated or joined with network; blink rate increases with activity on the network over the air or locally on the network
OFF	OFF	No power applied to the card

c. Verify connectivity to the Internet or network resources.

Note: If you are unable to connect, see troubleshooting tips in the Basic Installation section of the Reference Manual on the *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD*.

For Windows 2000 & 98/Me Users Installing a WPN511

1

Install the WPN511 driver and configuration utility software.

> **Note:** Windows 2000 may require you to be logged on with administrator rights.

a. Power on your notebook, let the operating system boot up completely, and log in as needed.

b. Insert the *Resource CD* for the WPN511 into your CD drive. The Resource CD main page shown at the right will load.

c. Click the "Install Driver & Utility" link.

d. Follow the Smart Wizard Wireless Assistant steps, click Finish when done, and if prompted, restart your computer.

Resource CD main page

Smart Wizard - Wireless Assistant

2

Install the NETGEAR RangeMax™ Wireless
PC Card WPN511.

a. Locate an available CardBus slot on
the side of your notebook. Hold the PC
Card with the NETFGEAR logo facing
up and insert it into the CardBus slot.

   After a short delay, the Found New
   Hardware Wizard displays.

b. Follow the Found New Hardware
Wizard steps, click **Finish** when done,
and if prompted, restart your computer.

c. Next, you will be prompted to choose
the country where you are located.
Select your location from the list.

   You should see the WPN511 system
   tray icon on the right in the lower right
   portion of the Windows task bar.
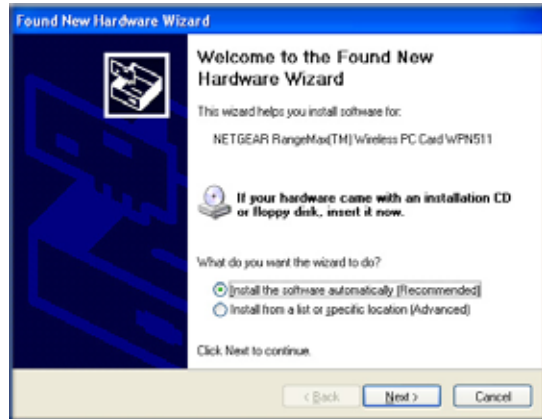
Found New Hardware Wizard

Note: If Windows warns about a Digital
Signature Not Found, click **Yes** to continue.

WPN511 System Tray Icon

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3

Configure your WPN511 and save the Profile.

a. Click on the WPN511 system tray icon to open the WPN511 Smart Wizard Wireless Assistant.

   The Settings tab page opens.

b. For the Network Name (SSID), use the default of **Any (First available network)** or type an SSID for your network.

   Tip: Instead of typing in the SSID, you can use the drop-down list or the Networks tab to view the available wireless networks, and choose the one you want.

c. Click **Apply** to activate the connection.

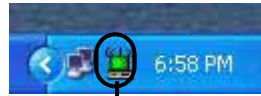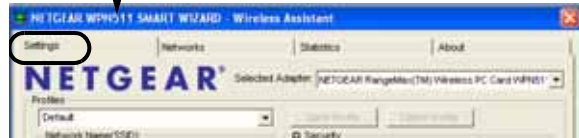d. You can also enter a profile name and click Save Profile to store the current settings.

   Tip: If you use your desktop PC to connect to a wireless network at work and at home, create profiles called *work* and *home*. Then, activate whichever one you need for wherever you are located.

Smart Wizard Wireless Assistant Settings tab

Note: The NETGEAR default settings are **Infrastructure mode**, with **Any** (case sensitive) for the wireless network name SSID, and WEP disabled. If your WLAN settings are different from the NETGEAR default settings, you will not connect. Set up your WPN511 accordingly.

Note: This procedure assumes you are connecting to a wireless network which is not using WEP or WPA security. If your network includes WEP or WPA settings, click the Security tab page and configure the WPN511 accordingly. For help with these steps, click the Help button in the Install Assistant to view context- sensitive help information, or see "Enabling Wireless Security Features" on page 4-7.

4

Verify wireless connectivity to your network.

  a. Verify that your Connection and Status Monitor information matches your wireless network.

  b. Check the two LEDs on the WPN511:

LED 2

LED 1

Table 3-2.   LED Descriptions

LED 1	LED 2	Meaning
Slow blink	OFF	Power save mode (default from power up or reset)
Alternate blink	Alternate blink	Looking for network association Power LED goes ON; Network LED is OFF; then Power LED goes OFF and Network LED goes ON
Slow blink	Slow blink	Associated or joined with network; no activity
Fast blink	Fast blink	Associated or joined with network; blink rate increases with activity on the network over the air or locally on the network
OFF	OFF	No power applied to the card

  c. Verify connectivity to the Internet or network resources.

Note: If you are unable to connect, see troubleshooting tips in the Basic Installation section of the Reference Manual on the *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD*.

Note: If you are unable to connect, see "Troubleshooting" on page 3-13.

WPN511 Wireless Connection Indicators

The NETGEAR RangeMax™ Wireless PC Card WPN511 provides the following three indicators which give you feedback on the status of your wireless connection:

- The two LEDs on the NETGEAR RangeMax™ Wireless PC Card WPN511 indicate the condition of wireless link.
- The color of the SysTray icon is on the System Tray portion of the taskbar in the Microsoft Windows desktop indicates the status of the connection.

Interpreting the LEDs on the WPN511

Figure 3-1: WPN511 LEDs

These LEDs are described in this table.

Table 3-1.   LED Descriptions

LED 1	LED 2	Meaning
Slow blink	OFF	Power save mode (default from power up or reset)
Alternate blink	Alternate blink	Looking for network association Power LED goes ON; Network LED is OFF; then Power LED goes OFF and Network LED goes ON
Slow blink	Slow blink	Associated or joined with network; no activity
Fast blink	Fast blink	Associated or joined with network; blink rate increases with activity on the network over the air or locally on the network
OFF	OFF	No power applied to the card

Interpreting System Tray Icon Colors

The System Tray (SysTray) resides on one end of the taskbar in the Microsoft Windows desktop.

Color	Condition	Description
Red	The wireless PC Card has no connection to any other wireless node.	The wireless PC Card is not able to link to any other wireless node or the link is lost. Check your configuration or try moving to a location where the wireless signal quality is better.
Yellow	The wireless PC Card has a connection with another wireless node.	The wireless link is weak. You may deed to move to a better spot, such as closer to the wireless access point. Also, look for possible interference such as a 2.4 GHz cordless phone or large metal surface.
Green	The wireless PC Card has a connection with another wireless node.	The wireless PC Card has established good communication with an access point and the signal quality is strong.

Troubleshooting

Use the information below to solve common problems you may encounter. Also, please refer to the knowledge base on the NETGEAR Web site at *www.netgear.com/support/main.asp*.

Also, for problems with accessing network resources, the Windows software might not be installed and configured properly on your computers. Please refer to Appendix C, "Preparing Your PCs for Network Access" .

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Basic Tips

If you have problems connected to your wireless network, try the tips below.

Symptom	Cause	Solution
The PC Card LEDs are not lit.	The WPN511 is not inserted into the slot properly or the WPN511 software is not loaded.	Remove and reinsert the WPN511. Check the Windows device manager to see if the PC Card is recognized and enabled. Reload the WPN511 software, if necessary. Try to install the WPN511 in a different slot on your system if one is available.
The LEDs blink alternately and cannot connect to an access point.	The WPN511 is attempting to connect to an access point, but cannot connect.	The access point may not be powered on. Or, the access point and the PC card are not configured with the same wireless parameters. Check the SSID and WEP settings.
I can connect to an access point, but I cannot connect to other computers on the network or the Internet.	This could be a physical layer problem or a network configuration problem.	Check to make sure that the access point is physically connected to the Ethernet network. Make sure that the IP addresses and the Windows networking parameters are all configured correctly. Restart the cable or DSL modem, router, access point, and notebook PC.

> **Note:** As of the date of publication of this manual, the Windows XP HotFix #Q815485 can prevent wireless adapters from connecting to the Internet and prevent wireless adapters from reloading a working configuration after a restart of the computer. To see if HotFix #Q815485 is installed, look in Add Remove Programs from the Windows Control Panel. If installed, remove it. Future updates to the Windows XP operating systems may correct this problem.

Troubleshooting Frequently Asked Questions

1. **Question:** The product literature says the WPN511 can operate at 108 Mbps. Why do I see no more than 54 Mbps speed on my WPN511 Smart Configuration Utility status line?

   Answer: You are probably connecting to standard 802.11g network. If you use the NETGEAR WGT624 108 Mbps Wireless Firewall Router, you will see network speeds up to 108 Mbps.

2. **Question:** Why does the utility kept asking me to Save my settings when I'm trying to close the utility?

Answer: This is because you've made changes to the settings and the utility is offering you the chance to save the changes. If you want to avoid these Profile setting prompts, simply click **Apply** before you Close the utility program.

3. **Question:** Why doesn't Ad Hoc mode work correctly after I enter a SSID and click Apply?

    Answer: You need to click the Initiate Ad Hoc button before you click Apply.

    Here is how you start an Ad Hoc network:

    a. Fill in the Network Name (SSID).

    b. Select the Computer-to-Computer (Ad-Hoc) network Type.

    c. Click initiate Ad Hoc.

    d. Accept default settings or make proper changes and click OK

    e. Click **Apply**

    (**Note**: Be sure all computers in your Ad Hoc network are configured with static IP address in the same subnet.)

4. **Question:** How do I remove the WPN511 software and utility? How come there is no "Uninstall WPN511 Software" shortcut in the "Start>Program> NETGEAR WPN511 Adapter" menu?

    Answer: The WPN511 uninstaller program is in the Windows Control Panel. To remove the WPN511 software, do the following: Use "Add or Remove Programs" in the Control Panel and remove the "NETGEAR WPN511 Wireless PC Card" entry.

5. **Question:** How do I know if my WPN511 card has received a valid IP address from my Wireless Router/AP?

    Answer: One easy way is to open up the WPN511 utility program and check the "IP Address" in the About page.

6. **Question:**: (XP Professional and XP Home user only): How do I use XP's own Wireless configuration utility that came with the OS?

    Answer: The NETGEAR WPN511 software is designed in such way that user will be asked to choose one of the utility programs during initial software installation. Be sure the card is in the notebook and follow these instructions to change your selection. Go to Control Panel> Network Connections> Wireless Network Connection > Properties> Wireless Networks tab> for the wireless card and check or uncheck "Use Windows to configure my wireless network settings".

7. **Question:** I don't understand the LEDs on the WPN511? Which is Power and which is network activity?

Answer: The WPN511 LED's behavior is as follows: both blinking alternately means attempting to connect, both blinking together indicates a good connection (fast blinking means data transmission); off means the card is not plugged in or no power applied to the card.

8. **Question:** It is nice to have a browser-based type of Manual on the Resource CD, but how do I get a PDF copy of it, like the Installation Guide?

    Answer: In the Manual html page, there is a PDF button image at the top right hand corner of the Web page. Click on the PDF button brings up the PDF file of the entire manual.   You can also Print, Email, Bookmark pages using the appropriate icons next to the PDF button.

Chapter 4
Configuration

This chapter describes how to configure your NETGEAR RangeMax™ Wireless PC Card WPN511 for wireless connectivity on your Wireless Local Area Network (WLAN) and use the data security encryption features.

> **Note:** The instructions in this section refer to the NETGEAR WPN511 configuration utility. For Windows XP users to use the NETGEAR configuration utility, you must first disable the Windows XP configuration utility. Open the network connections from the system tray icon, click the Properties button, click the Wireless Networks tab and then clear the "Use Windows to configure my wireless network settings" check box.

Understanding the Configuration Options

The WPN511 configuration utility provides a complete and easy to use set of tools to:

*   Configure wireless settings.
*   Monitor wireless network connections.
*   Save your settings in configuration profiles.

The section below introduces these capabilities of the configuration utility.

Using Configuration Profiles

The WPN511 configuration utility uses profiles to store all the configuration settings for a particular wireless network. You can store multiple profiles and recall the one which matches the network you want to join.

For example, if you use your notebook PC to connect to a wireless network in an office and a wireless network in your home, you can create a profile for each wireless network. Then, you can easily load the profile that has all the configuration settings you need to join the network you are using at the time.

There are two types of wireless network connections you can configure:

- **Infrastructure Mode —** uses the 802.11 infrastructure mode.

- **Ad-hoc Mode —** uses the 802.11 ad-hoc mode

For more information on 802.11 wireless network modes, see "Wireless Networking Overview" on page B-1 of this manual.

Connecting to an Access Point in Infrastructure Mode

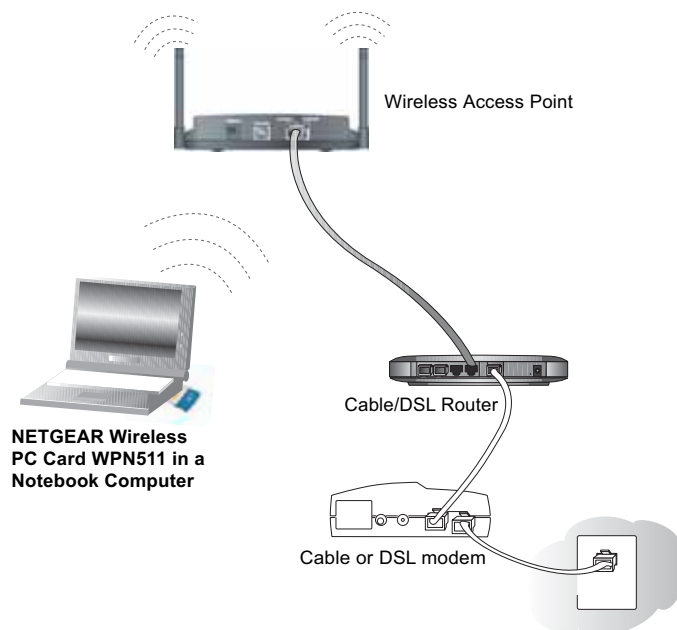**Figure 4-1: WPN511 Wireless PC Card connecting to a wireless access point.**

How to Configure an Infrastructure Mode Profile

Follow the instructions below to configure an infrastructure mode profile for connecting to an access point.

1. Run the WPN511 Smart Wizard Wireless Assistant.

a. Make sure the WPN511 software is installed and the WPN511 is fully inserted in an available CardBus slot in your PC.

b. Click the WPN511 icon ![icon] in the Windows system tray to open the Smart Wizard Wireless Assistant.

c. The Settings tab displays as shown below.

Figure 4-2: Smart Wizard Wireless Assistant Settings tab page

2. **Configure the wireless Network settings.**

    a. In the Network Type section, be sure that Infrastructure is selected.

    b. Enter the SSID. This is also called the Wireless Network Name.

    Note: You will not get a wireless network connection unless the network SSID matches exactly what is configured in the access point.

    Tip: You can click the Network tab to view a list of the available wireless networks and their SSIDs at the location where you are.

3. **Save your settings in a Profile.**

    a. Type a descriptive name for the Profile in the "Profiles" field.

    b. Click Save Profile. All the configuration settings are saved in this profile.

    c. Click **Apply**.

    d. Click Close to exit the configuration utility or Cancel to return to the previous settings

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4. Verify wireless connectivity to your network.

Verify connectivity by using a browser such as Netscape or Internet Explorer to connect to the Internet, or check for file and printer access on your network.

You can check the status bar in the configuration utility for the current connection status.

Note: If you cannot connect, see the "Troubleshooting" on page 3-13. Also, for problems with accessing network resources, the Windows Client and File and Print Sharing software might not be installed and configured properly on your computers. Please refer to "Preparing Your Computers for TCP/IP Networking" on page C-1.

Connecting to Another PC in Ad-hoc Mode

PC with 802.11b or g wireless adapter

WPN511 Wireless PC Card in a Notebook Computer
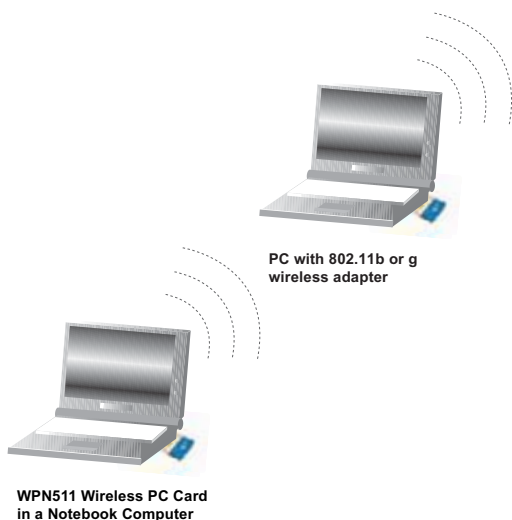
Figure 4-3: NETGEAR WPN511 Wireless PC Card in Peer-to-Peer Mode

The peer-to-peer setting of the WPN511 uses Ad-Hoc mode. Ad-Hoc mode is an 802.11 networking framework in which devices or computers communicate directly with each other, without the use of an access point. For example, this mode is used when two Windows computers are configured with file and print sharing enabled and you want to exchange files directly between them.

How to Configure an Ad-hoc Mode Profile

Note: Ad-hoc mode will not work using DHCP settings. Ad-hoc mode requires either static IP addresses (such as `192.168.0.1)`. For instructions on setting up static IP addresses on a Windows PC, refer to the PC Networking Tutorial included on the *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD*.

Follow the instructions below to configure an Ad-hoc mode profile.

1. Run the WPN511 Smart Wizard Wireless Utility.

   a. Make sure the WPN511 software is installed and the WPN511 is fully inserted in an available CardBus slot in your PC.

   b. Click the WPN511 icon ![icon] in the Windows system tray to open the Smart Wizard Wireless Assistant.

   c. The Settings tab displays as shown below.

Figure 4-4: Smart Wizard Wireless Assistant Settings tab page

   d. Select Computer-to-Computer (Ad hoc) for the Network Type.

   e. Enter the SSID for the Ad-Hoc network.

   f. Click **Apply**.

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2. **Save your settings in a Profile.**

   a. Type a descriptive name in the "Profiles" field.

   b. Click Save Profile. All the configuration settings are saved in this profile.

   c. Click **Apply**.

   d. Click Close to exit the configuration utility.

3. **Configure the PC network settings.**

   a. Configure each PC with either a static IP address or with the IPX protocol.

       Note: For instructions on configuring static IP addresses, refer to the networking tutorial on your *NETGEAR RangeMax™ Wireless PC Card WPN511 Resource CD*.

   b. Restart the PCs.

4. **Verify wireless connectivity between your peer devices.**

   Verify connectivity by using the Ping program:

   a. On the Windows taskbar click the Start button, and then click Run.
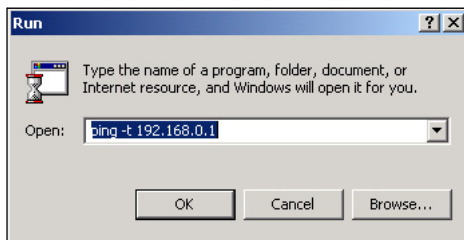
   b. Assuming the target PC is configured with 192.168.0.1 as its IP address, type `ping -t 192.168.0.1` and then click OK.

   c. This will cause a continuous ping to be sent to the device with the 192.168.0.1 static IP address. The ping response should change to "reply."

   At this point the connection is established.

   You may need to reboot in certain Windows operating systems such as Windows 98.

Note: If you cannot connect, see the "Troubleshooting" on page 3-13. Also, for problems with accessing network resources, the Windows Client and File and Print Sharing software might not be installed and configured properly on your computers. Please refer to "Preparing Your Computers for TCP/IP Networking" on page C-1.

How to Start a Computer-to-Computer (Ad-Hoc) Network

1. Fill in the Network Name (SSID).

2. Select the Computer-to-computer (Ad-Hoc) network type.

3. Click Initiate Ad-Hoc. The Ad-Hoc Setting dialog box will appear, as shown below.
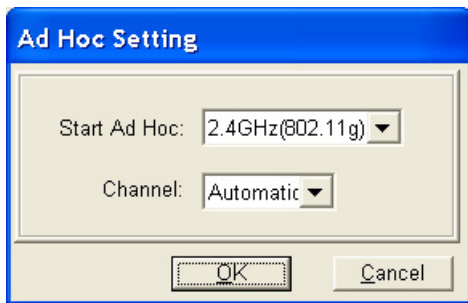
Figure 4-5: Ad-Hoc Setting dialog box

4. In the Start Ad-Hoc field, choose the wireless standard (802.11a, 802.11b, or 802.11g) for your Ad-Hoc computer-to-computer network.

5. In the Channel field, Automatic should work. If you notice interference problems with another nearby wireless device, select a channel that is not being used by any other wireless networks near your wireless adapter. Use the Networks tab to identify the channels in use in your area.

6. Click OK.

Note: The channel number differs depending on the country. The connection speed automatically defaults to the highest speed.

Enabling Wireless Security Features

You can strengthen the security of your wireless connection by enabling Wired Equivalent Privacy (WEP) encryption of the wireless data communications. For more information on 802.11 wireless security, see "Authentication and WEP" on page B-2.

In addition to the WPN511 wireless security features, you should also configure appropriate LAN network security features such as requiring a user name and password to access the shared resources in your network.

The procedures below identify how to configure the WEP encryption settings of your NETGEAR RangeMax™ Wireless PC Card WPN511.

Identifying the Wireless Network Name (SSID) and WEP Security Settings

Print this form, fill in the configuration parameters and put it in a safe place for possible future reference. For an existing wireless network, the person who set up the network will be able to provide this information.

*   *Wireless Network Name (SSID):* The Service Set Identification (SSID) identifies the wireless local area network. **Any** (First available network) is the default WPN511 wireless network name (SSID). You may customize it using up to 32 alphanumeric characters. Write your customized wireless network name (SSID) on the line below.

    Note: The SSID in the wireless access point is the SSID you configure in the wireless pc card. For the access point and wireless nodes to communicate with each other, all must be configured with the same SSID.

    Wireless network name (SSID): _____

*   *WEP Security Encryption key:* The default WEP encryption key number is 1, and the default key size is 64 bits.

    Note: The key number as well as the key value used by all wireless nodes must be the same. If they are different, you will not be able to connect.

    WEP Encryption Key Size, circle one: 64 or 128 bits

    WEP Encryption Passphrase, if used: _____

    A Passphrase is used to automatically generate the WEP hexadecimal numbers for the key. If the wireless network Access Point uses a Passphrase, you can also use that here. Otherwise, you will have to manually enter the hexadecimal numbers.

    WEP Hexadecimal Numbers: _____

    The WEP Hexadecimal Numbers are needed if a Passphrase is not used in the wireless network access point, but rather if the key is manually entered.

Use the procedures below to configure basic security settings in the WPN511.

How to Configure WEP Encryption Security

Follow the steps below to configure WEP Encryption Security.

1. **Run the WPN511 Smart Wizard Wireless Assistant.**

    a. Make sure the WPN511 software is installed and the WPN511 is fully inserted in an available CardBus slot in your PC.

    b. Click the WPN511 icon 📶 in the Windows system tray to open the Smart Wizard Wireless Assistant.

    c. The Settings tab displays as shown below.

Figure 4-6: Smart Wizard Wireless Assistant Settings tab page

2. **Configure the Security settings.**

    a. Select the Use WEP Encryption check box.

    b. Enter the SSID. This is also called the Wireless Network Name.

    Note: You will not get a wireless network connection unless the network SSID matches exactly what is configured in the access point.

    Tip: You can click the Networks tab to view a list of the available wireless networks and their SSIDs at your location.

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3. Save your settings in a Profile.

    a.   Type a descriptive name in the "Profiles" field.

    b.   Click Save Profile. All the configuration settings are saved in this profile.

    c.   Click **Apply**.

    d.   Click Close to exit the configuration utility.

4. **Select the WEP encryption strength you will use.**

   The choices are:

   •   64-bit WEP data encryption

   •   128-bit WEP data encryption

      Note: Larger encryption keys require more processing and may slow the communications response times.

5. Select Create with Passphrase and enter the passphrase. The configuration utility will automatically generate the WEP keys.

   Note: The characters are case sensitive. Be sure to use the same passphrase for all the wireless devices in the network.

   If the passphrase method is not available in the other devices, you must manually enter the keys to match exactly what is in the access point and other 802.11b wireless devices.

6. The Default Key setting must match what is set in the access point and the other 802.11 wireless devices.

7. Click **Apply** for the changes to take effect.

Statistics Page

The Statistics page provides real time and historical trend information on the data traffic and performance of your wireless adapter.
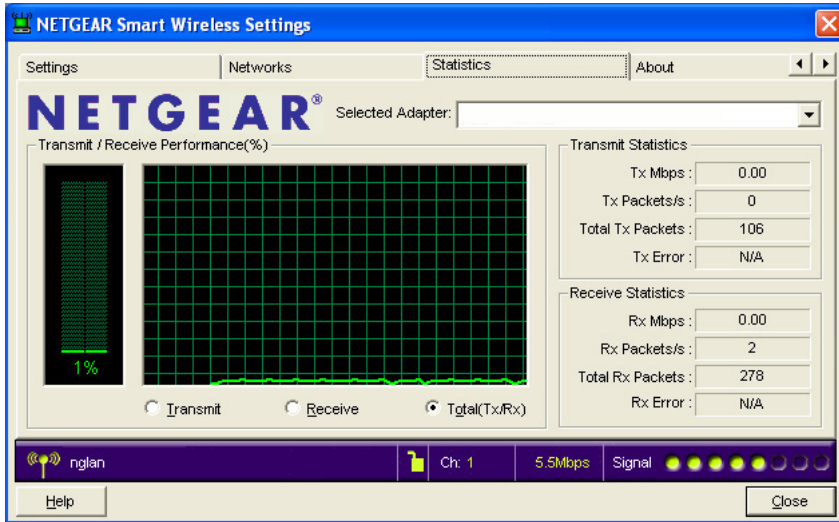
Figure 4-7: Statistics tab page

- **Transmit/Receive Performance (%):** A real time graph identifying the total, receive, and transmit utilization as a percentage the total possible.

- **Total/Receive/Transmit Graph:** Identifies the trend of transmit/receive data communications over time.

- **Transmit Statistics:** Identifies transmit megabits per second (Mbps), transmit packets per second (Tx Packets/s), total transmitted packets, and transmit errors.

- **Receive Statistics:** Identifies receive megabits per second (Mbps), receive packets per second (Rx Packets/s), total received packets, and received errors.

Advanced Settings Page

The Advanced settings should not require adjustment. Except for the power saving setting, changing any of the settings incorrectly on this page could cause your wireless connection to fail.
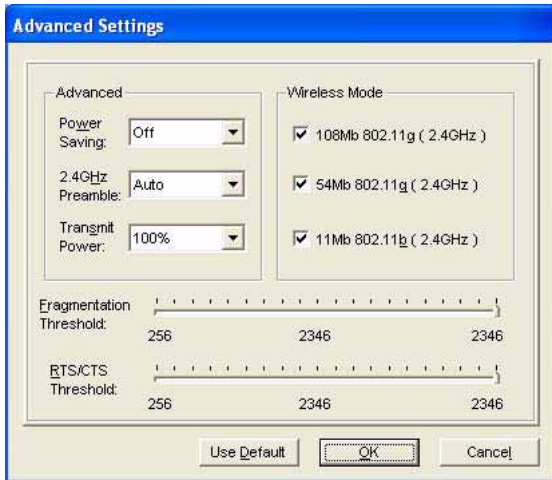

Figure 4-8: Advanced Settings page

- **Power Saving:** Select On if you are using a notebook computer running on battery power.

- **Preamble:** A long transmit preamble may provide a more reliable connection or slightly longer range. A short transmit preamble might give slightly better performance.

- **Transmit Power:** Lowering the output power level lets you reduce the chance of interference with other nearby access points, but reduces the range of your adapter.

- **Wireless Mode:** Select the wireless protocols you will use. Depending on your wireless adapter, you can choose some or all of the available 802.11 wireless protocols. Note that if the wireless network you are communicating with uses the 108 Mbps 802.11g mode, you must include that in your selection (for example, if you are using the WPN511 with the NETGEAR WGT624 108 Mbps Wireless Firewall Router).

- **Fragmentation Threshold:** This is the maximum packet size used for fragmentation. Packets larger than the size programmed in this field will be fragmented. The Fragmentation Threshold value must be larger than the RTS/CTS Threshold value.

- **RTS/CTS Threshold:** The packet size that is used to determine whether to use the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) mechanism or the CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) mechanism for packet transmission. CSMA/CD is slightly more efficient.

Appendix A
Technical Specifications

This appendix provides technical specifications for the NETGEAR RangeMax™ Wireless PC Card WPN511.

Antennae	2 Integrated internal diversity antennae
Radio Data Rate	1, 2, 5.5, 6, 9, 12, 18, 24, 36, 48, 54, and 108 Mbps (Auto Rate Sensing)
Frequency	2.4GHz to 2.5GHz CCK and OFDM Modulation)
Power Consumption	3.3V DC, typically 400mA in full transmit (TX), 300mA in full Receive (RX) and 40mA in power save mode
Emissions	FCC, CE, TELEC
Bus interface	Cardbus
Provided drivers	Microsoft Windows 98, 2000, ME, XP
Dimensions	L: 120mm W: 54 mm H: 7 mm
Weight	40 g
Status LED	Wireless Link
Operating Environment	Operating temperature: 0 to 55 degree C
Safety	US: UL1950
Encryption	40-bit (also called 64-bit) and 128-bit WEP data encryption
Warranty	Limited 3-year warranty

Appendix B
Wireless Networking Basics

This chapter provides an overview of Wireless networking.

Wireless Networking Overview

The WPN511 Wireless PC Card conforms to the Institute of Electrical and Electronics Engineers (IEEE) 802.11b standard for wireless LANs (WLANs) and a product update will bring the WPN511 into conformance to the 802.11g standard when it is ratified. On an 802.11b or g wireless link, data is encoded using direct-sequence spread-spectrum (DSSS) technology and is transmitted in the unlicensed radio spectrum at 2.5GHz. The maximum data rate for the wireless link is 11 Mbps, but it will automatically back down from 11 Mbps to 5.5, 2, and 1 Mbps when the radio signal is weak or when interference is detected. The 802.11g auto rate sensing rates are 1, 2, 5.5, 6, 9, 12, 18, 24, 36, 48, and 54 Mbps.

The 802.11 standard is also called Wireless Ethernet or Wi-Fi by the Wireless Ethernet Compatibility Alliance (WECA, see *http://www.wi-fi.net*), an industry standard group promoting interoperability among 802.11 devices. The 802.11 standard offers two methods for configuring a wireless network - ad hoc and infrastructure.

Infrastructure Mode

With a wireless Access Point, you can operate the wireless LAN in the infrastructure mode. This mode provides wireless connectivity to multiple wireless network devices within a fixed range or area of coverage, interacting with wireless nodes via an antenna.

In the infrastructure mode, the wireless access point converts airwave data into wired Ethernet data, acting as a bridge between the wired LAN and wireless clients. Connecting multiple Access Points via a wired Ethernet backbone can further extend the wireless network coverage. As a mobile computing device moves out of the range of one access point, it moves into the range of another. As a result, wireless clients can freely roam from one Access Point domain to another and still maintain seamless network connection.

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Ad Hoc Mode (Peer-to-Peer Workgroup)

In an ad hoc network, computers are brought together as needed; thus, there is no structure or fixed points to the network - each node can generally communicate with any other node. There is no Access Point involved in this configuration. This mode enables you to quickly set up a small wireless workgroup and allows workgroup members to exchange data or share printers as supported by Microsoft networking in the various Windows operating systems. Some vendors also refer to ad hoc networking as peer-to-peer group networking.

In this configuration, network packets are directly sent and received by the intended transmitting and receiving stations. As long as the stations are within range of one another, this is the easiest and least expensive way to set up a wireless network.

Network Name: Extended Service Set Identification (ESSID)

The Extended Service Set Identification (ESSID) is one of two types of Service Set Identification (SSID). In an ad hoc wireless network with no access points, the Basic Service Set Identification (BSSID) is used. In an infrastructure wireless network that includes an access point, the ESSID is used, but may still be referred to as SSID.

An SSID is a thirty-two character (maximum) alphanumeric key identifying the name of the wireless local area network. Some vendors refer to the SSID as network name. For the wireless devices in a network to communicate with each other, all devices must be configured with the same SSID.

Authentication and WEP

The absence of a physical connection between nodes makes the wireless links vulnerable to eavesdropping and information theft. To provide a certain level of security, the IEEE 802.11 standard has defined two types of authentication methods, Open System and Shared Key. With Open System authentication, a wireless PC can join any network and receive any messages that are not encrypted. With Shared Key authentication, only those PCs that possess the correct authentication key can join the network. By default, IEEE 802.11 wireless devices operate in an Open System network.

Wired Equivalent Privacy (WEP) data encryption is used when the wireless devices are configured to operate in Shared Key authentication mode. There are two shared key methods implemented in most commercially available products, 64-bit and 128-bit WEP data encryption.

802.11 Authentication

The 802.11 standard defines several services that govern how two 802.11 devices communicate. The following events must occur before an 802.11 Station can communicate with an Ethernet network through an access point such as the one built in to the WPN511:

1. Turn on the wireless station.

2. The station listens for messages from any access points that are in range.

3. The station finds a message from an access point that has a matching SSID.

4. The station sends an authentication request to the access point.

5. The access point authenticates the station.

6. The station sends an association request to the access point.

7. The access point associates with the station.

8. The station can now communicate with the Ethernet network through the access point.

An access point must authenticate a station before the station can associate with the access point or communicate with the network. The IEEE 802.11 standard defines two types of authentication: Open System and Shared Key.

*   Open System Authentication allows any device to join the network, assuming that the device SSID matches the access point SSID. Alternatively, the device can use the "ANY" SSID option to associate with any available Access Point within range, regardless of its SSID.

*   Shared Key Authentication requires that the station and the access point have the same WEP Key to authenticate. These two authentication procedures are described below.

Open System Authentication

The following steps occur when two devices use Open System Authentication:

1. The station sends an authentication request to the access point.

2. The access point authenticates the station.

3. The station associates with the access point and joins the network.

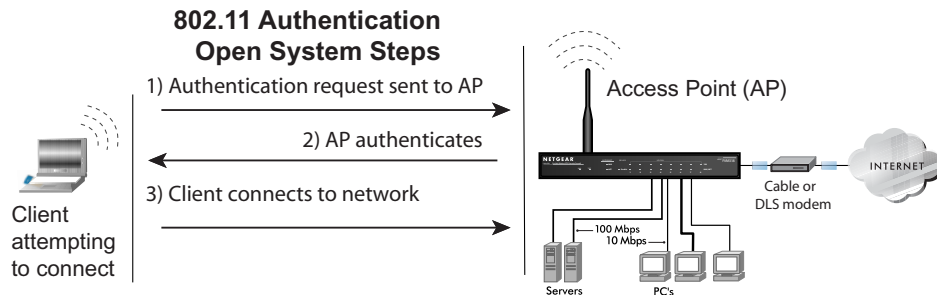This process is illustrated in below.

Figure 4-9: 802.11 open system authentication

Shared Key Authentication

The following steps occur when two devices use Shared Key Authentication:

1. The station sends an authentication request to the access point.

2. The access point sends challenge text to the station.

3. The station uses its configured 64-bit or 128-bit default key to encrypt the challenge text, and sends the encrypted text to the access point.

4. The access point decrypts the encrypted text using its configured WEP Key that corresponds to the station's default key. The access point compares the decrypted text with the original challenge text. If the decrypted text matches the original challenge text, then the access point and the station share the same WEP Key and the access point authenticates the station.

5. The station connects to the network.

If the decrypted text does not match the original challenge text (i.e., the access point and station do not share the same WEP Key), then the access point will refuse to authenticate the station and the station will be unable to communicate with either the 802.11 network or Ethernet network.

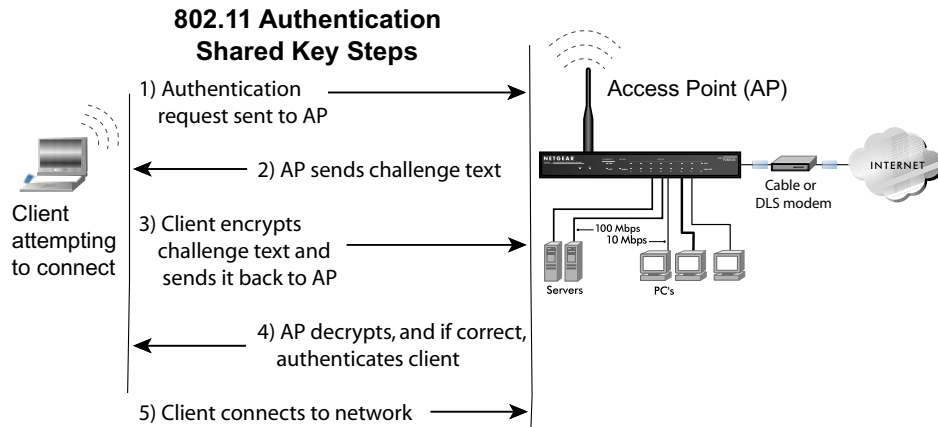This process is illustrated in below.

Figure 4-10: 802.11 shared key authentication

Overview of WEP Parameters

Before enabling WEP on an 802.11 network, you must first consider what type of encryption you require and the key size you want to use. Typically, there are three WEP Encryption options available for 802.11 products:

1. **Do Not Use WEP:** The 802.11 network does not encrypt data. For authentication purposes, the network uses Open System Authentication.

2. **Use WEP for Encryption:** A transmitting 802.11 device encrypts the data portion of every packet it sends using a configured WEP Key. The receiving 802.11b device decrypts the data using the same WEP Key. For authentication purposes, the 802.11b network uses Open System Authentication.

3. **Use WEP for Authentication and Encryption:** A transmitting 802.11 device encrypts the data portion of every packet it sends using a configured WEP Key. The receiving 802.11 device decrypts the data using the same WEP Key. For authentication purposes, the 802.11 network uses Shared Key Authentication.

Note: Some 802.11 access points also support **Use WEP for Authentication Only** (Shared Key Authentication without data encryption).

Key Size

The IEEE 802.11 standard supports two types of WEP encryption: 40-bit and 128-bit.

The 64-bit WEP data encryption method, allows for a five-character (40-bit) input. Additionally, 24 factory-set bits are added to the forty-bit input to generate a 64-bit encryption key. (The 24 factory-set bits are not user-configurable). This encryption key will be used to encrypt/decrypt all data transmitted via the wireless interface. Some vendors refer to the 64-bit WEP data encryption as 40-bit WEP data encryption since the user-configurable portion of the encryption key is 40 bits wide.

The 128-bit WEP data encryption method consists of 104 user-configurable bits. Similar to the forty-bit WEP data encryption method, the remaining 24 bits are factory set and not user configurable. Some vendors allow passphrases to be entered instead of the cryptic hexadecimal characters to ease encryption key entry.

128-bit encryption is stronger than 40-bit encryption, but 128-bit encryption may not be available outside of the United States due to U.S. export regulations.

When configured for 40-bit encryption, 802.11 products typically support up to four WEP Keys. Each 40-bit WEP Key is expressed as 5 sets of two hexadecimal digits (0-9 and A-F). For example, "12 34 56 78 90" is a 40-bit WEP Key.

When configured for 128-bit encryption, 802.11b products typically support four WEP Keys but some manufacturers support only one 128-bit key. The 128-bit WEP Key is expressed as 13 sets of two hexadecimal digits (0-9 and A-F). For example, "12 34 56 78 90 AB CD EF 12 34 56 78 90" is a 128-bit WEP Key.

Note: Typically, 802.11 access points can store up to four 128-bit WEP Keys but some 802.11 client adapters can only store one. Therefore, make sure that your 802.11 access and client adapters configurations match.

WEP Configuration Options

The WEP settings must match on all 802.11 devices that are within the same wireless network as identified by the SSID. In general, if your mobile clients will roam between access points, then all of the 802.11 access points and all of the 802.11 client adapters on the network must have the same WEP settings.

Note: Whatever keys you enter for an AP, you must also enter the same keys for the client adapter in the same order. In other words, WEP key 1 on the AP must match WEP key 1 on the client adapter, WEP key 2 on the AP must match WEP key 2 on the client adapter, etc.

Note: The AP and the client adapters can have different default WEP Keys as long as the keys are in the same order. In other words, the AP can use WEP key 2 as its default key to transmit while a client adapter can use WEP key 3 as its default key to transmit. The two devices will communicate as long as the AP's WEP key 2 is the same as the client's WEP key 2 and the AP's WEP key 3 is the same as the client's WEP key 3.

Wireless Channels

IEEE 802.11b and g wireless nodes communicate with each other using radio frequency signals in the ISM (Industrial, Scientific, and Medical) band between 2.4 GHz and 2.5 GHz. Neighboring channels are 5 MHz apart. However, due to spread spectrum effect of the signals, a node sending signals using a particular channel will utilize frequency spectrum 12.5 MHz above and below the center channel frequency. As a result, two separate wireless networks using neighboring channels (for example, channel 1 and channel 2) in the same general vicinity will interfere with each other. Applying two channels that allow the maximum channel separation will decrease the amount of channel cross-talk, and provide a noticeable performance increase over networks with minimal channel separation.

The radio frequency channels used are listed in Table 4-1:

Table 4-1.   **802.11b and g Radio Frequency Channels**

Channel	Center Frequency	Frequency Spread
1	2412 MHz	2399.5 MHz - 2424.5 MHz
2	2417 MHz	2404.5 MHz - 2429.5 MHz
3	2422 MHz	2409.5 MHz - 2434.5 MHz
4	2427 MHz	2414.5 MHz - 2439.5 MHz
5	2432 MHz	2419.5 MHz - 2444.5 MHz
6	2437 MHz	2424.5 MHz - 2449.5 MHz
7	2442 MHz	2429.5 MHz - 2454.5 MHz
8	2447 MHz	2434.5 MHz - 2459.5 MHz
9	2452 MHz	2439.5 MHz - 2464.5 MHz
10	2457 MHz	2444.5 MHz - 2469.5 MHz
11	2462 MHz	2449.5 MHz - 2474.5 MHz
12	2467 MHz	2454.5 MHz - 2479.5 MHz
13	2472 MHz	2459.5 MHz - 2484.5 MHz

Note: The available channels supported by the wireless products in various countries are different.

The preferred channel separation between the channels in neighboring wireless networks is 25 MHz (5 channels). This means that you can apply up to three different channels within your wireless network. There are only 11 usable wireless channels in the United States. It is recommended that you start using channel 1 and grow to use channel 6, and 11 when necessary, as these three channels do not overlap.

Appendix C
Preparing Your PCs for Network Access

This appendix describes how to prepare your PCs to connect to the Internet through the NETGEAR RangeMax™ Wireless PC Card WPN511.

For adding file and print sharing to your network, please consult the Windows help information included with the version of Windows installed on each computer on your network.

Preparing Your Computers for TCP/IP Networking

Computers access the Internet using a protocol called TCP/IP (Transmission Control Protocol/Internet Protocol). Each computer on your network must have TCP/IP installed and selected as its networking protocol. If a Network Interface Card (NIC) is already installed in your computer, then TCP/IP is probably already installed as well.

Most operating systems include the software components you need for networking with TCP/IP:

*   Windows® 95 or later includes the software components for establishing a TCP/IP network.

*   Windows 3.1 does not include a TCP/IP component. You need to purchase a third-party TCP/IP application package such as NetManage Chameleon.

*   Macintosh Operating System 7 or later includes the software components for establishing a TCP/IP network.

*   All versions of UNIX or Linux include TCP/IP components. Follow the instructions provided with your operating system or networking software to install TCP/IP on your computer.

In your IP network, each computer and the wireless access point must be assigned unique IP addresses. Each computer must also have certain other IP configuration information such as a subnet mask (netmask), a domain name server (DNS) address, and a default gateway address. In most cases, you should install TCP/IP so that the computer obtains its specific network configuration information automatically from a DHCP server during bootup.

Configuring Windows 95, 98, and Me for TCP/IP Networking

As part of the computer preparation process, you need to manually install and configure TCP/IP on each networked computer. Before starting, locate your Windows CD; you may need to insert it during the TCP/IP installation process.

Installing or Verifying Windows Networking Components

To install or verify the necessary components for IP networking:

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.

2. Double-click the Network icon.

   The Network window opens and displays a list of installed components.

3. Make sure that the following components are installed:

   • Client for Microsoft Networks
   • Ethernet Adapter
   • TCP/IP

4. The Primary Network Logon should be set to Client for Microsoft Networks.

5. If any of these items needs to be installed, follow the steps below.
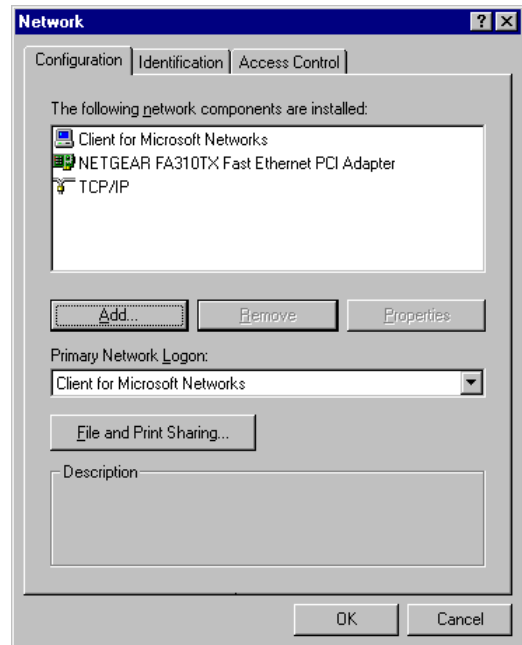
Note: It is not necessary to remove any other network components shown in the Network window in order to install the adapter, TCP/IP, or the Client for Microsoft Networks.

Installing a New Adapter

If you need to install a new adapter, follow these steps:

a. Click the Add button.

b. Select Adapter, and then click Add.

c. Select the manufacturer and model of your Ethernet adapter, and then click OK.

Installing TCP/IP

If you need TCP/IP:

a. Click the Add button.

b. Select Protocol, and then click Add.

c. Select Microsoft.

d. Select TCP/IP, and then click OK.

Installing the Client for Microsoft Networks

If you need the Client for Microsoft Networks:

a. Click the Add button.

b. Select Client, and then click Add.

c. Select Microsoft.

d. Select Client for Microsoft Networks, and then click OK.

6. Restart your computer for the changes to take effect.

Enabling DHCP to Automatically Configure TCP/IP Settings in Windows 95B, 98, and Me

After the TCP/IP protocol components are installed, each computer must be assigned specific information about itself and resources that are available on its network. The simplest way to configure this information is to allow the computer to obtain the information from a DHCP server in the network.

There are many similarities in the procedures for different Windows systems when using DHCP to configure TCP/IP. The following steps walk you through the configuration process for each of these versions of Windows.

1. **Open the Network Panel**

    •   If the Network Neighborhood icon is on the Windows desktop, position your mouse pointer over it and right-click your mouse button.

    •   If the icon is not on the desktop:

        —   On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.

        —   Locate the Network Neighborhood icon and click on it.

    The Network panel opens as shown to the right.

2. **Verify the Configuration Settings**

    a. On the Configuration tab, make sure that the following components are installed:

        •   Client for Microsoft Networks
        •   Ethernet Adapter
        •   TCP/IP

    b. The Primary Network Logon should be set to Windows Logon.

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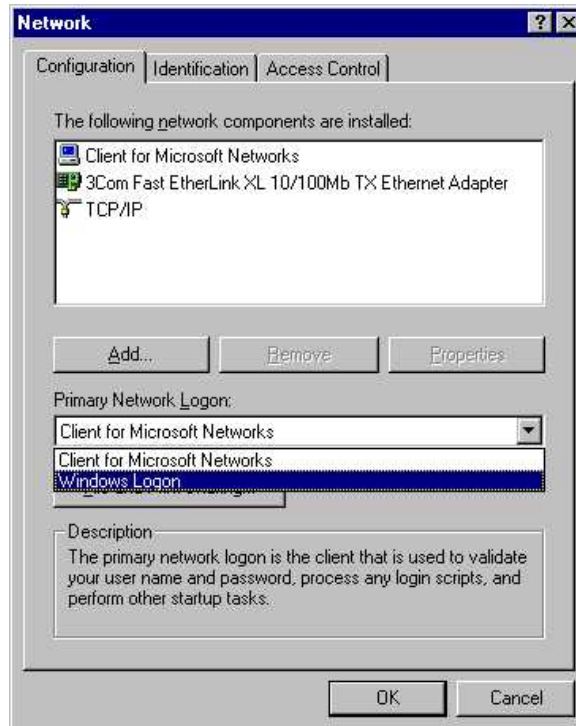
3. Verify the Properties IP Address Setting

a. Click the Properties button.

   The TCP/IP Properties window displays as shown to the right. By default, the IP Address tab is open.

b. Verify that "Obtain an IP address automatically" is selected.

   If it is not selected, click the radio button to the left of it to select it. This setting is required to enable the DHCP server to automatically assign an IP address.

c. Click OK to continue.

d. Restart the computer.

e. Repeat these steps for each computer with this version of Windows on your network.
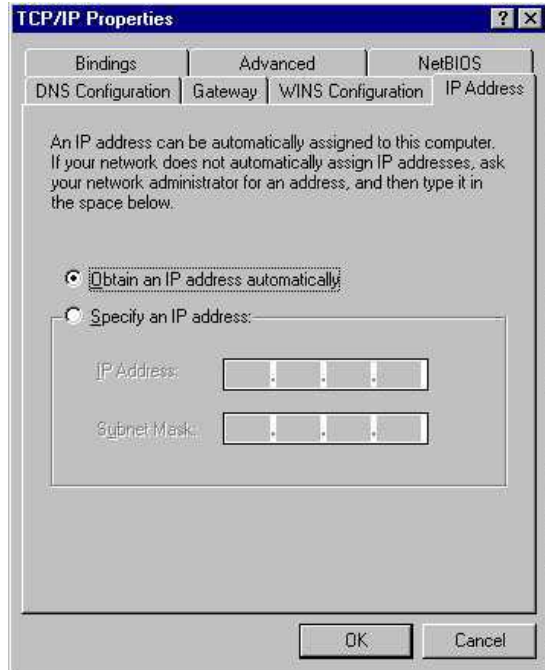
Selecting the Windows' Internet Access Method

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.

2. Double-click the Internet Options icon.

3. Select "I want to set up my Internet connection manually" or "I want to connect through a Local Area Network" and click Next.

4. Clear all the check boxes in the LAN Internet Configuration screen and click Next.

5. Proceed to the end of the Wizard.

Verifying TCP/IP Properties

After your computer is configured and has rebooted, you can check the TCP/IP configuration using the utility *winipcfg.exe*:

1. On the Windows taskbar, click the Start button, and then click Run.

2. Type **winipcfg**, and then click OK.

   The IP Configuration window opens and lists (among other things), your IP address, subnet mask, and default gateway.

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3. From the drop-down box, select your Ethernet adapter.

   The window is updated to show your settings. They should match the values below if you are using the default TCP/IP settings that NETGEAR recommends for connecting through a router or gateway:

TCP/IP Configuration	Current NETGEAR Standard	Previous NETGEAR Standard
Computer or workstation IP Address	192.168.1.2 through 192.168.1.254	192.168.0.2 through 192.168.0.254
Subnet mask	255.255.255.0	255.255.255.0
Gateway address for router	192.168.1.1 default address	192.168.0.1 default address

Configuring Windows 2000 or XP for TCP/IP Networking

As part of the PC preparation process, you may need to install and configure TCP/IP on each networked PC. Before starting, locate your Windows CD; you may need to insert it during the TCP/IP installation process.

Install or Verify Windows Networking Components

To install or verify the necessary components for IP networking:

1. On the Windows taskbar, click the Start button, point to Settings, and then click Control Panel.

2. Double-click the Network and Dialup Connections icon.

3. If an Ethernet adapter is present in your PC, you should see an entry for Local Area Connection. Double-click that entry.

4. Select Properties.

5. Verify that 'Client for Microsoft Networks' and 'Internet Protocol (TCP/IP)' are present. If not, select Install and add them.

6. Select 'Internet Protocol (TCP/IP)', click Properties, and verify that "Obtain an IP address automatically is selected.

7. Click OK and close all Network and Dialup Connections windows.

8. Then, restart your PC.

# Configuring DHCP of TCP/IP in Windows XP, 2000, or NT4

There are many similarities in the procedures for different Windows systems when using DHCP to configure TCP/IP. The following steps walk you through the configuration process for each of these versions of Windows.

DHCP Configuration of TCP/IP in Windows XP

1. **Open the Network Connection Window.**

    a. Select Control Panel from the Windows XP Start Menu.

    b. Select the Network Connections icon on the Control Panel.

    The Network Connection window displays as shown here. The Connections List is located to the right of that window.
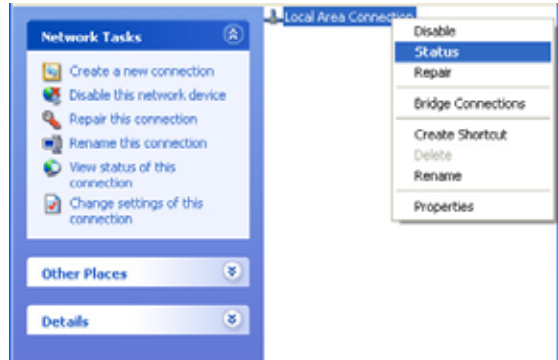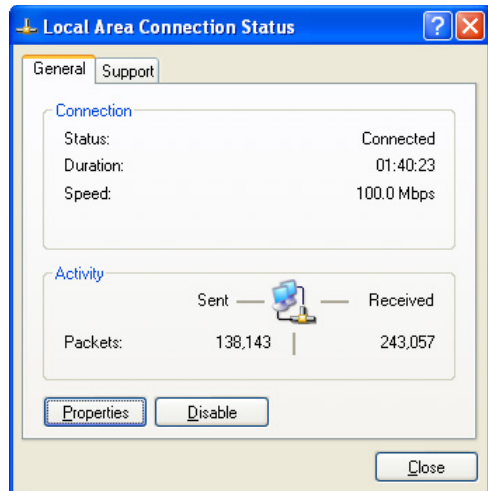
2. **Go to the Network Connection Status window.**

    Note: Administrator logon access rights are needed to use this window.

    Double-click the Connection you will use.

    The Local Area Network Connection Status window opens, as shown here. This box displays the connection status, duration, speed, and activity statistics.
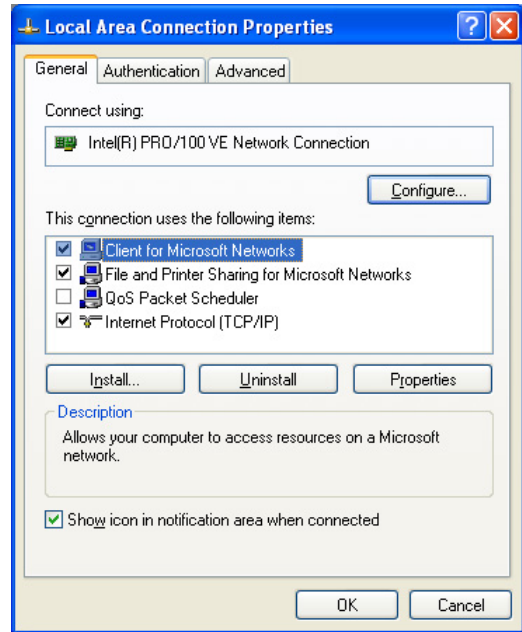
3. Go to Properties.

a. Click the Properties button to view details about the connection.

The TCP/IP details are shown on the Support tab page.

b. Select "Internet Protocol", and click Properties to view the configuration information**.**
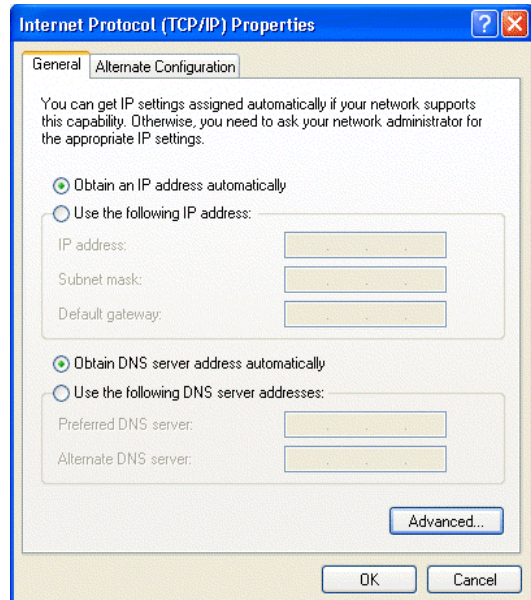
4. Set DHCP for TCP/IP.

a. Verify that the following two radio buttons are selected:

- Obtain an IP address automatically

- Obtain DNS server address automatically

b. Click the OK button.

This completes the DHCP configuration of TCP/IP in Windows XP for this computer.

c. Repeat these steps for each computer with this version of Windows on your network.

# DHCP Configuration of TCP/IP in Windows 2000

After you have installed the network card, TCP/IP for Windows 2000 is configured. TCP/IP should be added by default and set to DHCP without your having to configure it. However, if there are problems, follow these steps to configure TCP/IP with DHCP for Windows 2000.

1. Check the Local Area Connection Properties Settings.

a. Click the My Network Places icon on the Windows desktop. The Network and Dial-up Connections window opens.

b. Right click on "Local Area Connection" and select Properties.

The Local Area Connection Properties dialog box appears, as shown to the right.

c. Verify that you have the correct Ethernet card selected in the "Connect using:" box.

d. Verify that at least the following two items are displayed and selected in the "Components checked are used by this connection:" box:

   •   Client for Microsoft Networks

   •   Internet Protocol (TCP/IP)

e. Click OK.
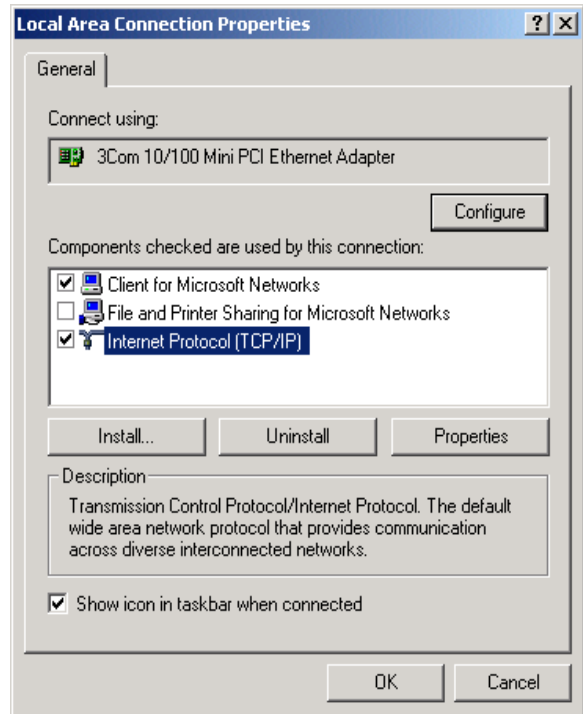
2. Check the Internet Protocol Properties.

a. With "Internet Protocol (TCP/IP)" selected, click Properties to open the Internet Protocol (TCP/IP) Properties dialog box.

b. Verify that the following items are selected:

- Obtain an IP address automatically

- Obtain DNS server address automatically

c. Click OK to return to Local Area Connection Properties.
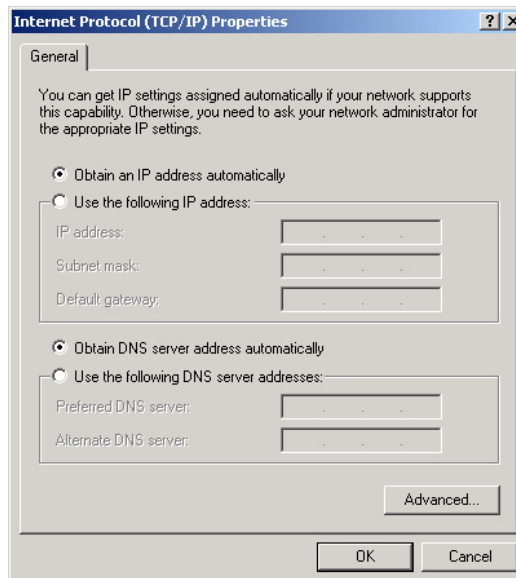
3. Complete the configuration.

a. Click OK again to complete the configuration process for Windows 2000.

b. Restart the computer.

c. Repeat these steps for each computer with this version of Windows on your network.

Preparing Your PCs for Network Access

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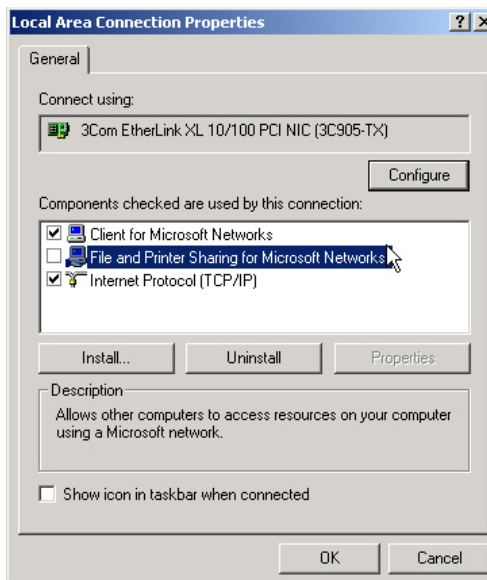
DHCP Configuration of TCP/IP in Windows NT4

Once you have installed the network card, you need to configure the TCP/IP environment for Windows NT 4.0. Follow this procedure to configure TCP/IP with DHCP in Windows NT 4.0.
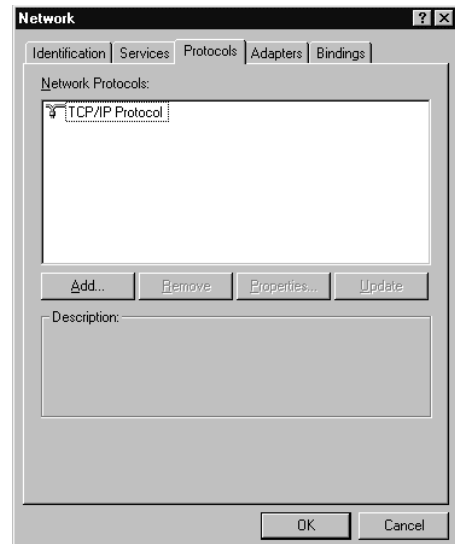
1. Open the Network panel.

    a. Choose Settings from the Start Menu.

    b. Select Control Panel to display Control Panel window.

    c. Double-click the Network icon to display the Network panel, as shown to the right.
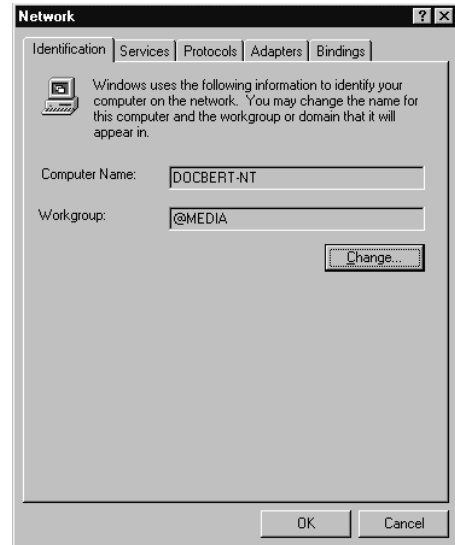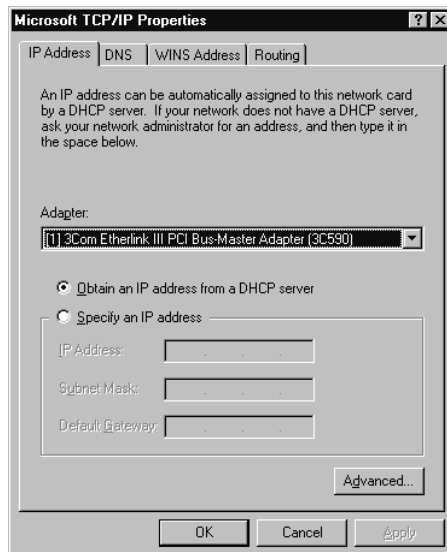
2. Go to TCP/IP Properties.

    a. Select the Protocols tab.

    b. Select "TCP/IP Protocol" in the Network Protocols box, and click the Properties button.

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3. Set the TCP/IP Properties.

The TCP/IP Properties dialog box displays.

a. Click the IP Address tab**.**

b. Select the radio button marked "Obtain an IP address from a DHCP server".

c. Click OK. This completes the configuration of TCP/IP in Windows NT for this computer.

d. Restart the computer.

e. Repeat these steps for each computer with this version of Windows on your network.

Verifying TCP/IP Properties for Windows XP, 2000, and NT4

To check your computer's TCP/IP configuration:

1. On the Windows taskbar, click the Start button, and then click Run.

    The Run window opens.

2. Type cmd and then click OK.

    A command window opens.

3. Type **ipconfig /all**

    Your IP Configuration information is listed, and should match the values below if you are using the default TCP/IP settings that NETGEAR recommends for connecting through a router or gateway.

TCP/IP Configuration	Current NETGEAR Standard	Previous NETGEAR Standard
Computer or workstation IP Address	192.168.1.2 through 192.168.1.254	192.168.0.2 through 192.168.0.254
Subnet mask	255.255.255.0	255.255.255.0
Gateway address for router	192.168.1.1 default address	192.168.0.1 default address

4. Type **exit**

Glossary

List of Glossary Terms

Use the list below to find definitions for technical terms used in this manual.

10BASE-T
IEEE 802.3 specification for 10 Mbps Ethernet over twisted pair wiring.

100BASE-Tx
IEEE 802.3 specification for 100 Mbps Ethernet over twisted pair wiring.

802.11b
IEEE specification for wireless networking at 11 Mbps using direct-sequence spread-spectrum (DSSS) technology and operating in the unlicensed radio spectrum at 2.5GHz.

802.11g
A soon to be ratified IEEE specification for wireless networking at 54 Mbps using direct-sequence spread-spectrum (DSSS) technology and operating in the unlicensed radio spectrum at 2.5GHz. 802.11g is backwards compatible with 802.11b.

ADSL
Short for asymmetric digital subscriber line, a technology that allows data to be sent over existing copper telephone lines at data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate).
ADSL requires a special ADSL modem. ADSL is growing in popularity as more areas around the world gain access.

DHCP
An Ethernet protocol specifying how a centralized DHCP server can assign network configuration information to multiple DHCP clients. The assigned information includes IP addresses, DNS addresses, and gateway (router) addresses.

DNS
Short for Domain Name System (or Service), an Internet service that translates domain names into IP addresses.
Because domain names are alphabetic, they're easier to remember. The Internet however, is really based on IP addresses. Every time you use a domain name, therefore, a DNS service must translate the name into the corresponding IP address. For example, the domain name www.example.com might translate to

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198.105.232.4. The DNS system is, in fact, its own network. If one DNS server doesn't know how to translate a particular domain name, it asks another one, and so on, until the correct IP address is returned.

Domain Name

A descriptive name for an address or group of addresses on the Internet. Domain names are of the form of a registered entity name plus one of a number of predefined top level suffixes such as .com, .edu, .uk, etc. For example, in the address mail.NETGEAR.com, mail is a server name and NETGEAR.com is the domain.

DSL

Short for digital subscriber line, but is commonly used in reference to the asymmetric version of this technology (ADSL) that allows data to be sent over existing copper telephone lines at data rates of from 1.5 to 9 Mbps when receiving data (known as the downstream rate) and from 16 to 640 Kbps when sending data (known as the upstream rate).
ADSL requires a special ADSL modem. ADSL is growing in popularity as more areas around the world gain access.

Dynamic Host Configuration Protocol

DHCP. An Ethernet protocol specifying how a centralized DHCP server can assign network configuration information to multiple DHCP clients. The assigned information includes IP addresses, DNS addresses, and gateway (router) addresses.

ESSID

The Extended Service Set Identification (ESSID) is a thirty-two character (maximum) alphanumeric key identifying the wireless local area network.

Gateway

A local device, usually a router, that connects hosts on a local network to other networks.

IETF

Internet Engineering Task Force. Working groups of the IETF propose standard protocols and procedures for the Internet, which are published as RFCs (Request for Comment) at *www.ietf.org*.
An open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet.

IP

Internet Protocol is the main internetworking protocol used in the Internet. Used in conjunction with the Transfer Control Protocol (TCP) to form TCP/IP.

IP Address

A four-byte number uniquely defining each host on the Internet, usually written in dotted-decimal notation with periods separating the bytes (for example, 134.177.244.57).
Ranges of addresses are assigned by Internic, an organization formed for this purpose.

IPX

Short for Internetwork Packet Exchange, a networking protocol used by the Novell NetWare operating systems.

Like UDP/IP, IPX is a datagram protocol used for connectionless communications. Higher-level protocols, such as SPX and NCP, are used for additional error recovery services.

ISP

Internet service provider.

Internet Protocol

The main internetworking protocol used in the Internet. Used in conjunction with the Transfer Control Protocol (TCP) to form TCP/IP.

LAN

A communications network serving users within a limited area, such as one floor of a building.

local area network

LAN. A communications network serving users within a limited area, such as one floor of a building. A LAN typically connects multiple personal computers and shared network devices such as storage and printers. Although many technologies exist to implement a LAN, Ethernet is the most common for connecting personal computers.

MAC address

The Media Access Control address is a unique 48-bit hardware address assigned to every network interface card. Usually written in the form 01:23:45:67:89:ab.

Mbps

Megabits per second.

NetBIOS

The Network Basic Input Output System is an application programming interface (API) for sharing services and information on local-area networks (LANs).

Provides for communication between stations of a network where each station is given a name. These names are alphanumeric names, up to 16 characters in length.

Network Address Translation

NAT. A technique by which several hosts share a single IP address for access to the Internet.

NIC

Network Interface Card. An adapter in a computer which provides connectivity to a network.

packet

A block of information sent over a network. A packet typically contains a source and destination network address, some protocol and length information, a block of data, and a checksum.

router

A device that forwards data between networks. An IP router forwards data based on IP source and destination addresses.

Routing Information Protocol

RIP. A protocol in which routers periodically exchange information with one another so that they can determine minimum distance paths between sources and destinations.

router

A device that forwards data between networks. An IP router forwards data based on IP source and destination addresses.

SSID

A Service Set Identification is a thirty-two character (maximum) alphanumeric key identifying a wireless local area network. For the wireless devices in a network to communicate with each other, all devices must be configured with the same SSID.

This is typically the configuration parameter for a wireless PC card. It corresponds to the ESSID in the wireless Access Point and to the wireless network name. *See also* Wireless Network Name and ESSID.

Subnet Mask

A mask used to determine what subnet an IP address belongs to. Subnetting enables a network administrator to further divide an IP address into two or more subnets.

TCP/IP

The main internetworking protocols used in the Internet. The Internet Protocol (IP) used in conjunction with the Transfer Control Protocol (TCP) form TCP/IP.

WAN

A long distance link used to extend or connect remotely located local area networks. The Internet is a large WAN.

WEB Proxy Server

A Web proxy server is a specialized HTTP server that allows clients access to the Internet from behind a firewall.

The proxy server listens for requests from clients within the firewall and forwards these requests to remote Internet servers outside the firewall. The proxy server reads responses from the external servers and then sends them to internal client clients.

WEP

Wired Equivalent Privacy is a data encryption protocol for 802.11b wireless networks.
All wireless nodes and access points on the network are configured with a 64-bit or 128-bit Shared Key for data encryption.

wide area network

WAN. A long distance link used to extend or connect remotely located local area networks. The Internet is a large WAN.

Wi-Fi

A trade name for the 802.11b wireless networking standard, given by the Wireless Ethernet Compatibility Alliance (WECA, see http://www.wi-fi.net), an industry standards group promoting interoperability among 802.11b devices.

Windows Internet Naming Service

WINS. Windows Internet Naming Service is a server process for resolving Windows-based computer names to IP addresses.
If a remote network contains a WINS server, your Windows PCs can gather information from that WINS server about its local hosts. This allows your PCs to browse that remote network using the Windows Network Neighborhood feature.

WINS

WINS. Windows Internet Naming Service is a server process for resolving Windows-based computer names to IP addresses.

Wireless Network Name (SSID)

Wireless Network Name (SSID) is the name assigned to a wireless network. This is the same as the SSID or ESSID configuration parameter.

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