**C H A P T E R 1**

# Product Overview and Installation

This chapter describes the Cisco Aironet CB21AG and PI21AG client adapters and their role in a wireless network. This chapter also provides information that you need to know before installing a client adapter and instructions for installing the client adapter hardware and software.

The following topics are covered in this chapter:

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**
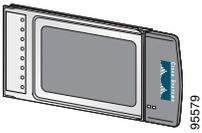
OL-16534-01

**1-1**

# Introduction to the Client Adapters

The Cisco Aironet IEEE 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) are radio modules that provide wireless data communications among fixed, portable, and mobile devices within both wireless and wired network infrastructures. The client adapters are fully compatible when used in devices supporting "plug-and-play" (PnP) technology.

The primary function of the client adapters is to transfer data packets through the wireless infrastructure by communicating with other clients or with access points that are connected to a wired LAN. The adapters operate similarly to a standard network product except that radios rather than Ethernet cables make the connection to the wire. No special wireless networking functions are required, and all existing applications that operate over a network can operate using the adapters.

This document covers the two client adapters described in Table 1-1.

*Table 1-1*      ***Client Adapter Types***

| Client Adapter | Model Number | Description | Illustration |
|---|---|---|---|
| **PC-Cardbus card** | AIR-CB21AG | An IEEE 802.11a/b/g-compliant 2.4- and 5-GHz 54-Mbps client adapter card radio module with a Cardbus interface that can be inserted into any device equipped with a 32-bit Cardbus slot. Host devices can include laptops and notebook computers. |  |
| **PCI card** | AIR-PI21AG | An IEEE 802.11a/b/g-compliant 2.4- and 5-GHz 54-Mbps client adapter card radio module that can be inserted into any device equipped with an empty PCI expansion slot, such as a desktop personal computer. |  |
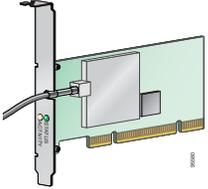
# Terminology

The following terms are used throughout this document:

- **client adapter**—Refers to both types of adapters.
- **PC-Cardbus card** or **PCI card**—Refers to a specific adapter.
- **workstation** (or **station**)—Refers to a computing device with an installed client adapter.
- **infrastructure device**—Refers to a device that connects client adapters to a wired LAN, such as an access point, bridge, or base station. Throughout this document, *access point* is used to represent infrastructure devices in general.

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**1-2**

OL-16534-01

# Hardware Components

The client adapters have three major hardware components: a radio, a radio antenna, and two LEDs.

## Radio

The client adapters contain a dual-band radio that is both IEEE 802.11a and 802.11b/g compliant. The radio uses both direct-sequence spread spectrum (DSSS) technology and orthogonal frequency division multiplexing (OFDM) technology for client applications in the 2.4-GHz Industrial Scientific Medical (ISM) frequency band and OFDM technology in the 5-GHz Unlicensed National Information Infrastructure (UNII) frequency bands. The client adapters operate with other IEEE 802.11a or 802.11b/g-compliant client devices in ad hoc mode or with Cisco Aironet access points and other IEEE 802.11a or 802.11b/g-compliant infrastructure devices in infrastructure mode.

## Radio Antenna

The type of antenna used depends on your client adapter:

- PC-Cardbus cards have an integrated, permanently attached 0-dBi gain, dual-band 2.4/5-GHz diversity antenna. The benefit of the diversity antenna system is improved coverage. The system works by enabling the card to sample and switch between its two antenna ports in order to select the optimum port for receiving data packets. As a result, the card has a better chance of maintaining the radio frequency (RF) connection in areas of interference. The antenna is housed within the section of the card that hangs out of the Cardbus slot when the card is installed.

- PCI cardshave a 1-dBi gain, dual-band 2.4/5-GHz antenna that is permanently attached by a 6.6-foot (2-meter) cable. A base is provided with the antenna to enable it to be mounted to a wall or to sit upright on a desk or other horizontal surface.

## LEDs

The client adapters have two LEDs that glow or blink to indicate the status of the adapter or to convey system messages. Table 1-2 provides interpreations of the the LEDs.

*Table 1-2       LED Operating Messages*

| Status LED (green) | Activity LED (amber) | Condition |
| --- | --- | --- |
| Off | Off | Client adapter is not receiving power. |
| Blinking slowly | Off | Client adapter is in power save mode. |
| On | Off | Client adapter has awakened from power save mode. |
| Alternating blink: | | Client adapter is scanning for the wireless network for which it is configured. |
| On | Off | |
| Off | On | |

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OL-16534-01

**1-3**

**Table 1-2     LED Operating Messages (continued)**

| Status LED (green) | Activity LED (amber) | Condition |
|---|---|---|
| Blinking slowly | Blinking slowly | Client adapter is associated to an access point (in infrastructure mode) or another client (in ad hoc mode). |
| Blinking quickly | Blinking quickly | Client adapter is transmitting or receiving data while associated to an access point (in infrastructure mode) or another client (in ad hoc mode). |

# Software Components

You can install both the driver for the CB21AG and PI21AG and the software that runs the adapter by running a single executable file that is available from Cisco.com. You must execute this file on devices that are running Windows Vista. This driver and softward can be used only with CB21AG and PI21AG client adapters.

# Network Configurations Using Client Adapters

Client adapters can be used in a variety of network configurations. In some configurations, access points provide connections to your network or act as repeaters to increase wireless communication range. The maximum communication range is based on how you configure your wireless network.
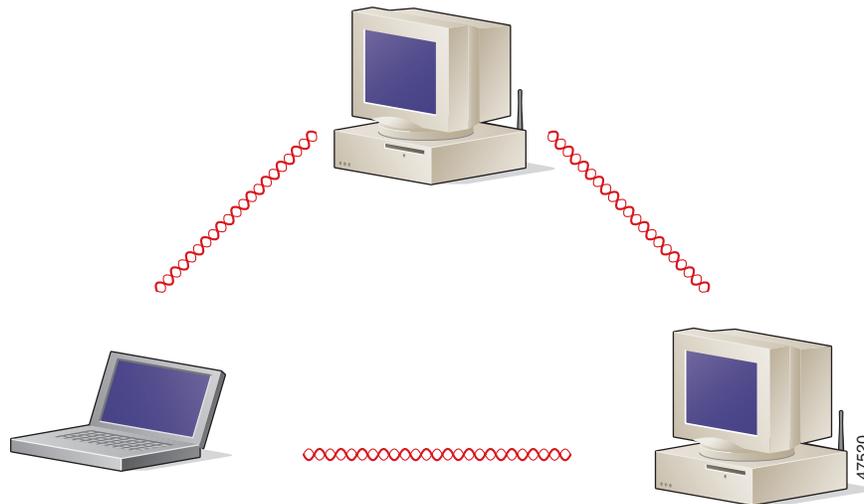
This section describes and illustrates the two most common network configurations:

- Ad hoc wireless local area network (LAN)
- Wireless infrastructure with workstations accessing a wired LAN

For examples of more complex network configurations involving client adapters and access points, refer to the documentation for your access point.

## Ad Hoc Wireless LAN

An ad hoc (or *peer-to-peer*) wireless LAN (see Figure 1-1) is the simplest wireless LAN configuration. In a wireless LAN using an ad hoc network configuration, all devices equipped with a client adapter can be linked together and communicate directly with each other. The use of an infrastructure device, such as an access point, is not required.
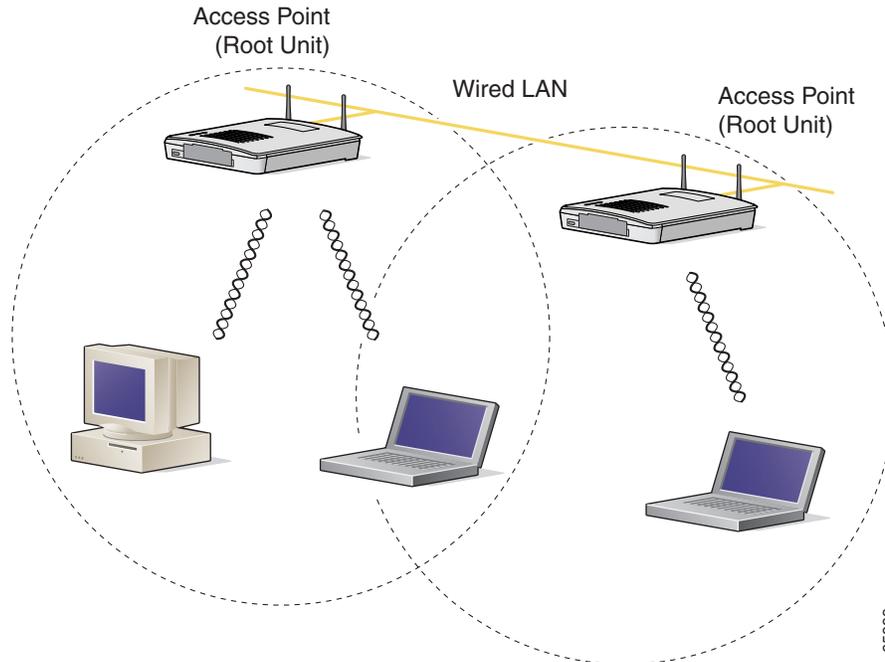
**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-4**

OL-16534-01

*Figure 1-1        Ad Hoc Wireless LAN*



## Wireless Infrastructure with Workstations Accessing a Wired LAN

A infrastructure network can be created by placing two or more access points on a LAN. Figure 1-2 shows a microcellular network with workstations accessing a wired LAN through several access points.

This configuration is useful with portable or mobile stations because it enables them to be directly connected to the wired network even while moving from one microcell domain to another. This process is transparent, and the connection to the file server or host is maintained without disruption. The mobile station stays connected to an access point as long as it can. However, when the transfer of data packets needs to be retried or beacons are missed, the station automatically searches for and associates to another access point. This process is referred to as seamless roaming.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

OL-16534-01

**1-5**

*Figure 1-2        Wireless Infrastructure with Workstations Accessing a Wired LAN*



# Safety information

Follow the guidelines in this section to ensure proper operation and safe use of the client adapter.

## FCC Safety Compliance Statement

The FCC, with its action in ET Docket 96-8, has adopted a safety standard for human exposure to RF electromagnetic energy emitted by FCC-certified equipment. When used with approved Cisco Aironet antennas, Cisco Aironet products meet the uncontrolled environmental limits found in OET-65 and ANSI C95.1, 1991. Proper operation of this radio device according to the instructions in this publication will result in user exposure substantially below the FCC recommended limits.

## Safety Guidelines

- Do not touch or move the antenna while the unit is transmitting or receiving.
- Do not hold any component containing a radio such that the antenna is very close to or touching any exposed parts of the body, especially the face or eyes, while transmitting.
- Do not operate the radio or attempt to transmit data unless the antenna is connected; otherwise, the radio may be damaged.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-6**

OL-16534-01

- Use in specific environments:
  - The use of wireless devices in hazardous locations is limited to the constraints posed by the safety directors of such environments.
  - The use of wireless devices on airplanes is governed by the Federal Aviation Administration (FAA).
  - The use of wireless devices in hospitals is restricted to the limits set forth by each hospital.

## Warnings

Observe the following warnings when operating the client adapter. The second warning pertains to the PI21AG client adapter, and the third warning pertains to the CB21AG client adapter.

**Warning**    **Do not operate your wireless network device near unshielded blasting caps or in an explosive environment unless the device has been modified to be especially qualified for such use.**

**Warning**    **In order to comply with FCC radio frequency (RF) exposure limits, antennas should be located at a minimum of 7.9 inches (20 cm) or more from the body of all persons.**

**Warning**    **This device has been tested and complies with FCC RF Exposure (SAR) limits in typical laptop computer configurations and this device can be used in desktop or laptop computers with side mounted PC Card slots that can provide at least 0.394 in (1 cm) separation distance from the antenna to the body of the user or a nearby person. Thin laptop computers may need special attention to maintain antenna spacing while operating. This device cannot be used with handheld PDAs (personal digital assistants). Use in other configurations may not ensure compliance with FCC RF exposure guidelines. This device and its antenna must not be co-located or operated in conjunction with any other antenna or transmitter.**

Translated versions of these safety warnings are provided in Appendix B

## Unpacking the Client Adapter

Follow these steps to unpack the client adapter:

**Step 1**    Open the shipping container and carefully remove the contents.

**Step 2**    Return all packing materials to the shipping container and save the container.

**Step 3**    Ensure that all items listed in the "Package Contents" section below are included in the shipment. Check each item for damage.

**Note**    If any item is damaged or missing, notify your authorized Cisco sales representative.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

OL-16534-01

**1-7**

## Package Contents

Each client adapter is shipped with the following items:

- 1-dBi gain antenna permanently attached by a 6.6-ft (2-m) cable, antenna base, low-profile bracket, two mounting screws, and two plastic wall anchors (PCI cards only)
- *Quick Start Guide: Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG)*
- Cisco Aironet 802.11a/b/g Wireless Adapters (CB21AG and PI21AG) CD

# System Requirements

In addition to the items shipped with the client adapter, you also need the following items in order to install and use the adapter:

- One of the following computing devices running Windows Vista.
  - Laptop or notebook computer equipped with a 32-bit Cardbus slot
  - Desktop personal computer equipped with an empty PCI expansion slot
- Windows Vista Service Pack 1 or Windows Vista with hotfix KB932063 and hotfix KB935222

**Note** You must obtain these hotfix patches from the Microsoft site. You must also contact Microsoft directly for any support that you need for these patches.

http://support.microsoft.com/kb/932063
http://support.microsoft.com/kb/935222

**Note** The client adapter software supports Windows Vista Business, Enterprise, and Ultimate operating systems.

- 1 GHz 32-bit (x86) or 64-bit (x64) processor.
- 1 GB of system memory
- 40 GB hard drive with at least 15 GB of available space
- The appropriate tools for removing your computer's cover and expansion slot dust cover and for mounting the antenna base (for PCI cards)
- EAP versions:
  - EAP-FAST verion 2.2.9
  - PEAP version 1.1.2
  - LEAP version 1.0.15
- If your wireless network uses EAP-TLS or PEAP authentication, Certificate Authority (CA) and user certificates for EAP-TLS authentication or CA certificate for PEAP authentication
- If your wireless network uses PEAP (EAP-GTC) authentication with a One-Time Password (OTP) user database:
  - A hardware token device from OTP vendors or the Secure Computing SofToken program (version 2.1 or later)

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-8**

OL-16534-01

– Your hardware or software token password

- All necessary infrastructure devices (such as access points, servers, gateways, user databases, etc.) must be properly configured for any authentication type you plan to enable on the client.

- The following information from your system administrator:

    – The logical name for your workstation (also referred to as *client name*)

    – The protocols necessary to bind to the client adapter, such as TCP/IP

    – The case-sensitive service set identifier (SSID) for your RF network

    – If your network setup does not include a DHCP server, the IP address, subnet mask, and default gateway address of your computer

    – The wired equivalent privacy (WEP) keys of the access points with which your client adapter will communicate, if your wireless network uses static WEP for security

    – The username and password for your network account

    – Protected access credentials (PAC) file if your wireless network uses EAP-FAST authentication with manual PAC provisioning

# Site Requirements

This section discusses the site requirements for both infrastructure and client devices.

## For Infrastructure Devices

Because of differences in component configuration, placement, and physical environment, every network application is a unique installation. Therefore, before you install any wireless infrastructure devices (such as access points, bridges, and base stations, which connect your client adapters to a wired LAN), a site survey must be performed to determine the optimum placement of these devices to maximize range, coverage, and network performance.

**Note**   Infrastructure devices are installed and initially configured prior to client devices.

## For Client Devices

Because the client adapter is a radio device, it is susceptible to RF obstructions and common sources of interference that can reduce throughput and range. Follow these guidelines to ensure the best possible performance:

- Install the client adapter in an area where large steel structures such as shelving units, bookcases, and filing cabinets will not obstruct radio signals to and from the client adapter.

- Install the client adapter away from microwave ovens. Microwave ovens operate on the same frequency as the client adapter and can cause signal interference.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

OL-16534-01

1-9

# Inserting the Client Adapter

This section provides instructions for inserting a PC-Cardbus card or PCI card into your computer.

⚠

**Caution**    These procedures and the physical connections they describe apply generally to conventional Cardbus slots and PCI expansion slots. In cases of custom or nonconventional equipment, be alert to possible differences in Cardbus slot and PCI expansion slot configurations.

## Inserting a PC-Cardbus Card

**Step 1**    Before you begin, examine the card. One end has a dual-row, 68-pin connector. The card is keyed so it can be inserted only one way into the Cardbus slot.

✎

**Note**    The PC-Cardbus slot, if supported, is usually on the left or right side of a laptop computer, depending on the model.

**Step 2**    Turn on your computer and let the operating system boot up completely.

**Step 3**    Hold the card with the Cisco label facing up and insert it into the Cardbus slot, applying just enough pressure to make sure it is fully seated (see Figure 1-3). The green LED lights when the card is inserted properly.

⚠

**Caution**    Do not force the card into your computer's Cardbus slot. Forcing it will damage both the card and the slot. If the card does not insert easily, remove the card and reinsert it.

*Figure 1-3        Inserting a PC-Cardbus Card into a Computer*



✎
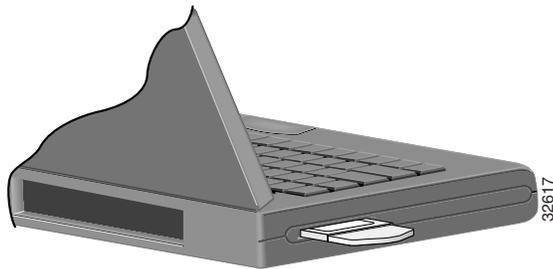
**Note**    The configuration profiles for PC-Cardbus cards are tied to the slot in which the card is inserted. Therefore, you must always insert your PC-Cardbus card into the same slot or create profiles for both slots. See Chapter 4 for information on creating profiles for your client adapter.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-10**

OL-16534-01

**Step 4**    If the Found New Hardware Wizard window appears, click **Cancel**.

> ✎
> **Note**    If you do not click **Cancel**, the wizard will attempt to install software for the client adapter but will be unable to find it.

**Step 5**    Go to the "Installing the Client Adapter Driver and Software" section on page 1-18.

# Inserting a PCI Card

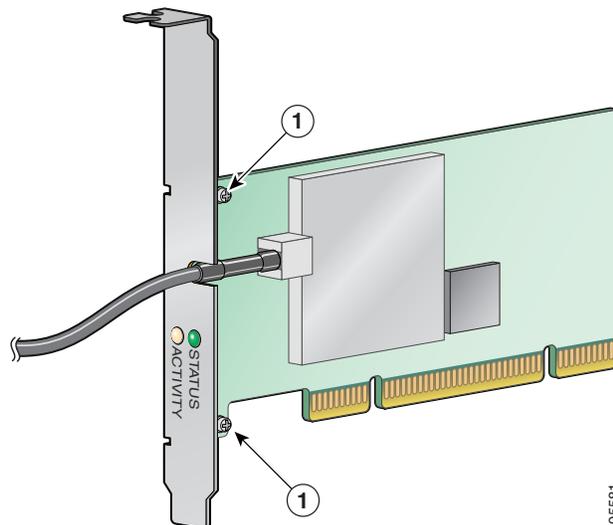You must perform the following procedures in the order listed below to insert a PCI card:

- If required, change the bracket (see the "Changing the Bracket" section on page 1-11).
- Insert the card (see the "Inserting the Card" section on page 1-12).
- Assemble the antenna (see the "Assembling the Antenna" section on page 1-13).
- Mount the antenna (see the "Mounting the Antenna" section on page 1-14).

## Changing the Bracket

The PCI card is shipped with a full-profile bracket attached. If the PC into which you are inserting the PCI card requires the card to use a low-profile bracket, follow these steps to change brackets.

**Step 1**    Remove the two screws that attach the bracket to the card. See Figure 1-4.

*Figure 1-4        Changing the PCI Card Bracket*



| 1 | Bracket screws |
|---|---|

Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista

OL-16534-01

**1-11**

**Step 2**    Slide the bracket away from the card; then tilt the bracket to free the antenna cable.

⚠

**Caution**    Do not pull on the antenna cable or detach it from the PCI card. The antenna is meant to be permanently attached to the card.

**Step 3**    Hold the low-profile bracket to the card so that the LEDs slip through their corresponding holes on the bracket.

**Step 4**    Insert the screws that you removed in Step 1into the holes on the populated side of the card near the bracket (see Figure 1-4) and tighten.

## Inserting the Card

Follow the steps below to insert a PCI card into your PC.

**Step 1**    Turn off the PC and all its components.

**Step 2**    Remove the computer cover.

✎

**Note**    On most Pentium PCs, PCI expansion slots are white. Refer to your PC documentation for slot identification.

**Step 3**    Remove the screw from the top of the CPU back panel above an empty PCI expansion slot. This screw holds the metal bracket on the back panel.
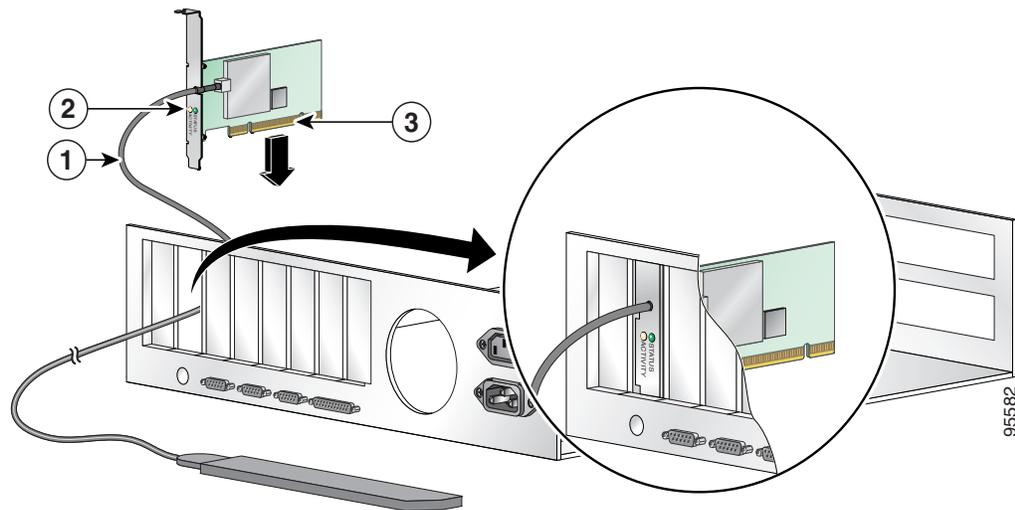
⚠

**Caution**    Static electricity can damage your PCI card. Before removing the card from the anti-static packaging, discharge static by touching a metal part of a grounded PC.

**Step 4**    Locate an empty PCI expansion slot inside your computer.

**Step 5**    Slip your card's antenna through the opening near the empty expansion slot so that it is located outside of the computer. See Figure 1-5.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-12**

OL-16534-01

***Figure 1-5        Inserting a PCI Card into a PC***



| 1 | Antenna cable |
|---|---|
| 2 | LEDs |
| 3 | Card edge connector |

**Step 6**   Tilt the card to enable the LEDs to slip through the opening in the CPU back panel. See the enlarged view in Figure 1-5.

**Step 7**   Press the card into the empty slot until its connector is firmly seated.

⚠

**Caution**   Do not force the card into the expansion slot; this could damage both the card and the slot. If the card does not insert easily, remove it and reinsert it.
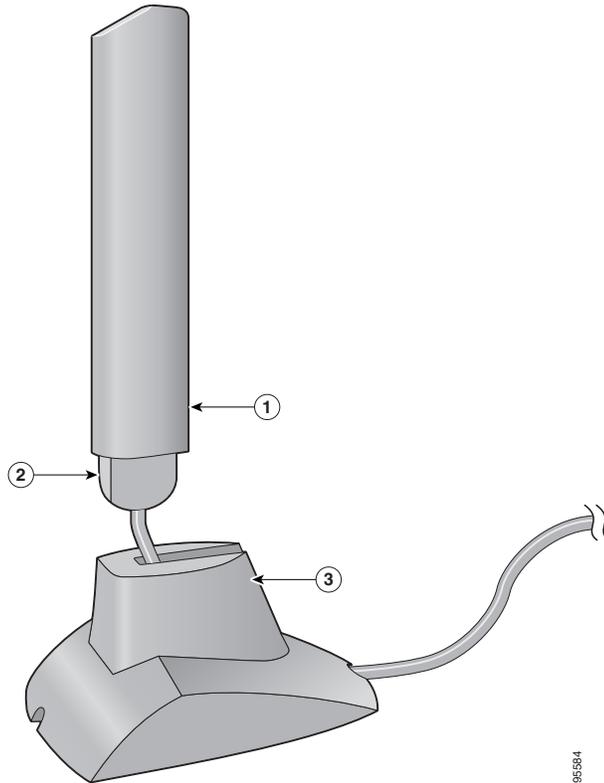
**Step 8**   Reinstall the screw on the CPU back panel and replace the computer cover.

## Assembling the Antenna

Follow the steps below to assemble the PCI card's antenna.

**Step 1**   Slide the antenna through the opening in the bottom of the antenna base.

**Step 2**   Position the antenna so its notches are facing the Cisco label on the front of the base. See Figure 1-6.

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OL-16534-01

**1-13**

*Figure 1-6        Inserting the Antenna into Its Base*



| 1 | Antenna |
|---|---------|
| 2 | Notch |
| 3 | Antenna base |

**Step 3**    Press the antenna cable into the receptacle on the top of the base as shown in Figure 1-6.

**Step 4**    Press the antenna straight down into the receptacle until it clicks into place.
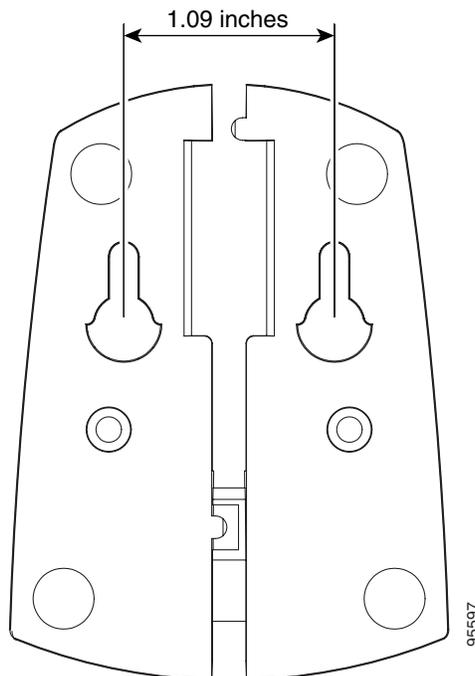
## Mounting the Antenna

Because the PCI card is a radio device, it is susceptible to RF obstructions and common sources of interference that can reduce throughput and range. Follow these guidelines to ensure the best possible performance:

- Place the PCI card's antenna in an area where large steel structures such as shelving units, bookcases, and filing cabinets will not obstruct radio signals being transmitted or received.

- Place the antenna away from microwave ovens and 2.4- and 5.8-GHz cordless phones. These products can cause signal interference because they operate in the same frequency range as the PCI card.
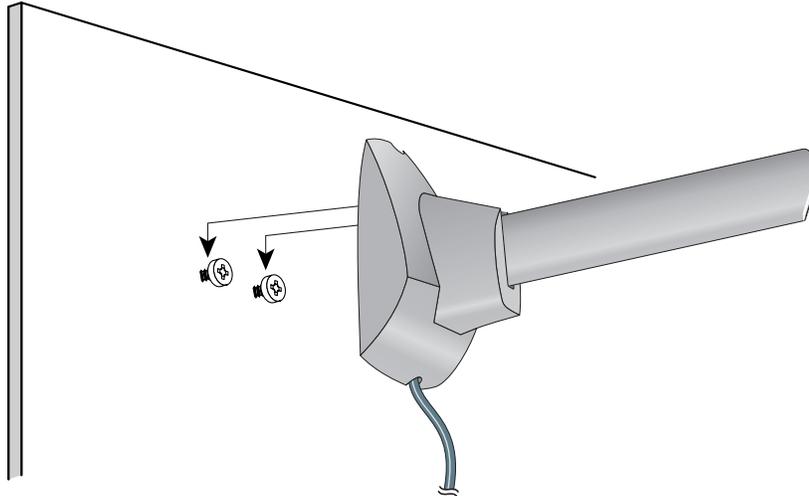
**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-14**

OL-16534-01

Follow the steps below to position the PCI card's antenna on a flat horizontal surface or to mount it to a wall.

**Step 1** Perform one of the following:

- If you want to use the antenna on a flat horizontal surface, position the antenna so it is pointing straight up. Then go to Step 7.

- If you want to mount the antenna to a wall, go to Step 2.

**Step 2** Drill two holes in the wall that are 1.09 in. (2.8 cm) apart. Figure 1-7 shows the distance between the mounting holes on the bottom of the antenna base.

*Figure 1-7       Bottom of Antenna Base*



**Step 3** Tap the two supplied wall anchors into the holes.

**Step 4** Drive the two supplied screws into the wall anchors, leaving a small gap between the screw head and the anchor.

**Step 5** Position the mounting holes on the bottom of the antenna base over the screws (see Figure 1-8) and pull down to lock in place.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

OL-16534-01

**1-15**

*Figure 1-8        Mounting the Antenna*



**Step 6**    The antenna rotates 90 degrees from its base. For optimal reception, position the antenna so it is pointing straight up (see Figure 1-9).

*Figure 1-9        Rotating the Antenna*
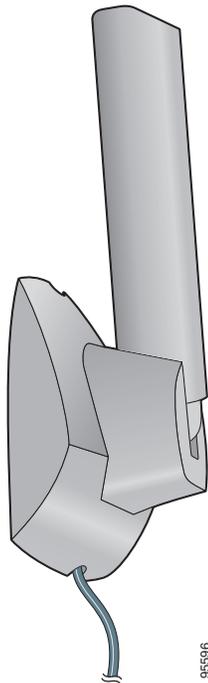


**Step 7**    Boot up your PC.The green LED lights when the card is inserted properly.

**Step 8**    If the Found New Hardware Wizard window appears, click **Cancel**.

**Step 9**    Go to the "Installing the Client Adapter Driver and Software" section on page 1-18.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-16**

OL-16534-01

# Obtaining Client Adapter Software

The software is provided on the CD that shipped with your client adapter; however, Cisco recommends retrieving it from Cisco.com to ensure that you have the latest version.

- To obtain the version of the software on the CD, open the FileList.txt file on the CD root directory.

- To obtain the version of the latest software on Cisco.com, follow these steps:

**Step 1**   Make sure that you have a Cisco.com username and password.

**Step 2**   If you do not have a Cisco.com username and password, go to Cisco's main page (http://www.cisco.com) and click **Register** (top). Follow the instructions to create a username and password.

**Step 3**   Use your computer's web browser to access the following URL:

**Step 4**   http://www.cisco.com/public/sw-center/

**Step 5**   Click **Wireless Software**.

**Step 6**   Click **Client Adapters and Client Software**.

**Step 7**   Click **Cisco Aironet Wireless LAN Client Adapters**.

**Step 8**   Follow one of these steps:

**Step 9**   If you are using a PC-Cardbus card, click **Cisco Aironet 802.11a/b/g CardBus Wireless LAN Client Adapter (CB21AG)**.

**Step 10**   If you are using a PCI card, click **Cisco Aironet 802.11a/b/g PCI Wireless LAN Client Adapter (PI21AG)**.

**Step 11**   When prompted, enter your Cisco.com username and password, and click **OK**.

**Step 12**   Click **Windows Vista**.

**Step 13**   Under Available Releases, determine whether the Install Wizard file on Cisco.com has a later version number than the file on the CD. If it does, proceed to the next step. If it does not, use the Install Wizard file on your CD.

**Step 14**   Click the link with the latest release number.

**Step 15**   Click the software file (**WinClient-802.11a-b-g-Vista-Ins-Wizard-v*xx*.exe**), where *xx* is the version number.

**Step 16**   Click the **Download** button.

**Step 17**   Read and accept the terms and conditions of the Software License Agreement. Click **Agree** to accept the terms and condition, or click **Decline** not to accept. Save the file to your device.

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

OL-16534-01

**1-17**

# Installing the Client Adapter Driver and Software

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**Caution**    Do not eject your client adapter at any time during the installation process, including during the reboot.
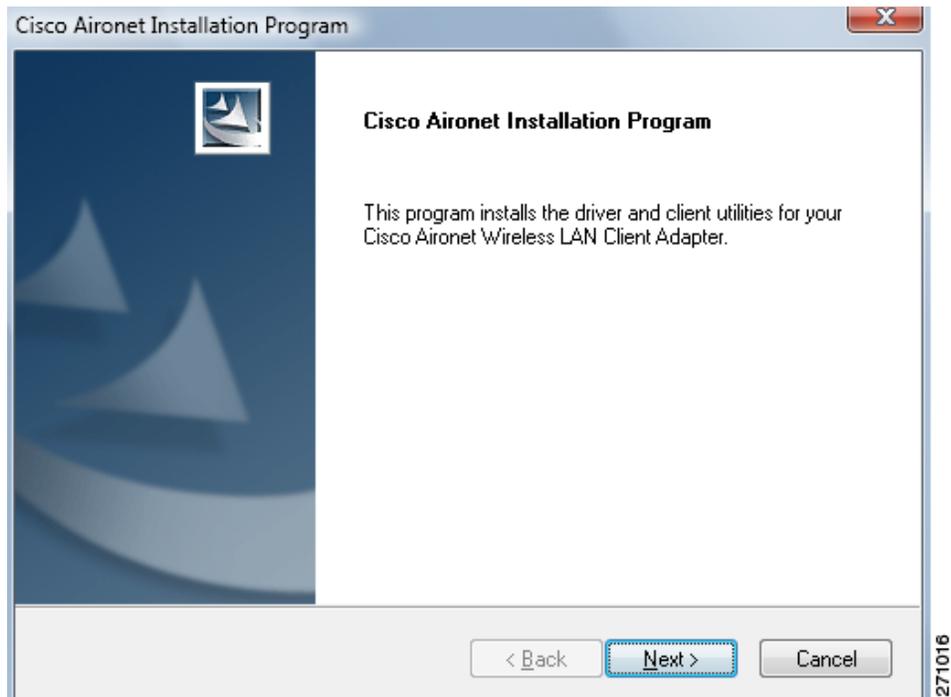
Follow these steps to use to install the client software on a device that is running Windows Vista.

**Step 1**    Double-click **WinClient-802.11a-b-g-Vista-Ins-Wizard-v*xx*.exe**. A window appears that asks you if you want to run the softward file.

**Step 2**    Click **Run**. The Cisco Aironet Installation Program - InstallShield window appears (see Figure 1-10).
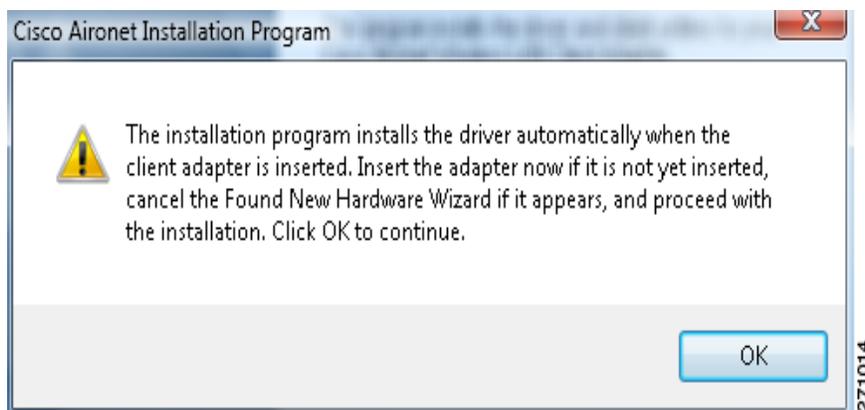
*Figure 1-10        Cisco Aironet Installation Program—Installation Wizard Preparing Setup Window*
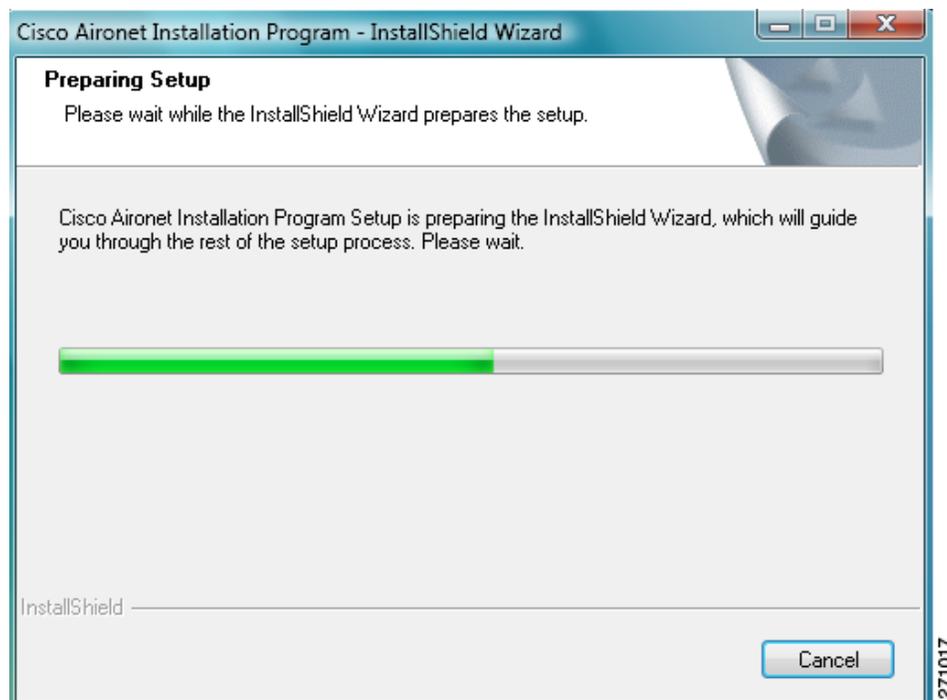


**Step 3**    Allow the preparation sequence to finish . After the preparation sequence finishes, the next Cisco Aironet Installation Program window appears (see Figure 1-11).

**1-18**

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**
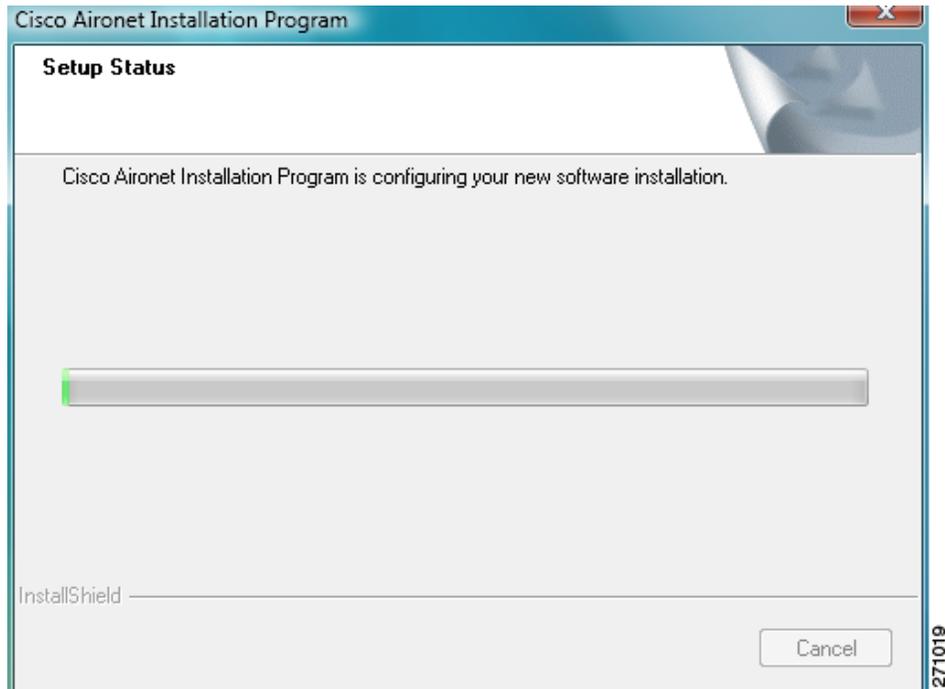
OL-16534-01

*Figure 1-11      Cisco Aironet Installation Program Window*



**Step 4**    Click **Next**. A Cisco Aironet Installation Program dialog box that includes a message about driver and hardware installation appears (see Figure 1-12).

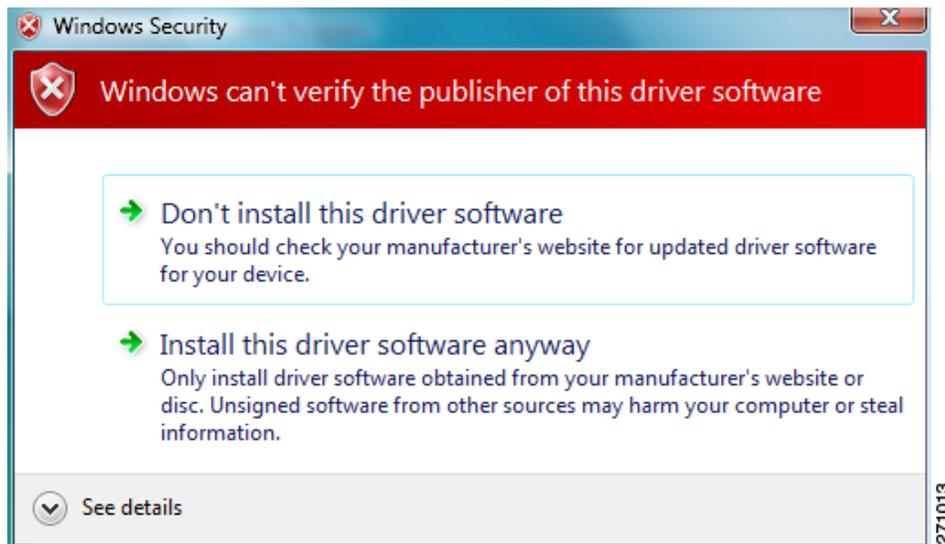*Figure 1-12      Cisco Aironet Installation Program Dialog Box—Driver Installation and Hardware Insertion*



**Step 5**    Click **OK**. The Cisco Aironet Installation Program—Setup Status window appears (see Figure 1-13).

**Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

OL-16534-01

**1-19**

*Figure 1-13*        *Cisco Aironet Installation Program—Setup Status Window*



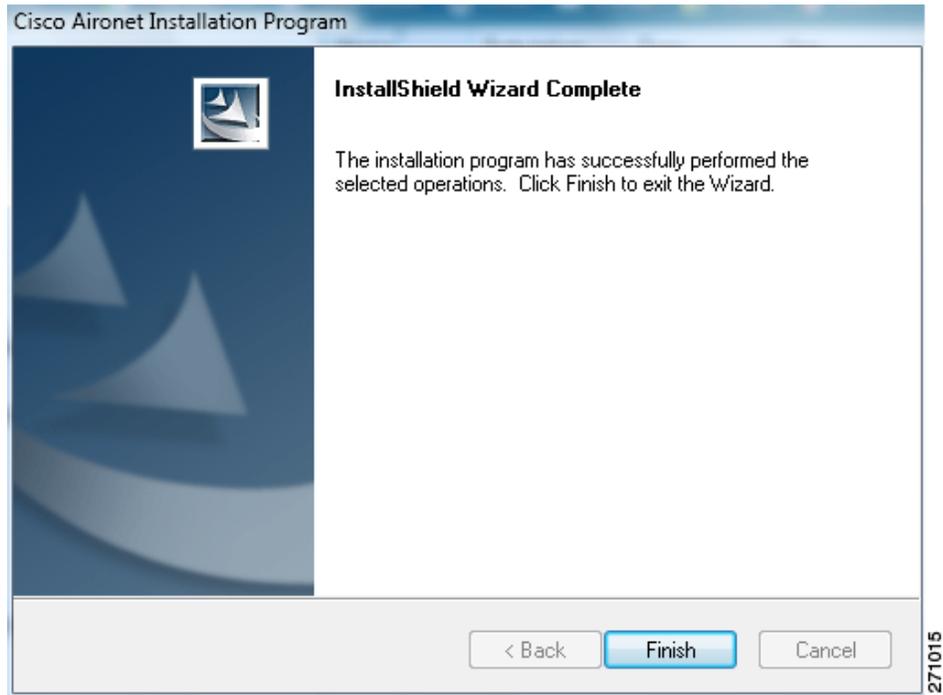**Step 6**    Allow the software installation to finish. A Windows Security dialog box might appear (see Figure 1-14).

*Figure 1-14*        *Windows Security—Windows can't verify the publisher of this driver software Dialog Box*



**Step 7**    If this dialog box appears, double-click **Install this driver software anyway**. After the driver installation finishes, the Cisco Aironet Installation Program—InstallShield Wizard Complete window appears (see Figure 1-15).

■ **Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista**

**1-20**

OL-16534-01

*Figure 1-15        Cisco Aironet Installation Program—InstallShield Wizard Complete Window*



**Step 8**    Click **Finish**.

Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista

**1-21**

Cisco Aironet 802.11a/b/g Wireless LAN Client Adapters (CB21AG and PI21AG) Installation and Configuration Guide for Windows Vista

1-22

OL-16534-01