

# ***Vigor520 WLAN PCMCIA Adapter***

## **User's Guide**

Version A2  
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## TRADEMARKS

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## FCC WARNING

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

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

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

This device complies with part 15 of the 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.

## FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

# Packing List

Your Vigor520 WLAN PCMCIA Adapter package should contain the following items:

- One Vigor520 WLAN PCMCIA Adapter
- One CD including: Driver, Utility and User's Guide
- One Quick Guide

# Quick Installation and Operation Guide

1. If the computer requires an external CD drive to access CD-ROM, connect the drive.

2. Insert the adapter in the CardBus slot.

See [chapter 3](#) of this user's guide for detailed instructions.

3. Install a driver from the installation CD.

Follow the instructions on the screen and in [chapter 4](#) of this user's guide.

4. Install the Wireless Adapter Utility.

Open the **Start** menu, choose **Run**, type "e:\RunMe" (assuming the CD drive is e:), Click ***Install Utility***, and follow the instructions on the screen and in [chapter 5](#) of this user's guide.

5. Create and apply a connection profile for a wireless network.

See [chapter 6](#) of this user's guide for detailed instructions.

# Contents

<b>Introduction .....</b>	<b>1</b>
<b>1 System Requirements .....</b>	<b>2</b>
1.1 Hardware .....	2
1.2 Software .....	2
<b>2 Terminology Used in this Guide .....</b>	<b>3</b>
<b>3 Familiarization and Installation .....</b>	<b>5</b>
3.1 The Parts of the Adapter .....	5
3.2 Adapter Installation .....	5
<b>4 Driver Installation and Operation .....</b>	<b>7</b>
4.1 Installation Preview .....	7
4.2 Installation Details .....	8
4.3 Controlling the Driver .....	10
4.4 Removing the Driver .....	11
<b>5 Utility Installation, Startup, and Shutdown .....</b>	<b>12</b>
5.1 Installation .....	12
5.2 Controlling the Utility .....	13
<b>6 Operation .....</b>	<b>15</b>
6.1 The Utility's Panels .....	15
6.1.1 The Information Panel .....	15
6.1.2 The Configuration Panel .....	16
6.1.3 The Security Panel .....	17
6.1.4 The SiteSurvey Panel .....	18
6.1.5 The Profile Panel .....	19
6.1.6 The About Panel .....	20
6.2 Connecting for the First Time .....	21
6.2.1 Required Information .....	21
6.2.2 Connection Steps .....	22
<b>7 Utility Command Reference .....</b>	<b>28</b>
 <b>Appendix A: Character Conversion Charts .....</b>	 <b>31</b>
<b>Appendix B: Troubleshooting .....</b>	<b>32</b>
<b>Appendix C: Technical Support .....</b>	<b>34</b>
<b>Appendix D: Limited Warranty .....</b>	<b>35</b>
<b>Appendix E: Specifications .....</b>	<b>37</b>
<b>Appendix F: Channels and Regulations .....</b>	<b>38</b>

# Figures

Figure 1. Ad-hoc network .....	3
Figure 2. Infrastructure network .....	3
Figure 3. Roamable multi-AP infrastructure network .....	4
Figure 4. Vigor520 WLAN PCMCIA Adapter.....	5
Figure 5. Microsoft Windows 98 Add New Hardware Wizard window .....	7
Figure 6. Driver icon in system tray/notification area .....	10
Figure 7. Driver icon menus (1): main button .....	10
Figure 8. Driver icon menus (2): secondary button .....	11
Figure 9. Utility icons in the Start menu and on the desktop.....	13
Figure 10. Utility icon in the system tray/notification area .....	13
Figure 11. Closing the utility's main window .....	14
Figure 12. Shutting down the utility .....	14
Figure 13. The Information panel .....	16
Figure 14. The Configuration panel.....	17
Figure 15. The Security panel.....	18
Figure 16. The SiteSurvey panel.....	19
Figure 17. The Profile panel .....	20
Figure 18. The About panel .....	21
Figure 19. The New Profile dialog box (1).....	24
Figure 20. The Profile dialog box (2) .....	25
Figure 21. The Security panel in the New Profile dialog box .....	27
Figure 22. The Confirm dialog box .....	27

# Introduction

Congratulations on choosing an outstanding wireless networking product. Your Vigor520 WLAN PCMCIA Adapter conforms to Institute of Electrical and Electronics Engineers (IEEE) standard 802.11b and the Wi-Fi specification of the Wireless Ethernet Compatibility Alliance (WECA). It supports data rates of up to 11 megabits per second (Mbps) and 64- and 128-bit Wired Equivalent Privacy (WEP) encryption, and will interoperate seamlessly with all other 802.11b and Wi-Fi compliant products.

Your adapter also supports Packet Binary Convolutional Code (PBCC) modulation and 256-bit encryption. It can therefore provide a higher data rate (22 Mbps), increased throughput, up to 30 percent greater range, and stronger security than other 802.11b-compliant adapters. These capabilities can be used on wireless links to products in the same family as your adapter.

This guide contains detailed instructions on installing and using your adapter and the software included with it. Basic terms and concepts of wireless networking are also introduced. Follow the instructions in this guide carefully to ensure that your Vigor520 WLAN PCMCIA Adapter will give you many years of trouble-free, high-performance operation.

# **1 System Requirements**

Before installing the adapter and related software, make sure the computer system meets the minimum requirements described below.

## **1.1 Hardware**

The adapter can be installed in any recent-model IBM-type microcomputer with a CardBus slot, also known as a PCMCIA or PC Card slot. The adapter is a Type II CardBus card, and can be installed in a Type II or Type III CardBus slot.

The computer must have a CD drive to allow installation of the driver and utility software for the adapter.

## **1.2 Software**

The drivers included with the adapter allow the adapter to be used in Microsoft Windows 98, ME, 2000, and XP. Third-party drivers may allow the adapter to be used, with reduced functionality, in other operating systems.



## 2 Terminology Used in this Guide

### Ad-hoc Network

An ad-hoc network is a wireless local-area network (WLAN) made up of stations communicating directly with each other through their wireless interfaces. There is no central relay point, and normally no connection to a wired network. Ad-hoc mode is sometimes referred to as *peer-to-peer*, *computer-to-computer*, or *Independent Basic Service Set (IBSS)* mode. Figure 1 shows a typical ad-hoc network.

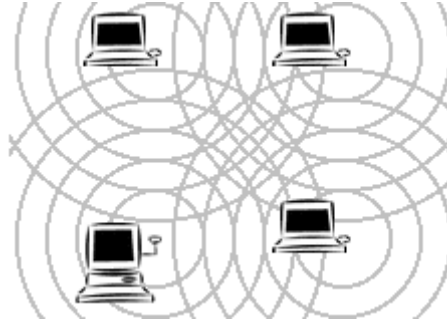


Figure 1. Ad-hoc network

### Infrastructure Network

An infrastructure network is a WLAN made up of wireless stations and at least one wireless relay point, known as a *base station* or *access point (AP)*. The AP usually has a connection to a wired network, allowing wireless stations to use resources on that network. The AP also relays all communications between wireless stations in its coverage area; these stations never communicate directly with each other. Infrastructure mode is sometimes referred to as *managed* or *Basic Service Set (BSS)* mode. Figure 2 shows a typical infrastructure network.

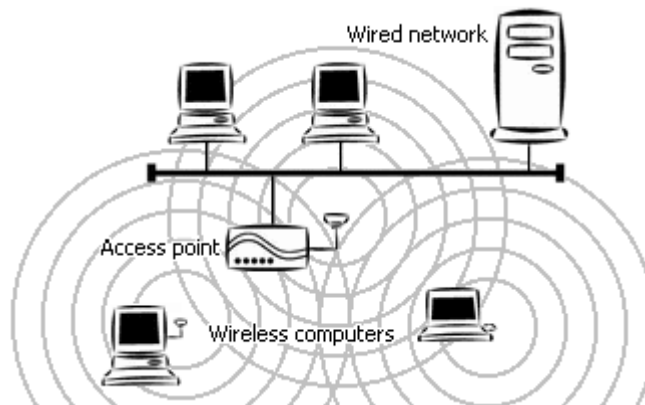


Figure 2. Infrastructure network

### BSSID/MAC Address

A Basic Service Set (BSS) is two or more wireless devices that are in communication with each other. Like every wired Ethernet device, every wireless device has a fixed, unique “medium access control” (MAC) address. When wireless devices establish communication,

they automatically select the MAC address of one BSS member as an identifier for the group; this is the BSSID.

It has become customary to refer to a wireless device's MAC address as its BSSID even when the address is not being used to identify an active BSS.

A BSS that includes an access point is often referred to as a *cell*.

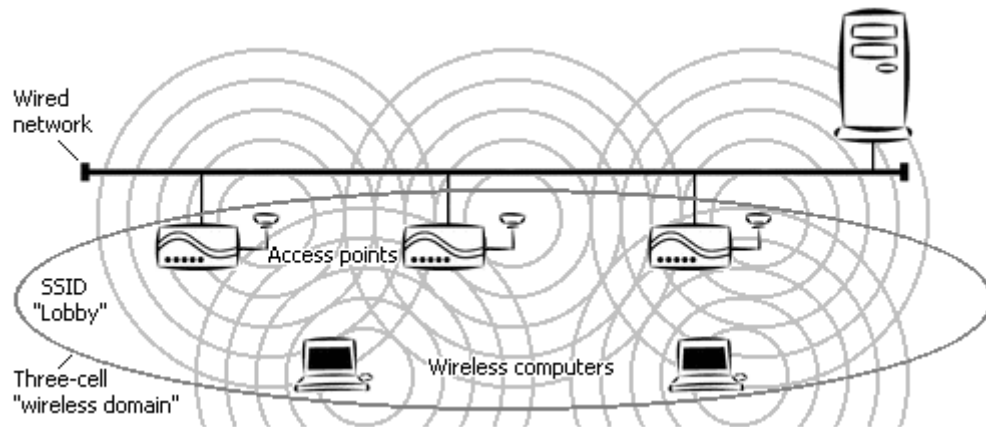
## SSID/Domain Identifier

A Service Set Identifier (SSID) is a shared name, usually assigned by a network administrator, that identifies wireless devices that are allowed to communicate with each other. This is one way of providing basic security on a wireless network. An SSID can be up to 32 characters long, and can include letters and numbers.

Giving multiple access points the same SSID and encryption settings allows mobile stations that also share those settings to “roam” from one AP to another. When at least one AP is among the devices sharing an SSID, the name may be referred to as an *Extended Service Set Identifier* (ESSID).

An SSID is sometimes called a “domain name,” but it is unrelated to the domain names used to identify machines and networks on the Internet. Other terms for SSID are *domain ID*, *net ID*, *network name*, *extended network ID*, and *wireless network name*. The set of devices that an SSID identifies is sometimes called a *communication domain* or *wireless domain*.

Figure 3 shows a common wireless network setup. If the APs share SSID and encryption settings, mobile devices that also share those settings can roam among them.



**Figure 3. Roamable multi-AP infrastructure network**

## Roaming

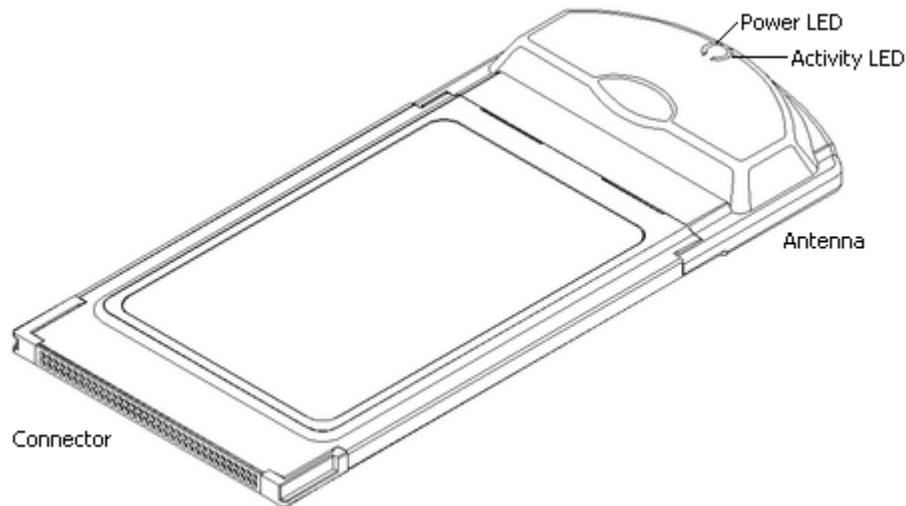
When APs covering adjacent areas have the same SSID and encryption settings, a mobile device that also shares those settings can communicate through the APs continuously while moving from one coverage area to another. This is known as *roaming*. When one AP's signal begins to weaken, the mobile device automatically searches for another AP that it is authorized to “associate with” (that is, connect to); when the second AP's signal quality is better than that of the first, the station automatically switches over.

## 3 Familiarization and Installation

This chapter describes the adapter and gives instructions on inserting it for the first time.

### 3.1 The Parts of the Adapter

The adapter has a thin, rectangular end with 68 connector holes, and a thick, rounded end that contains the antenna and two light-emitting diode (LED) indicators.



**Figure 4. Vigor520 WLAN PCMCIA Adapter**

The connector end will fit only in a Type II or Type III CardBus slot (also called a “PCMCIA” or “PC Card” slot) that provides the correct voltage level for the adapter.

The antenna housing will extend outside the slot when the adapter is fully inserted. The LEDs indicate power and wireless network activity. When the antenna housing faces right like a capital letter D, the power LED is above the activity LED. The LEDs work as follows:

- The power LED shines green when the adapter is receiving power from the computer. Note that power to the adapter can be turned off and on through software.
- The activity LED shines orange when the adapter is transmitting or receiving.

### 3.2 Adapter Installation

On most computer systems, the adapter can be safely inserted or removed at any time. Certain cautions should, however, be noted:

- If the adapter is inserted or removed while the computer is running, the operating system may beep very loudly even if the sound control has been set to **Mute** or **Muted**.
- If the adapter will be connected to an extender card installed in a desktop computer, make sure the extender card is firmly bolted to the computer’s housing before inserting or removing the adapter. Shifting or rocking of a loose extender card can result in

momentary loss of contact, which can permanently damage sensitive electronic components.

- Microsoft Windows lets you turn off power to the adapter before removing it. Depending on your version of Windows, this may be called “stopping” or “disabling” the adapter. It is strongly recommended that you use this function and avoid removing the adapter while it is operating.

For installation of adapter software to go smoothly, follow the steps below when inserting the adapter for the first time.

**1. Have the installation CD and your Microsoft Windows CD-ROM ready.**

The operating system might request the CD-ROM so it can install networking components. The CD-ROM’s contents may have been copied to the hard disk during system installation; if you know the path to the copy on the hard disk, you will be able to supply that path instead of inserting the CD-ROM.

**2. If the computer uses an external CD drive, connect the drive as described in the manual for the computer.**

**3. Insert the adapter in the CardBus slot.**

The location of the CardBus slot depends on the make and model of the computer. See your computer manual for details. The manual might refer to the slot as a PCMCIA or PC Card slot.

Most CardBus slots have a button for removing adapters. The button is normally flush with the housing of the computer. Press and release it to make it extend outside the housing; press it again to eject an adapter from the slot. A third press will return it to its original position.

## 4 Driver Installation and Operation

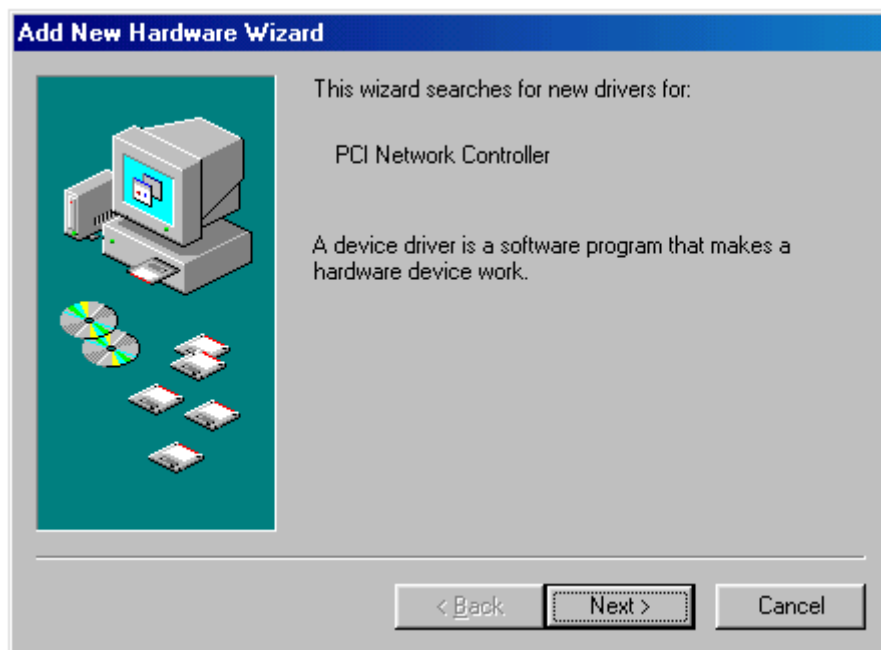
After physically installing the adapter in the computer as described above, you are ready to install a driver. This is software that lets the adapter be used in a specific operating system. The Wireless Adapter Driver disk included with your adapter contains drivers for Microsoft Windows 98, ME, 2000, and XP.

The following note is for technicians experienced at installing drivers in Microsoft Windows. Other readers should go directly to [section 4.1, “Installation Preview,”](#) immediately following the note.

**Note to technicians:** The files on the Installation CD reside in directories named according the version of Windows the files are for: \Vigor520\WIN2K, \Vigor520\WIN98, and \Vigor520\WINXP. For Windows ME, use the files in \Vigor520\WIN98. Although Windows XP has a built-in driver for the adapter, the supplied utility program will work only if the supplied driver is installed and activated.

### 4.1 Installation Preview

When Microsoft Windows detects a newly installed adapter, it starts up a special program to help you install a driver. Below is the opening window of the program that runs in Windows 98:



**Figure 5. Microsoft Windows 98 Add New Hardware Wizard window**

Each version of Windows has a different “wizard” for installing new drivers. To explain and illustrate all the steps required in each version would fill up this entire manual. The following tips apply to all supported versions of Windows; keep them firmly in mind, and you will have no trouble installing the driver:

- You will be able to move forward and back through the installation process by choosing the **Next** and **Back** buttons at the bottom of the window.
- A number of options will appear during the installation process. You must select the options that tell the program:
  - You wish it to search for a driver.  
  
If you do not tell it to search for a driver, it will display a list that you will have to search through yourself. This list will be long and hard to understand, and it might not contain the correct driver.
  - You will specify the location (or one of the locations) to search.  
  
The program normally will not search on “removable media” such as a floppy disk. You must tell it in advance that you wish it to do so.
  - The location to search is a folder on the installation CD (assuming the CD drive is E:).  
  
The installation CD contains three folders. When the program displays a text input box for specifying a location, type in the name of the folder that corresponds to your version of Windows. Type e:\Vigor520\win2k if you are using Windows 2000. Type e:\Vigor520\win98 if you are using Windows 98 or Windows ME. Type e:\Vigor520\winxp if you are using Windows XP.
- Always read everything in the window carefully, and make sure the correct options are selected, before choosing **Next**.
- Avoid common mistakes. Be sure to —
  - Insert the installation CD at a suitable time (either when the program window appears, or when you type a folder name into the location box).
  - Insert the installation CD.
  - Type a backslash [\] after “a:” when specifying the location of the driver (do not type a slash [/]).

For step-by-step instructions, see the appropriate part of the next section.

## 4.2 Installation Details

### *Microsoft Windows 98:*

1. Insert the adapter. Windows 98 will detect the adapter and start the Add New Hardware Wizard.
2. Choose **Next**.
3. Select “Search for the best driver for your device” and choose **Next**.

4. Check “Specify a location,” and uncheck all other options; then type the following into the location box: e:\Vigor520\win98
5. Insert the installation CD and choose **Next**. The Add New Hardware Wizard will find the driver and show information about it.
6. Choose **Next**. Installation will begin.
7. Follow the on-screen instructions to finish.

***Microsoft Windows ME (uses the Windows 98 driver):***

1. Insert the adapter. Windows ME will detect the adapter and start the Add New Hardware Wizard.
2. Select “Specify the location of the driver (Advanced)” and choose **Next**.
3. Make sure “Search for the best driver for your device (Recommended)” is selected; under it, check both “Removable Media (Floppy, CD-ROM....)” and “Specify a location”; then type the following into the location box: e:\Vigor520\win98
4. Insert the installation CD and choose **Next**. The Add New Hardware Wizard will find the driver and show information about it.
5. Choose **Next**. Installation will begin.
6. Follow the on-screen instructions to finish.

***Microsoft Windows 2000:***

1. Insert the adapter. Windows 2000 will detect the adapter and start the Found New Hardware Wizard.
2. Choose **Next**.
3. Select “Search for a suitable driver for my device” and choose **Next**.
4. Select “Specify a location” and choose **Next**.
5. Insert the Installation CD and type the following into the location box:  
e:\Vigor520\win2k
6. Choose **Next**. The Found New Hardware Wizard will find the driver and display information about it.
7. Choose **Next**; then choose **Yes**. Installation will begin.
8. When the Found New Hardware Wizard indicates that installation is complete, choose **Finish**.

### **Microsoft Windows XP:**

1. Insert the adapter. Windows XP will detect the adapter and start the Found New Hardware Wizard.
2. Insert the Wireless Adapter Driver disk and select “Install from a list or specific location (Advanced)”; then choose **Next**.
3. Check “Include this location in the search” and type the following into the location box:  
e:\Vigor520\winxp
4. Choose **Next**. Installation will begin.
5. When the Found New Hardware Wizard indicates that installation is complete, choose **Finish**.

After the driver is installed, an icon of a CardBus adapter will appear in the “system tray” or “notification area” of the task bar. The following illustration is from Microsoft Windows 98; the corresponding portion of your screen may look quite different:



**Figure 6. Driver icon in system tray/notification area**

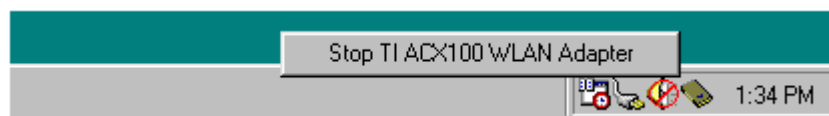
## **4.3 Controlling the Driver**

The driver normally works automatically:

- When the computer is turned on with the adapter inserted, the driver is loaded and its icon appears in the “system tray” (also called the “notification area”).
- When the computer is turned on with the adapter removed, the driver is not loaded and its icon does not appear.

You can also control the driver and the adapter as follows:

- **To deactivate the driver:** Click the driver’s icon using the mouse’s main button (usually the left button) and choose **Stop TI ACX100 WLAN Adapter**.



**Figure 7. Driver icon menus (1): main button**

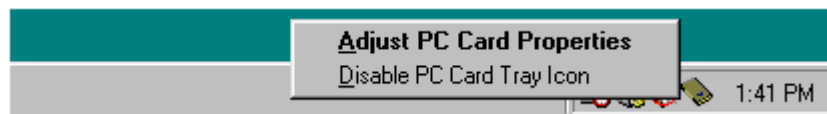
This will unload the driver from the computer’s memory and turn off power to the adapter. The message “You may safely remove this device” will appear; choose **OK** to continue.



- **To reactivate the driver:** Open the **Start** menu, go to **Settings**, choose **Control Panel**, open the **Add New Hardware** (or **Add Hardware**) icon, choose **Next**, choose **Next** again, and press **Esc**.

Assuming the adapter is in the slot, the driver will be activated and the adapter will start working. Note that the system may stop responding to keyboard and mouse actions for about one minute.

- **To hide the driver's icon without deactivating the driver:** Click the icon using the mouse's secondary button (usually the right button) and choose **Disable PC Card Tray Icon**.



**Figure 8. Driver icon menus (2): secondary button**

- **To unhide the driver's icon:** Open the **Start** menu, go to **Settings**, choose **Control Panel**, open the **PC Card (PCMCIA)** icon, select the adapter, check the "Show control on taskbar" box, and choose **OK**.

The dialog box that appears when you open the **PC Card (PCMCIA)** icon contains adapter-related functions provided by the operating system. Some are self-explanatory; others are highly technical. There are two other ways to open this dialog box:

- double-click the driver's icon, or
- click the icon with the mouse's secondary button (usually the right button) and choose **Adjust PC Card Properties**.

If you wish to remove the adapter while the computer is running, it is strongly recommended that you first deactivate the driver as described above.

## 4.4 Removing the Driver

If you wish to remove the driver from the system, do so as described below. It is assumed here that the adapter has already been removed.

1. Open the **Start** menu, go to **Settings**, choose **Control Panel**, and open the **Network** icon.
2. In the list of network components, select **TI ACX100 WLAN Adapter**.
3. Choose **Remove**.

You will be asked for confirmation and instructed to reboot the computer.

## 5 Utility Installation, Startup, and Shutdown

To join and leave wireless networks and use the adapter's special features, you must install the utility included with the adapter. In addition to its basic functions, this utility has special features that make wireless networking as convenient as possible.

### 5.1 Installation

Before installing the utility, make sure all items on the following checklist have been completed:

- The adapter is installed and its LEDs light up.
- The driver is installed and its icon appears in the system tray (also known as the notification area).
- If the computer has no built-in CD drive, an external drive is connected.

Install the utility as follows:

1. Exit all application and utility programs.
2. Insert the installation CD in CD drive.
3. Open the **Start** menu, choose **Run**, and type the following into the input box labeled **Open**: e:\RunMe (assuming the CD drive is e:)
4. Click ***Install Utility***.
5. Follow the instructions on the screen.

The installation program ordinarily places the Wireless Adapter Utility in the following location on your hard disk:

C:\Program Files\Wireless\Wireless Adapter Utility

It also normally adds a folder icon to the **Start** menu's **Programs** submenu labeled **Wireless Adapter Utility**. Commands to start and uninstall the Wireless Adapter Utility will appear when you choose this folder icon.

You will be given a chance to specify other locations for the utility on your hard disk and in the **Start** menu. After you have indicated your choices, the utility will be installed and a dialog box titled **Setup Complete** will appear.

6. Choose **Finish**.

Icons for the Wireless Adapter Utility will appear on your desktop and in the **Start** menu. The following example is from a computer running Microsoft Windows 98; the appearance of these items on your screen might be different.

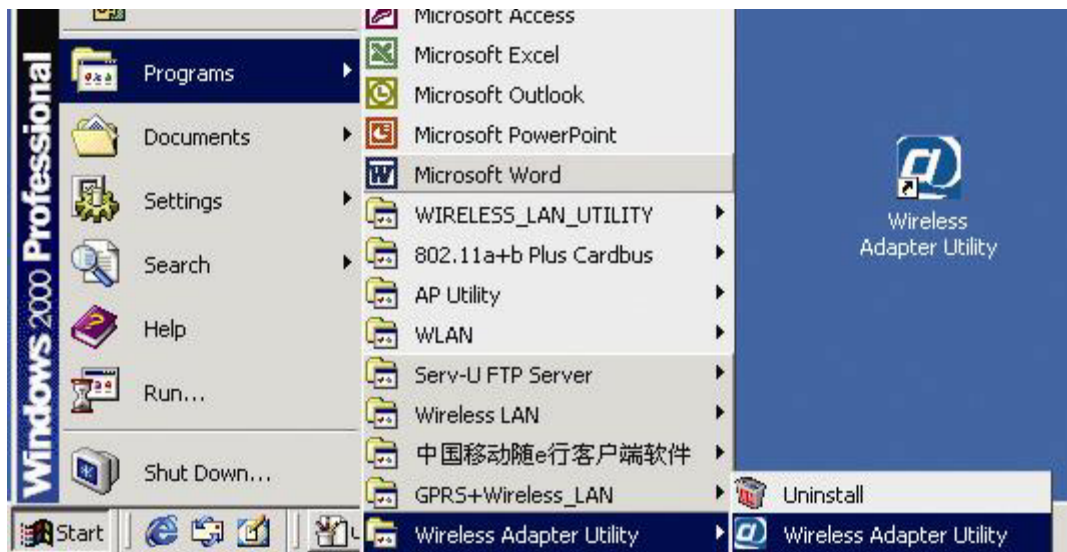


Figure 9. Utility icons in the Start menu and on the desktop

## 5.2 Controlling the Utility

The Wireless Adapter Utility behaves slightly differently from most programs with icons on the desktop and in the **Start** menu. Take note of the following so you will know what to expect when you start using the utility:

- You can start the utility up in either of two ways:
  - by opening the **Start** menu, going to **Programs**, choosing the **Wireless Adapter Utility** folder, and choosing the **Wireless Adapter Utility** command, or
  - by choosing the **Wireless Adapter Utility** icon on the desktop.
- When the utility is running, its icon appears in the system tray (also known as the notification area).

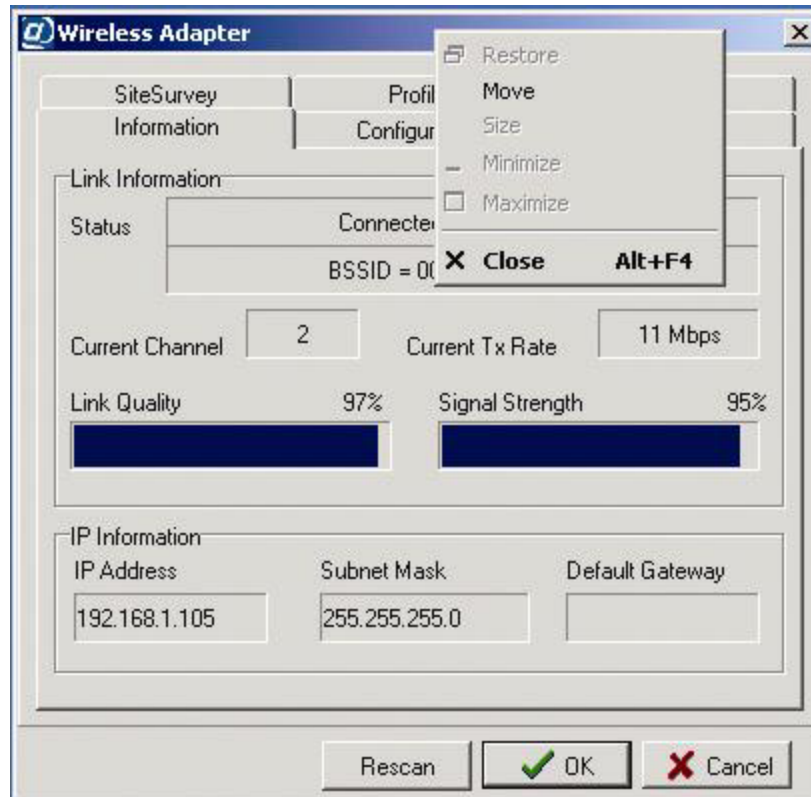
This icon has three states: **(1)** A green screen shows that you are connected to a wireless network. **(2)** A red screen shows that the adapter and driver are working, but a wireless connection cannot be established. **(3)** A black screen shows that the driver is not running.



Figure 10. Utility icon in the system tray/notification area

- When you close the utility's main window in any of the usual ways (clicking its close box, choosing **Close** from its system menu, or pressing **Alt+F4**), the utility continues to run in the background.

The utility must be running to keep any wireless connections active.



**Figure 11. Closing the utility's main window**

- To re-open the utility window, you can double-click the utility icon in the system tray, or you can carry out either of the procedures for starting the utility up (see [first item above](#)). None of these actions will cause multiple instances of the utility to run at the same time.
- To shut the utility down, click the utility's icon in the system tray with the mouse's secondary button (usually the right button) and choose the **Exit** command.



**Figure 12. Shutting down the utility**

Note that shutting down the utility will also shut down any existing wireless connections.

## 6 Operation

This chapter explains how to establish wireless connections using your Vigor520 WLAN PCMCIA Adapter and the Wireless Adapter Utility. It is assumed here that —

- you have completed installation of the adapter, driver, and utility;
- you know how to start the utility, close and redisplay its window, and shut it down (see [section 5.2, “Controlling the Utility”](#)); and
- you are within range of at least one wireless device that is working and will accept a connection from you.

Any wireless connection, even a connection to a single device, is treated in this chapter as a connection to a wireless network. There is, in fact, no difference in the steps required to connect wirelessly to a single device or a whole network, and a connection to a single device is in fact a true network connection.

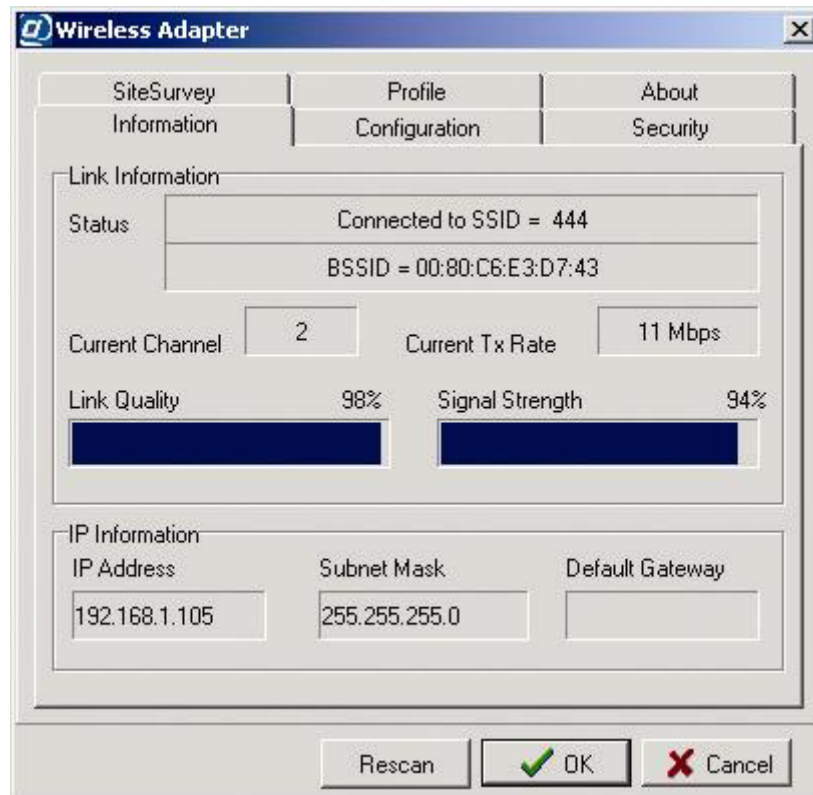
### 6.1 The Utility’s Panels

The utility has six tabbed panels. When the program starts up, the **Information** panel is shown, and a dotted rectangle on the tab shows that the panel name is selected. For convenience on laptop computers, you can switch panels with the right, left, and up arrow keys when a panel name is selected.

The utility's panels are explained briefly below. The order of the explanations matches the order in which the right and left arrow keys take you through the panels

#### 6.1.1 The Information Panel

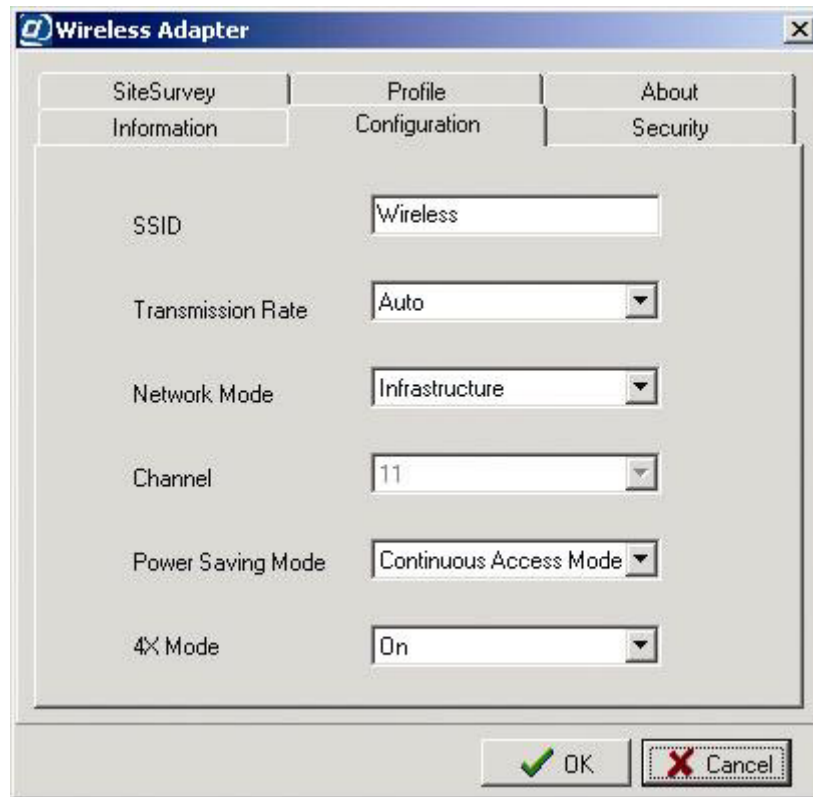
The **Information** panel shows if you are connected to a WLAN. When you have an active connection, information about it appears here. This panel can also display important error messages. A **Rescan** button, visible only when this panel appears, is for attempting to reconnect if the radio link has gone down.



**Figure 13. The Information panel**

### **6.1.2 The Configuration Panel**

The **Configuration** panel shows the adapter's current settings (except for security settings), and lets you change them. Changes are applied (that is, sent to the adapter) when you switch panels or click **OK**. This lets you test changes to the current profile before editing and resaving the profile itself.



**Figure 14. The Configuration panel**

### **6.1.3 The Security Panel**

The **Security** panel shows the adapter's current Wired Equivalent Privacy (WEP) settings, and lets you change them. WEP is a form of encryption that can help prevent snooping. To join a WLAN that uses WEP, you must obtain WEP settings from the WLAN operator. WEP settings are part of the current profile, and can be changed and tested like the settings in the **Configuration** panel.



**Figure 15. The Security panel**

#### **6.1.4 The SiteSurvey Panel**

The **Site Survey** panel shows the results of searches for WLANs. Clicking the **Search** button makes the adapter search again. Double-clicking a listed WLAN displays a window for creating a profile for that WLAN. After you click **OK** to save the profile, you are asked if you want to join the WLAN.



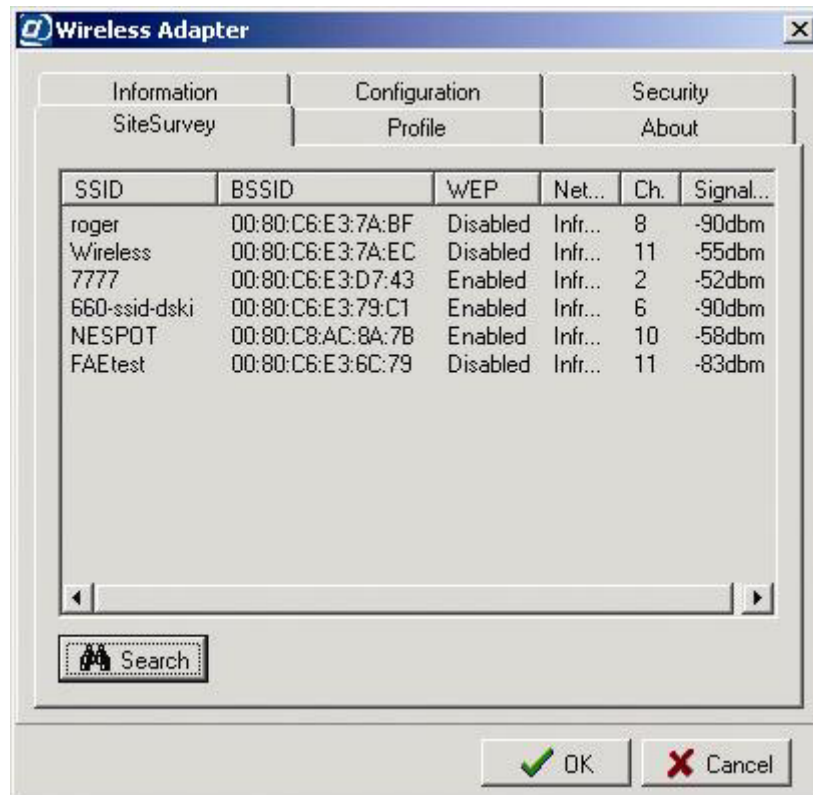
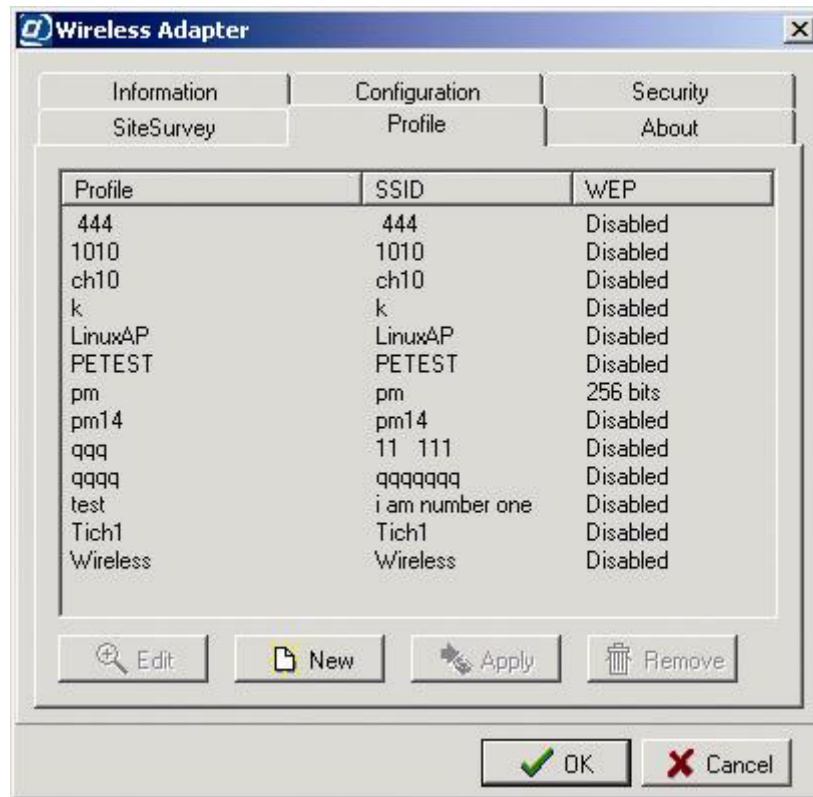


Figure 16. The SiteSurvey panel

### 6.1.5 The Profile Panel

The **Profile** panel lists existing profiles. Click a profile to enable buttons that let you edit, apply, or remove it. Double-clicking a profile is another way of applying it. The **New** button is for creating a profile from scratch. After creating or editing a profile, you are asked if you want to apply it.



**Figure 17. The Profile panel**

#### 6.1.6 The About Panel

The **About** panel contains a copyright notice and information about the operating system, the utility, the driver, and the adapter. The "regulatory domain" is the region whose laws the adapter's capabilities conform to.

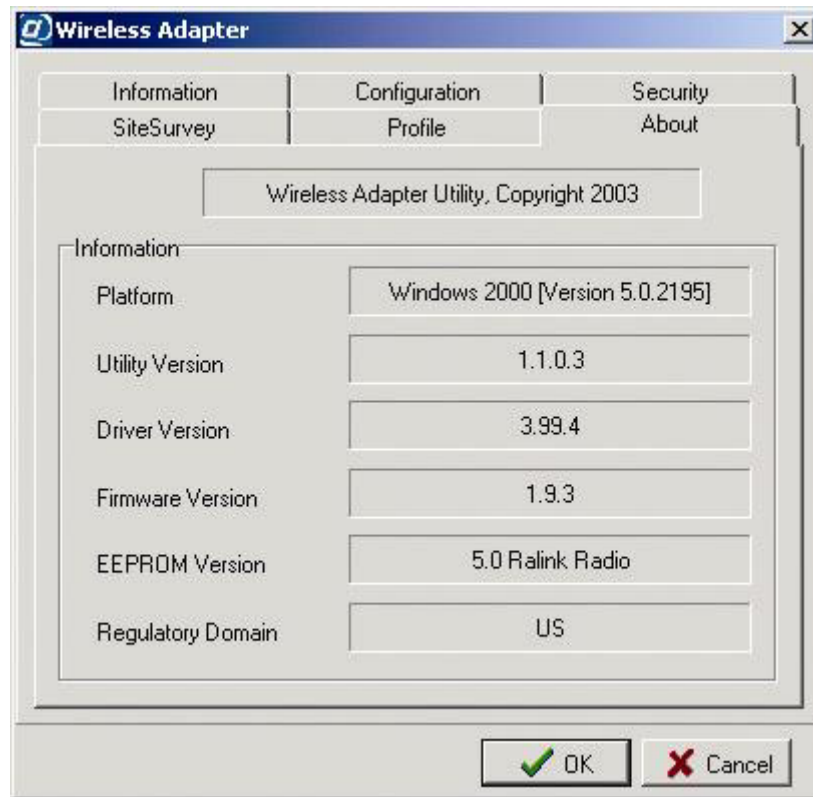


Figure 18. The About panel

## 6.2 Connecting for the First Time

The utility works on the basis of *connection profiles*. A connection profile is a group of settings that lets you join a particular WLAN. Connection profiles are referred to simply as *profiles* in the rest of this guide.

For a low-security WLAN, you often can create a profile with two clicks, save it with another click, and *apply* it (that is, use the settings in it to join the WLAN) with one more click. For some WLANs, however -- especially high-security WLANs -- you must input settings supplied by the WLAN operator to create a profile and join the WLAN for the first time.

A profile is automatically saved for each WLAN that you join. The next time you want to join that WLAN, you can do so by simply applying the profile. There is no limit to the number of profiles you can save. You can also save multiple profiles for a single WLAN, if it requires different settings at different times (this is done on some WLANs for security reasons). You can create, edit, and delete profiles at any time, whether you are connected to a WLAN or not.

### 6.2.1 Required Information

Before you create a connection profile, you need to know certain information about the wireless network that the profile is for:

- The **SSID**, sometimes referred to as the network name or ID, or the domain name or ID. If you are within range of the network, you can obtain the SSID from the **SiteSurvey** panel. If it exceeds the width of the **SSID** column, place the pointer on it (or drag the **BSSID** column to the right) to see all of it.
  - Note:** On some infrastructure networks where unusually tight security is enforced, SSID broadcasts (also known as “beacons”) are disabled. Such a network will not appear in the **Site Survey** listing, and you may not be able to connect to it even if you know the SSID.
- The **operating mode** of the network. This can be 802.11 ad-hoc, infrastructure, or high-speed ad-hoc. The **Site Survey** display will show you if a network is in ad-hoc or infrastructure mode.
  - If the mode is ad hoc (either 802.11 or high-speed), you will need to know the radio frequency channel the network is operating on. This is displayed in the **Site Survey** listing.
  - High-speed ad-hoc mode can be used only with wireless devices from the same product family as your adapter. The network installer or operator can tell you if the network is in high-speed ad-hoc mode.
- The **Wired Equivalent Privacy (WEP)** settings that are used on the network. WEP increases network security by encrypting transmissions on the basis of a “key” known only to authorized users. The **SiteSurvey** panel will show you if WEP is enabled or disabled; if it is enabled, the network installer or operator can tell you the type and content of the key.
  - A key can be 64, 128, or 256 bits long. (A 64-bit key is sometimes called a “40-bit” key.) 256-bit keys can be used only with wireless devices from the same product family as your adapter.
  - A key may be given to you in the form of a text string, a series of numeric values in “hex” (hexadecimal, that is, base 16) notation, or ASCII characters
    - In hex notation, the characters 0 through 9 and A through F are all considered digits. The letters represent the values we usually write as 10 through 15. (BSSIDs are always shown in hex.) When typing a value into a hex input box, you must type two hex digits, for example “0x4142333132”.
    - ASCII characters are a text string from, for example “AB312”.

SSID, network mode (and possibly radio channel), and WEP settings (possibly including key length and content or generation method) — that is all you need to know to connect to any IEEE 802.11b-compliant wireless network.

### 6.2.2 Connection Steps

These instructions assume that you have installed the driver and utility correctly, that the adapter is inserted and in operation, and that you are within radio range of the WLAN you want to join.

If the WLAN is set up for the easiest possible access, you can join as follows: **(1)** Start the utility. **(2)** Go to the **SiteSurvey** panel. **(3)** Double-click the line showing information about the WLAN. **(4)** Click **OK** to save the profile created by the utility. **(5)** Click **Yes** to confirm that you want to connect.

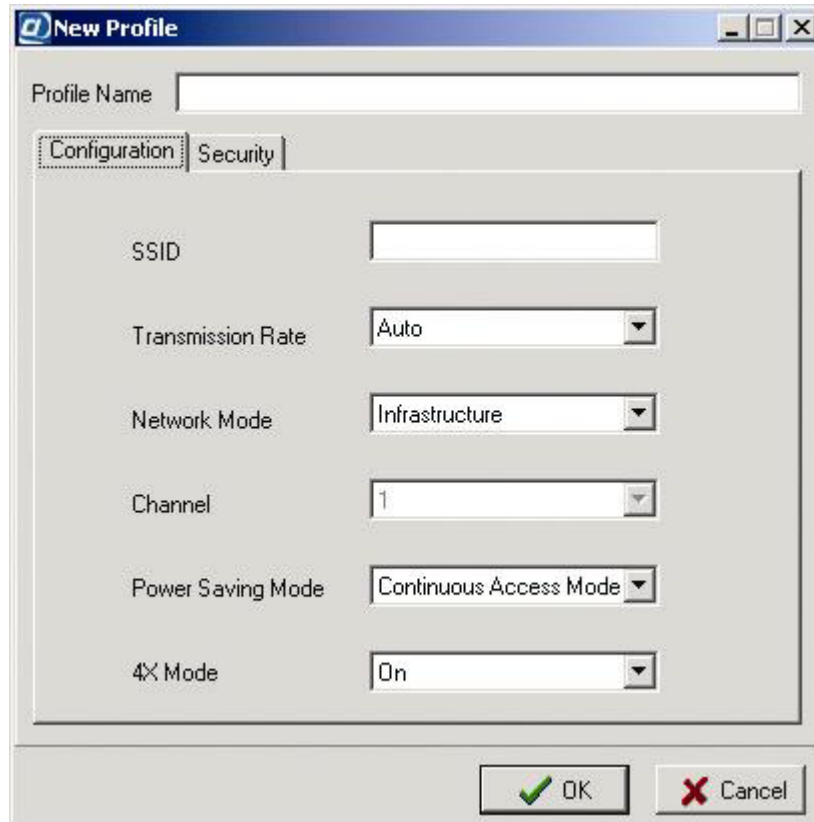
This process is described in greater detail below.

1. Start up the Wireless Adapter Utility.

The utility's **Information** panel will appear. Ordinarily, the first time you run the utility, this panel will show that you have not joined a WLAN.

If the WLAN you want to join allows automatic detection, the utility can create a profile containing all or most of the settings required for joining. You will need little or no information from the WLAN operator.

If the WLAN does not allow automatic detection, you will have to obtain configuration and security information from the WLAN operator. Then, to create a profile and join the WLAN, go to the **Profile** panel, click **New**, input all the information, and click **OK**.



**Figure 19. The New Profile dialog box (1)**

It is assumed here that the WLAN allows automatic detection. If it does, information about it will appear on your screen in the next step.

2. Go to the **SiteSurvey** panel. Note the information shown in the **SSID** and **WEP** columns.

An SSID (Service Set Identifier) is a name assigned to a WLAN by the operator. WEP is Wired Equivalent Privacy, a means of encrypting digital communications to prevent snooping.

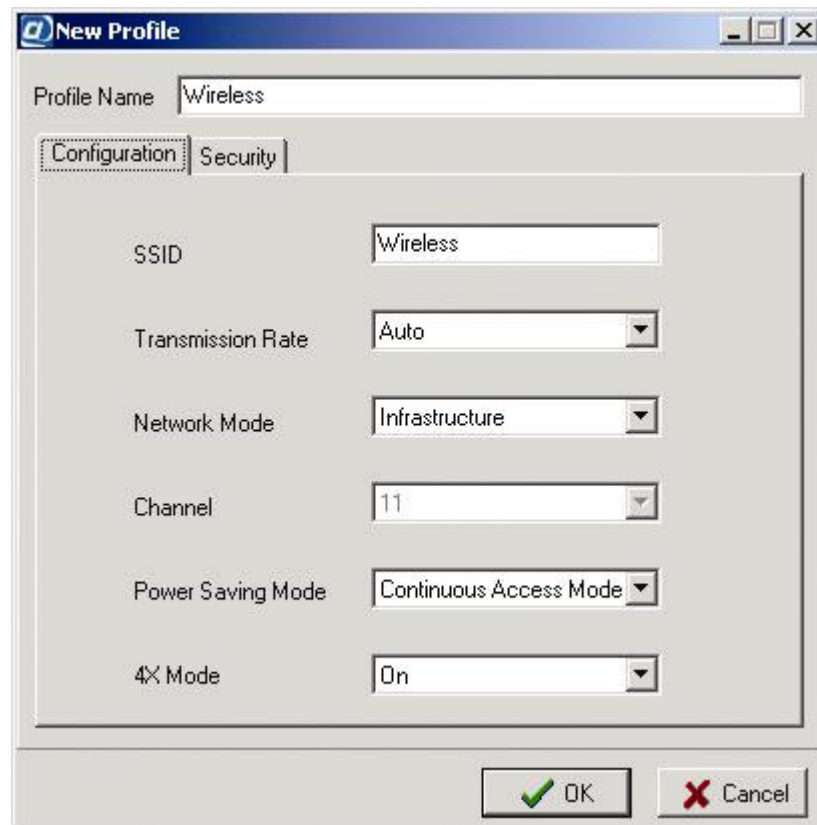
If more than one WLAN is listed, the SSIDs should help you identify the one you want to join. Look to see if WEP is disabled or enabled on that WLAN; this affects what you must do to join.

- *If WEP is disabled*, the utility can create a profile containing all the settings required for joining the WLAN. **Go straight to step 3.**
- *If WEP is enabled*, encryption is used for security on the WLAN, and you will need to know **(1)** the encryption method (64-, 128-, or 256-bit WEP), **(2)** the format of the "key" or keys ("hex" or "ASCII" -- that is, numeric or textual), **(3)** the key or keys, and in some cases, **(4)** the "authentication mode" ("open" or "shared").

The encryption method is sometimes called the "key length," and 64-bit WEP is sometimes called "40-bit WEP." If you have received a key or keys but are not sure of the method and format, see the additional explanations in step 3.

3. Double-click the WLAN you want to join.

A window titled **New Profile** will appear. It will show a suggested name for the profile and, in a panel titled **Configuration**, adapter settings that the utility has determined are suitable for joining the WLAN.



**Figure 20. The Profile dialog box (2)**

The name and most of the settings should be left unchanged. If you need to conserve battery power on a laptop computer, you can set the **Power Saving Mode** control to **Maximum Power Save**. This will make the adapter's radio go off and on periodically when you are connected to this WLAN. As a result, the connection might sometimes seem slower than usual.

- *If WEP is disabled on the WLAN, go straight to step 4.*
- *If WEP is enabled on the WLAN, go to the New Profile window's Security panel.*

To enable WEP in this profile, pull down the **Method** list and select **64-Bit**, **128-Bit**, or **256-Bit**. Controls for selecting the "key input method" (that is, key format) and for entering keys will appear.

If you are unsure of how to set the **Method** and **Key Input Method** controls, you can tell from the length and contents of the WLAN's key or keys. Read the following two paragraphs very carefully.

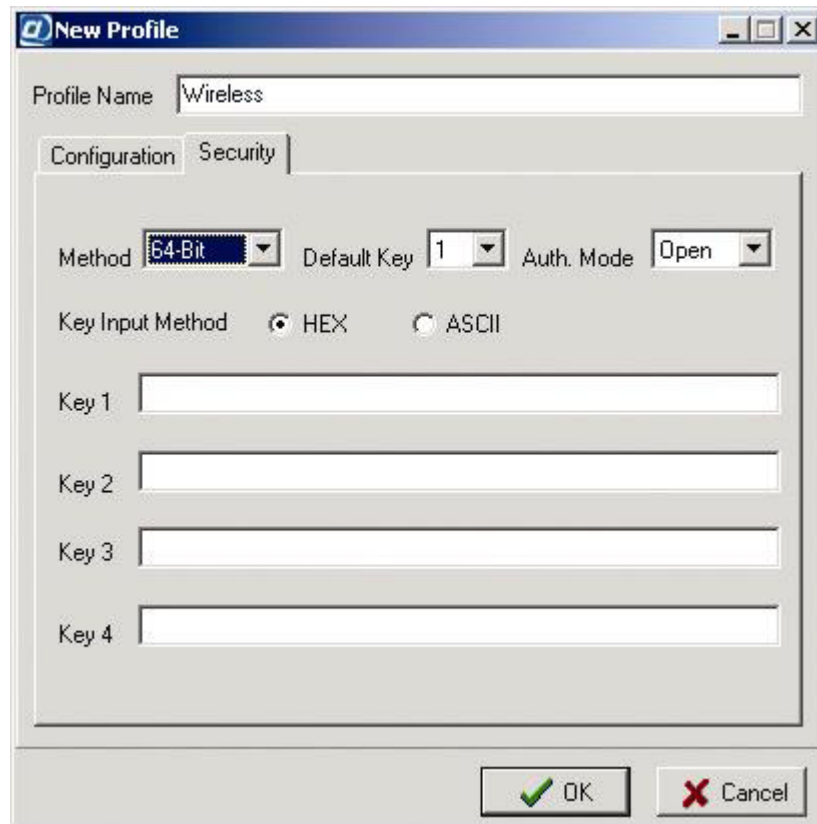
"Hex" is hexadecimal (base 16) notation. A WEP key in hex format can contain only hex digits. The hex digits are the numerals 0 through 9 and the letters A through F (case does not matter; "A" has the same meaning as "a" in hex). The key must contain an exact number of hex digits: 10 for 64-bit WEP, 26 for 128-bit WEP, and 58 for 256-bit WEP. (A WEP key in hex format may be written with spaces or colons between pairs of digits. Be sure to count and type only the digits.)

ASCII (American Standard Code for Information Interchange) means plain text. A WEP key in ASCII format can contain any characters you can type on your keyboard, including spaces. Case matters; "A" and "a" are treated as different characters. The key must contain an exact number of characters: 5 for 64-bit WEP, 13 for 128-bit WEP, and 29 for 256-bit WEP.

64-bit WEP allows the use of one to four keys, and the **Default Key** control must be set to the key currently in use. If using 128- or 256-bit WEP, type the key into the **Key 1** box.

The **Auth. Mode** (authentication mode) control is set by default to **Open**. In open authentication, a request to join a WLAN is never encrypted. If the WLAN uses shared authentication (where requests to join must be encrypted), set this control to **Shared**. (If **Auth. Mode** is set to **Auto**, the adapter will try both methods. Some WLANs allow this, and some do not.)





**Figure 21. The Security panel in the New Profile dialog box**

4. Click **OK**.

The utility will save the profile and ask if you want to connect to the WLAN.



**Figure 22. The Confirm dialog box**

5. Click **Yes**.

Connection is usually very quick. If your computer needs to obtain settings (such as an IP address) from a server on the WLAN, this may take a few more seconds. The utility's **Information** panel shows the state of the connection. It also displays your computer's IP address and other TCP/IP settings (this is for convenience only; these settings are not related to wireless networking).

## 7 Utility Command Reference

This chapter explains all the controls in the Wireless Adapter Utility's panels.

### SSID

The **SSID** control is a text input box for typing the target network's Service Set Identifier, also known as the (wireless) network name (or ID), (wireless) domain name (or ID), or Extended Service Set Identifier (ESSID). All devices on a wireless network must use the same SSID.

### BSSID

The BSSID is an automatically assigned numeric identifier for the network. On an infrastructure network, it is usually the medium access control (MAC) address of the access point (AP); on an ad-hoc network, it is usually the MAC address of one of the members. BSSIDs are shown in hexadecimal (base 16) notation.

### Transmission Rate

The **Transmission Rate** control is a drop-down list box for selecting a communication speed setting. The default setting is **Auto**, that is, automatic speed detection and adjustment. **Auto** is the only setting allowed on an infrastructure network or a high-speed ad-hoc network. When the setting of the **Transmission Rate** control is fixed because of the **Network Mode** setting, it is shown in gray characters and the control is disabled.

When the **Network Mode** control is set to **802.11 Ad-hoc**, the **Transmission Rate** control offers five settings: **Auto**, **1 Mbps**, **2 Mbps**, **5.5 Mbps**, and **11 Mbps**.

Using a fixed, high speed throughout a network can improve security by reducing the effective range. Fixed, low speeds may be necessary for interoperation with some pre-802.11b devices. The **Auto** setting lets the adapter adjust communication speed according to signal quality; this setting thus offers the best combination of throughput, range, and resistance to interference.

### Network Mode

The **Network Mode** control is a drop-down list that offers three settings: **802.11 Ad-hoc**, **Infrastructure**, and **High Speed Ad-hoc**. You must choose the setting that agrees with the actual operating mode of the network. High-speed ad-hoc mode can only be used by devices in the same product family as your adapter.

### Channel

Depending on which part of the world you are in, there can be up to 14 "channels" in the radio frequency band used for wireless networking (2.4 to 2.4835 GHz in most countries). A channel consists of 23 exact frequencies spaced 1 MHz apart for a total spread of 22 MHz. Such spreading is required by regulatory agencies to reduce interference among devices operating in this band.

On an infrastructure network, each access point (AP) is set to use a fixed channel, and stations automatically detect the channel used by the AP that provides the best signal quality. The **Channel** control is therefore disabled when the **Network Mode** control is set to **Infrastructure**.

An ad-hoc network operates on a fixed channel. To join a given ad-hoc network, you must select the correct channel from the **Channel** control's drop-down list. The settings offered in the list depend on the regulations of the country in which the adapter was purchased.

APs with overlapping coverage areas, or different ad-hoc networks operating in the same area, should use channel settings that are at least four, and preferably five channels apart (for example, 1, 6, and 11) to avoid interference and obtain the best possible performance.

## Power Saving Mode

The **Power Saving Mode** control is a drop-down list that offers two settings: **Continuous Access Mode** and **Maximum Power Save**.

In Continuous Access mode, your adapter's receiver is always on.

Maximum Power Save mode is a "doze" mode in which the adapter turns its receiver off but "wakes up" at fixed intervals to see if any communications are waiting for it. Before entering this mode, it tells the AP (or, on an ad-hoc network, the current coordinating station) that it is going to do so. The AP (or coordinating station) will "buffer" (temporarily store) communications destined for your machine. The adapter stays "awake" only long enough to check for and receive waiting communications..

## 4X Mode

The **4X Mode** control is a drop-down list that offers two settings: **Off** and **On**.

The default setting is **On**. When Mode 4x is **On**, it can therefore provide a higher data rate (more than 22 Mbps), increased throughput, around two times greater range, than other 802.11b-compliant adapters. Mode 4x can be used on wireless links to products in the same family as your adapter.

## Security

The **Security** control is a drop-down list at **Security** panel's **Method** for selecting a WEP setting. Four settings are offered: **Disable**, **64-Bit**, **128- Bit**, and **256-Bit**.

The default setting is **Disable**. Selecting any other setting enables the WEP key input controls WEP itself is not enabled in the profile until you complete WEP key input.

If you select **64-Bit**, **128- Bit**, and **256-Bit**, four WEP keys can be used. These keys accept "hex" (hexadecimal, that is, base 16) notation or "ASCII" characters. In hex, the numbers 0 through 9 and the letters A through F are all considered digits (the letters stand for the values we normally refer to as ten through fifteen). When typing into one of these keys you must type "0x" first, or your input is considered incomplete. The current key must be selected here, or you will not be able to connect.

The **256-Bit** setting can only be used on connections to devices in the same product family as your adapter.

## **Auth. Mode**

The **Auth. Mode** (Authentication Mode) control is the first control in the **Security** panel. It is a drop-down list offering two settings: **Open**, **Shared**, and **Auto**.

The setting of this control is ignored when WEP is disabled.

A machine must request permission to join a wireless network. On some networks where WEP is enabled, a request to join must be WEP-encrypted; on others, it must not.

In Open Authentication mode, requests to join the network are never WEP-encrypted. In Shared Authentication mode, all requests to join must be WEP-encrypted. The default setting is **Auto Mode**.

## **Profile Name**

The **Profile Name** control is a text input box for giving the profile a name. Each profile must have a unique name. A profile name can be any length, but it cannot contain spaces. The case of any letters you type is preserved. When you are editing an existing profile, the name appears on a gray background here and cannot be edited.

# Appendix A: Character Conversion Charts

These charts show both control codes and printable characters. Control codes (including DEL) have no standard printed representations and are unlikely to appear in plain-text WEP keys; they are included for completeness only.

Printable characters appear in the punctuation/numbers, symbols/diacritics, uppercase, and lowercase columns. Each is followed by an equals sign and a numeric value in hexadecimal notation. Type the value into the appropriate WEP key hex input box. To input the WEP key Mimsy, for example, you would type 4D, 69, 6D, 73, and 79 into the boxes for the key.

## Hexadecimal Character Code Conversion Charts

### 1. American Standard Code for Information Interchange (ASCII)

Control Codes		Punct./Num.		Uppercase		Lowercase	
00=NUL=^@	10=DLE=^P	SP=20	0=30	@=40	P=50	`=60	p=70
01=SOH=^A	11=DC1=^Q	!=21	1=31	A=41	Q=51	a=61	q=71
02=STX=^B	12=DC2=^R	"=22	2=32	B=42	R=52	b=62	r=72
03=ETX=^C	13=DC3=^S	#=23	3=33	C=43	S=53	c=63	s=73
04=EOT=^D	14=DC4=^T	\$=24	4=34	D=44	T=54	d=64	t=74
05=ENQ=^E	15=NAK=^U	%=25	5=35	E=45	U=55	e=65	u=75
06=ACK=^F	16=SYN=^V	&=26	6=36	F=46	V=56	f=66	v=76
07=BEL=^G	17=ETB=^W	'=27	7=37	G=47	W=57	g=67	w=77
08=BS=^H	18=CAN=^X	(=28	8=38	H=48	X=58	h=68	x=78
09=HT=^I	19=EM=^Y	)=29	9=39	I=49	Y=59	i=69	y=79
0A=LF=^J	1A=SUB=^Z	*=2A	: =3A	J=4A	Z=5A	j=6A	z=7A
0B=VT=^K	1B=ESC=^[	+ =2B	; =3B	K=4B	[ =5B	k=6B	{ =7B
0C=FF=^L	1C=FS=^\ 	, =2C	< =3C	L=4C	\ =5C	l=6C	=7C
0D=CR=^M	1D=GS=^] 	- =2D	= =3D	M=4D	] =5D	m=6D	} =7D
0E=SO=^N	1E=RS=^^	. =2E	> =3E	N=4E	^ =5E	n=6E	~ =7E
0F=SI=^O	1F=US=^_	/ =2F	? =3F	O=4F	_ =5F	o=6F	?F=DEL

### 2. ISO 8859-1 Extension to ASCII

Control Codes		Symb./Diac.		Uppercase		Lowercase	
80=PAD	90=DCS	NBS=A0	°=B0	À=C0	Ð=D0	à=E0	ð=F0
81=HOP	91=PU1	¡=A1	±=B1	Á=C1	Ñ=D1	á=E1	ñ=F1
82=BPH	92=PU2	¢=A2	²=B2	Â=C2	Ò=D2	â=E2	ò=F2
83=NBH	93=STS	£=A3	³=B3	Ã=C3	Ó=D3	ã=E3	ó=F3
84=IND	94=CCH	¤=A4	´=B4	Ä=C4	Ô=D4	ä=E4	ô=F4
85=NEL	95=MW	¥=A5	µ=B5	Å=C5	Õ=D5	å=E5	õ=F5
86=SSA	96=SPA	¦=A6	¶=B6	Æ=C6	Ö=D6	æ=E6	ö=F6
87=ESA	97=EPA	§=A7	·=B7	Ç=C7	×=D7	ç=E7	÷=F7
88=HTS	98=SOS	¨=A8	¸=B8	È=C8	Ø=D8	è=E8	ø=F8
89=HTJ	99=SGCI	©=A9	¹=B9	É=C9	Ù=D9	é=E9	ù=F9
8A=VTS	9A=SCI	ª=AA	º=BA	Ê=CA	Ú=DA	ê=EA	ú=FA
8B=PLD	9B=CSI	«=AB	»=BB	Ë=CB	Û=DB	ë=EB	û=FB
8C=PLU	9C=ST	¬=AC	¼=BC	Ì=CC	Ü=DC	ì=EC	ü=FC
8D=RI	9D=OSC	–=AD	½=BD	Í=CD	Ý=DD	í=ED	ý=FD
8E=SS2	9E=PM	®=AE	¾=BE	Î=CE	Þ=DE	î=EE	þ=FE
8F=SS3	9F=APC	¯=AF	¿=BF	Ï=CF	ß=DF	ï=EF	ÿ=FF

## Appendix B: Troubleshooting

**Problem:** Adapter installation appears to have failed.

**Solutions:**

- Make sure the adapter is firmly seated in the CardBus slot.
- Uninstall and reinstall the adapter. If the problem persists, uninstall the adapter and install it in another slot. If possible, try the adapter in another computer to see if the problem is in the adapter or the computer.
- Check to see if there is an IRQ conflict with another device:
  1. Open the **Start** menu, go to **Settings**, choose **Control Panel**, open the **System** icon, choose **Device Manager**, and open the **Network adapters** entry. If an exclamation mark [!] appears on the adapter icon, select the icon and choose **Properties**.
  2. Under **Conflicting device list** in the **Resources** panel of the **Properties** dialog box, you will see a device conflict message.
  3. Uncheck **Use automatic settings** and choose the **Change Setting** button.
  4. Select a new IRQ value. When the message “No conflicts” appears in the **Properties** dialog box, close all windows by choosing **OK**, and then restart the computer.

**Problems:** (1) The adapter fails to function. (2) The adapter’s LEDs are both off. (3) The operating system does not detect the adapter.

**Solution:** These problems may be caused by unsuccessful installation. If you are sure that the adapter is firmly seated in a working slot and has not been turned off through the software, we recommend that you completely uninstall the adapter, the driver, and the utility, and then repeat the installation procedures described in this manual.

**Problem:** You cannot join a network that currently appears in the Settings panel’s Site Survey section.

**Solution:** Make sure the computer has the same SSID and security settings as the access point or (in the case of an ad-hoc network) whatever device represents the network in the **Site Survey** listing.

- **SSID:** The SSID is case-sensitive. Every device on a wireless network must use exactly the same SSID.
- **Security:** If the **Site Survey** list shows that WEP is disabled on the network, WEP must be disabled on your machine. If WEP is enabled on the network, it must be enabled with the same key length and contents on your machine.

In addition, if WEP is enabled, the **Auth. Mode** control must be set to either **Auto** or the mode used on the network (open authentication or shared authentication).

If the network is in ad-hoc mode, in addition to using the correct SSID and security settings, you must use the channel indicated in the **Site Survey** section and set the transmission rate to **Auto** or the exact fixed speed used on the network.

Remember that high-speed ad-hoc mode and 256-bit WEP encryption can be used only on connections to devices in the same product line as your adapter.

Select the connection profile for the network, choose **Details**, edit the profile, choose **OK**, and choose **Apply** to put the new settings into effect.

**Problem:** An initially good wireless link fails, or the link alternates between good and bad (the utility icon in the system tray goes from green to red, or constantly alternates between green and red).

**Solutions:**

- On an ad-hoc network, the link may go up and down for a short while until the network adjusts to the addition of a new member. A different BSSID may appear in the **Information** panel each time the link comes back. The link should quickly stabilize; try the solutions below only if the problem persists.
- The computer may be too far from the access point (or the nearest ad-hoc network member). If possible, move closer. In some cases, changing the orientation of the antenna (on one device or both) can help.
- There may be interference from a microwave oven, cordless phone, or remote control. Shut down the interfering device, move it further away, or move away from it. If channel selection is under your control, setting the access point (or all members of an ad-hoc network) to use a different channel may solve the problem.
- Objects in the vicinity may be blocking or reflecting the signal. Metallic and other high-density objects affect radio signals the most, but even a tinted or wet window can reduce signal quality. Signal reflection, even from a remote object, can cause serious “multipath distortion” (this also causes “ghosts” on television screens). Try a different location (sometimes a small shift is all that is needed), or, if possible, move objects that may be affecting reception.
- Make sure the access point (or ad-hoc network member) is working correctly. Check all antennas, connectors, and cables.

**Problem:** A working, nearby access point does not appear in the Site Survey listing.

**Solutions:**

- Check the range, and check the environment for interference, signal absorption, and signal reflection (see preceding).
- The access point may be set not to broadcast its SSID. If possible, change the setting; otherwise, contact your dealer to see if an updated driver is available for the adapter.

## Appendix C: Technical Support

If you encounter a problem that cannot be solved by following the steps in the [troubleshooting section](#), call your networking equipment supplier for help. Have the following information ready before you make the call:

- Full product name and, if possible, firmware version number
- Version numbers of all software products included in the package
- Operating system name and version
- Network type and configuration, and any recent configuration changes
- Actions that led to the situation that prompted the call
- LED status and any on-screen messages seen in connection with the problem

If it appears that a return or exchange will be required, you may be asked to provide the serial number of the product.

Support personnel may ask you to try to reproduce the problem. They may also ask you to run some simple tests using diagnostic tools included with the system. Proper preparation on your part can greatly reduce the amount of time needed to solve the problem.



# Appendix D: Limited Warranty

## Hardware

The manufacturer warrants its products to be free of defects in workmanship and materials, under normal use and service, for a period of 12 months from the date of purchase from the manufacturer or its authorized reseller, and for the period of time specified in the documentation supplied with each product.

Should a product fail to be in good working order during the applicable warranty period, the manufacturer will, at its option and expense, repair or replace it, or deliver to the purchaser an equivalent product or part at no additional charge except as set forth below. Repair parts and replacement products are furnished on an exchange basis and will be either reconditioned or new. All replaced products and parts will become the property of the manufacturer. Any replaced or repaired product or part has a warranty of ninety (90) days or the remainder of the initial warranty period, whichever is longer.

The manufacturer shall not be liable under this warranty if its testing and examination disclose that the alleged defect in the product does not exist or was caused by the purchaser's or any third party's misuse, neglect, improper installation or testing, unauthorized attempt at repair or modification, or any other cause beyond the range of the intended use, or by accident, fire, lightning, or other hazard.

## Software

Software and documentation materials are supplied "as is," without warranty as to their performance, merchantability, or fitness for any particular purpose. However, the media containing the software is covered by a 90-day warranty that protects the purchaser against failure within that period.

## Limited Warranty Service Procedure

Any product **(1)** received in error, **(2)** received in a defective or non-functioning condition, or **(3)** exhibiting a defect under normal working conditions, can be returned to the manufacturer by following these steps:

1. Prepare the following in printed or electronic form:
  - Dated proof of purchase
  - Product model number and quantity
  - Product serial number
  - Precise reason for return
  - Your name, address, email address, phone number, and fax number
2. Inform the distributor or retailer.
3. Ship the product back to the distributor/retailer with freight charges prepaid. The purchaser must pay the cost of shipping from the distributor/retailer to the manufacturer. Any package sent C.O.D. (Cash On Delivery) will be refused.

**Charges:** Usually, RMA (Returned Material Authorization) items will be returned to the purchaser via airmail, prepaid by the manufacturer. If any item is returned by another carrier, the purchaser will pay the difference. A return freight and handling fee will be charged to the purchaser if the manufacturer determines that the product is not defective or that the damage was caused by the user.

## **Warning**

The manufacturer is not responsible for the integrity of any data on storage equipment (hard drives, tape drives, floppy diskettes, etc.). We strongly recommend that our customers back their data up before sending such equipment in for diagnosis or repair.

## **Service After Warranty Period**

After the warranty period expires, all products can be repaired for a reasonable service charge. The shipping charges to and from the manufacturer's facility will be borne by the purchaser.

## **Return for Credit**

In the case of a DOA item (an item that is "dead on arrival") or a shipping error, a return for credit will automatically be applied to the purchaser's account, unless otherwise requested.

## **Limitation of Liability**

All expressed and implied warranties of a product's merchantability, or of its fitness for a particular purpose, are limited in duration to the applicable period as set forth in this limited warranty, and no warranty will be considered valid after its expiration date.

If this product does not function as warranted, your sole remedy shall be repair or replacement as provided for above. In no case shall the manufacturer be liable for any incidental, consequential, special, or indirect damages resulting from loss of data, loss of profits, or loss of use, even if the manufacturer or its authorized distributor/dealer has been advised of the possibility of such damages, or for any claim by any other party.

## Appendix E: Specifications

Standards compliance	IEEE 802.11b, PCMCIA CardBus (Type II)
Regulatory compliance	USA: FCC Part 15 Class B EU: ETS 300.328, ETS 300.826, CE Mark Japan: ARIB STD-T66
Frequency band	2400.0 to 2497.0 MHz (Japan) 2400.0 to 2483.5 MHz (North America and Europe) 2445.0 to 2475.0 MHz (Spain) 2446.5 to 2483.5 MHz (France)
Transmitter power	15 dBm (typical)
Receiver sensitivity*	11 Mbps: -82 dBm (typical) 22 Mbps: -78 dBm (typical)
* Minimum receiver input power level at which a frame error ratio (FER) of less than 8% can be maintained, given a packet length of 1024 bytes and conditions of 20° to 30° C.	
Input power	DC 3.3V $\pm$ 5%
Power consumption	550 mA/3.3V (transmitting), 350 mA/3.3V (receiving)
Data rates	11, 5.5, 2, and 1 Mbps with auto fallback Special user-selectable 22 Mbps option
RF spreading scheme	Direct-sequence spread-spectrum (DSSS)
Encoding and modulation methods	1 Mbps: Barker sequence + BPSK 2 Mbps: Barker sequence + QPSK 5.5 and 11 Mbps: CCK/PBCC 22 Mbps: PBCC
Security	64- and 128-bit Wired Equivalent Privacy (WEP) encryption Special user-selectable 256-bit WEP option
Antenna	Internal printed diversity type
LED indicators	Two: power on/off (green) and wireless activity (orange)
Dimensions (L $\times$ W $\times$ H)	118 $\times$ 54 $\times$ 9 mm
Environmental requirements	Operating temperature: 0° to 50° C Storage temperature: -30° to 70° C  Operating humidity: Tested to RH 85% at 40° C (104° F) for 48 hours
Accompanying software	Drivers for Microsoft Windows 98/ME (NDIS 5.0), 2000 (NDIS 5.0), and XP (NDIS 5.1); configuration utility with connection profile management for multiple networks

## Appendix F: Channels and Regulations

The following table lists the IEEE 802.11b transmission channels and provides important notes on regulations regarding channel use.

Channel	Start, Center, and End Frequencies (MHz)	Non-overlapped Channels	Notes
<b>1</b>	2401 2412 2423	6-14	<i>1</i>
<b>2</b>	2406 2417 2428	7-14	<i>1</i>
<b>3</b>	2411 2422 2433	8-14	<i>1</i>
<b>4</b>	2416 2427 2438	9-14	<i>1</i>
<b>5</b>	2421 2432 2443	10-14	<i>1</i>
<b>6</b>	2426 2437 2448	1, 11-14	<i>1</i>
<b>7</b>	2431 2442 2453	1, 2, 12-14	<i>1</i>
<b>8</b>	2436 2447 2458	1-3, 13, 14	<i>1</i>
<b>9</b>	2441 2452 2463	1-4, 14	<i>1</i>
<b>10</b>	2446 2457 2468	1-5, 14	
<b>11</b>	2451 2462 2473	1-6	
<b>12</b>	2456 2467 2478	1-7	<i>2</i>
<b>13</b>	2461 2472 2483	1-8	<i>2</i>
<b>14</b>	2473 2484 2495	1-10	<i>3</i>
Notes: <i>1.</i> Not used where the regulations of Spain or France are in effect. <i>2.</i> Not used where the regulations of Spain or North America are in effect. <i>3.</i> Used only where the regulations of Japan are in effect.			