



## **Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Mac OS**

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# Preface

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The preface provides an overview of the *Cisco Aironet Wireless LAN Client Adapters Installation and Configuration Guide for Mac OS*, references related publications, and explains how to obtain other documentation and technical assistance.

The following topics are covered in this section:

- [Audience, page x](#)
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- [Conventions, page xi](#)
- [Related Publications, page xii](#)
- [Obtaining Documentation, page xiii](#)
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# Audience

This publication is for the person responsible for installing and maintaining a Cisco Aironet Wireless LAN Adapter, also referred to as a *client adapter*. The installer should be familiar with computing devices and with network terms and concepts.

# Purpose

This publication describes the client adapter hardware and software, and explains how to install, configure, monitor, and troubleshoot client adapters for the Mac OS.

# Organization

This publication is organized into the following chapters:

- [Chapter 1, “Overview,”](#) provides an introduction to the client adapters and describes network configurations.
- [Chapter 2, “Preparing for Installation,”](#) provides information that you need to know before installing a client adapter, such as safety information and system requirements.
- [Chapter 3, “Installing the Client Adapter,”](#) provides instructions for inserting a client adapter, installing the driver and the client utility, configuring your client adapter with basic settings, and how to verify your configuration settings.
- [Chapter 4, “Using the Client Adapter,”](#) explains how to use the Aironet Client Utility, the Aironet desktop controls, and work with multiple users.
- [Chapter 5, “Security Features,”](#) provides an overview of the WEP and LEAP security features as well as explains how use the client utility to enable WEP and LEAP for your client adapter.
- [Chapter 6, “Advanced Configuration,”](#) explains how to configure basic and advanced client adapter properties.
- [Chapter 7, “Performing Diagnostics,”](#) explains how to use the client utility to perform user-level diagnostics.
- [Chapter 8, “Routine Procedures,”](#) explains how to determine the version of firmware, driver, and client utility; explains how to update the firmware, driver, and client utility; explains how to uninstall the driver and client utility; and explains how to remove the client adapter.
- [Chapter 9, “Troubleshooting,”](#) provides information on diagnosing and correcting common problems, defines error messages, and explains how to access online help.
- [Appendix A, “Technical Specifications,”](#) lists the physical, radio, power, and regulatory specifications for the client adapters.
- [Appendix B, “Translated Safety Warnings,”](#) provides translations of the client adapters’ safety warnings in nine languages.
- [Appendix C, “Declarations of Conformity and Regulatory Information,”](#) provides conformity and regulatory information for the client adapters.
- [Appendix D, “Channels, Power Levels, and Antenna Gains,”](#) lists the channels, maximum power levels, and antenna gains supported by the world’s regulatory domains.

# Conventions

This publication uses the following conventions to convey instructions and information:

- Commands and keywords are in **boldface**.
- Variables are in *italics*.
- Notes, cautions, and warnings use the following conventions and symbols:



## Note

Means *reader take note*. Notes contain helpful suggestions or references to materials not contained in this manual.



## Caution

Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.



## Warning

**This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. (To see translations of the warnings that appear in this publication, refer to the appendix “Translated Safety Warnings.”)**

## Waarschuwing

**Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. (Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het anhangsel “Translated Safety Warnings” (Vertalingen van veiligheidsvoorschriften) raadplegen.)**

## Varoitus

**Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. (Tässä julkaisussa esiintyvien varoitusten käännökset löydät liitteestä “Translated Safety Warnings” (käännetyt turvallisuutta koskevat varoitukset).)**

## Attention

**Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures. Avant d'accéder à cet équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures courantes de prévention des accidents. Pour obtenir les traductions des mises en garde figurant dans cette publication, veuillez consulter l'annexe intitulée « Translated Safety Warnings » (Traduction des avis de sécurité).**

## Warnung

**Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewusst. (Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Anhang mit dem Titel “Translated Safety Warnings” (Übersetzung der Warnhinweise).)**

<b>Avvertenza</b>	<b>Questo simbolo di avvertenza indica un pericolo. Si è in una situazione che può causare infortuni. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nell'appendice, "Translated Safety Warnings" (Traduzione delle avvertenze di sicurezza).</b>
<b>Advarsel</b>	<b>Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. (Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i vedlegget "Translated Safety Warnings" [Oversatte sikkerhetsadvarsler].)</b>
<b>Aviso</b>	<b>Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. (Para ver as traduções dos avisos que constam desta publicação, consulte o apêndice "Translated Safety Warnings" - "Traduções dos Avisos de Segurança").</b>
<b>¡Advertencia!</b>	<b>Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. (Para ver traducciones de las advertencias que aparecen en esta publicación, consultar el apéndice titulado "Translated Safety Warnings.")</b>
<b>Varning!</b>	<b>Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. (Se förklaringar av de varningar som förekommer i denna publikation i appendix "Translated Safety Warnings" [Översatta säkerhetsvarningar].)</b>

## Related Publications

For more information about Cisco Aironet Wireless LAN Adapters and related products, refer to the following publications:

- *Quick Start Guide: Cisco Aironet Wireless LAN Client Adapters*
- *Release Notes for Cisco Aironet Wireless LAN Client Adapters*
- *Release Notes for Cisco Aironet Client Utility and Driver, Version 3.0 for Mac OS 9.x and Mac OS X*
- *Cisco Aironet Access Point Software Configuration Guide*
- *Cisco Aironet 1100 Access Point Installation and Configuration Guide*
- *Cisco Aironet 1200 Access Point Software Configuration Guide*

# Obtaining Documentation

The following sections explain how to obtain documentation from Cisco Systems.

## World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following URL:

<http://www.cisco.com>

Translated documentation is available at the following URL:

[http://www.cisco.com/public/countries\\_languages.shtml](http://www.cisco.com/public/countries_languages.shtml)

## Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription.

## Ordering Documentation

Cisco documentation is available in the following ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Networking Products MarketPlace:  
[http://www.cisco.com/cgi-bin/order/order\\_root.pl](http://www.cisco.com/cgi-bin/order/order_root.pl)
- Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:  
<http://www.cisco.com/go/subscription>
- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco corporate headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 800 553-NETS (6387).

## Documentation Feedback

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You can e-mail your comments to [bug-doc@cisco.com](mailto:bug-doc@cisco.com).

To submit your comments by mail, use the response card behind the front cover of your document, or write to the following address:

Cisco Systems  
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San Jose, CA 95134-9883

We appreciate your comments.

## Obtaining Technical Assistance

Cisco provides Cisco.com as a starting point for all technical assistance. Customers and partners can obtain documentation, troubleshooting tips, and sample configurations from online tools by using the Cisco Technical Assistance Center (TAC) Web Site. Cisco.com registered users have complete access to the technical support resources on the Cisco TAC Web Site.

## Cisco.com

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Cisco.com is a highly integrated Internet application and a powerful, easy-to-use tool that provides a broad range of features and services to help you to

- Streamline business processes and improve productivity
- Resolve technical issues with online support
- Download and test software packages
- Order Cisco learning materials and merchandise
- Register for online skill assessment, training, and certification programs

You can self-register on Cisco.com to obtain customized information and service. To access Cisco.com, go to the following URL:

<http://www.cisco.com>

## Technical Assistance Center

The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

### Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

<http://www.cisco.com/tac>

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

<http://www.cisco.com/register/>

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

<http://www.cisco.com/tac/caseopen>

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

### Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.





# Overview

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This chapter describes the Cisco Aironet Wireless LAN Adapters, also referred to as *client adapters*, and illustrates their role in a wireless network.

The following topics are covered in this section:

- [Introduction to the Client Adapters, page 1-2](#)
- [Hardware Components, page 1-3](#)
- [Software and Firmware Components, page 1-5](#)
- [Network Configurations Using the Client Adapter, page 1-6](#)



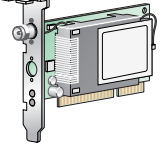
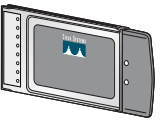
# Introduction to the Client Adapters

The Cisco Aironet Wireless LAN Adapters, also referred to as *client adapters*, are radio modules that provide transparent wireless data communications between fixed, portable, or mobile devices and other wireless devices or a wired network infrastructure.

The primary function of the client adapters is to transfer data packets transparently through the wireless infrastructure. The adapters operate similarly to a standard network product except that the cable is replaced with a radio connection. No special wireless networking functions are required, and all existing applications that operate over a network will operate using the adapters.

This document covers the following types of client adapters:

**Table 1-1 Client Adapter Types**

Client Adapter	Model Number	Description	Illustration
PC card	AIR-PCM3xx	An IEEE 802.11b-compliant 11-Mbps 2.4-GHz PCMCIA card radio module that can be inserted into any device equipped with an <i>external</i> Type II or Type III PC card slot. Host devices can include laptops, notebook computers, personal digital assistants, and handheld or portable devices. The PC card is available in the 340 and 350 series.	 47519
LM card	AIR-LMC3xx	An IEEE 802.11b-compliant 11-Mbps 2.4-GHz PCMCIA card radio module that is usually preinstalled in a device equipped with an <i>internal</i> Type II or Type III PC card slot. Host devices usually include handheld or portable devices. The LM card is available in the 340 and 350 series.	 47893
PCI card	AIR-PCI3xx	An IEEE 802.11b-compliant 11-Mbps 2.4-GHz 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. The PCI card is available in the 340 and 350 series.	 65189
PC-Cardbus card	AIR-CB20A	An IEEE 802.11a-compliant 54-Mbps 5-GHz client adapter card radio module with a Cardbus interface that can be inserted into any device equipped with an <i>external</i> Type II or Type III Cardbus slot. Host devices can include laptops, notebook computers, personal digital assistants, and handheld or portable devices.	 74795



## Note

In the first three product model numbers, the first *x* represents the client adapter series (340 or 350), and the second *x* indicates the wired equivalent privacy (WEP) level of the card, where 0 = no WEP capability, 1 = 40-bit WEP, and 2 = 128-bit WEP. If the last two product model numbers contain K9, the card is 128-bit WEP capable.

Refer to the [“Radio Antenna” section on page 1-4](#) for antenna differences between these adapters.

## Terminology

Throughout this document, the following terms are used:

- **client adapter**—Refers to all four types of adapters
- **PC card, LM card, PCI card, or PC-Cardbus client adapter**—Refer to a specific adapter type
- **workstation (or station)**—Refers to a computing device with an installed client adapter

## Hardware Components

The client adapter has three major hardware components: a radio, a radio antenna, and two LEDs.

### Radio

Different radios are used for the 2.4-GHz and 5-GHz client adapters:

- The Cisco Aironet 340 and 350 series PC, LM, and PCI cards are IEEE 802.11b-compliant client adapters. They contain a direct-sequence spread spectrum (DSSS) radio that operates in the 2.4-GHz Industrial Scientific Medical (ISM) license-free band. The 340 series 30-milliwatt (mW) radio and the 350 series 100-mW radio transmit data over a half-duplex radio channel operating at up to 11 Mbps. These cards interoperate with other IEEE 802.11b-compliant client devices in ad hoc (or *peer-to-peer*) mode or with Cisco Aironet 340, 350, and 1200 Series Access Points (with a 2.4-GHz radio) and other IEEE 802.11b-compliant infrastructure devices in infrastructure mode. They are approved for indoor and outdoor use.

DSSS technology distributes a radio signal over a wide range of frequencies and then returns the signal to the original frequency range at the receiver. The benefit of this technology is its ability to protect the data transmission from interference. For example, if a particular frequency encounters noise or interference or both, enough redundancy is built into the signal on other frequencies that the client adapter usually will still be successful in its transmission.

- The Cisco Aironet AIR-CB20A PC-Cardbus card is an IEEE 802.11a-compliant client adapter. It contains an orthogonal frequency division multiplexing (OFDM) radio that operates in the Unlicensed National Information Infrastructure (UNII) 1 and UNII 2 license-free bands located in the lower 5-GHz portion of the radio frequency spectrum. The 20-mW radio transmits data over a half-duplex radio channel operating at up to 54 Mbps. This card interoperates with other IEEE 802.11a-compliant client devices in ad hoc mode or with Cisco Aironet 1200 Series Access Points (with a 5-GHz radio) and other IEEE 802.11a-compliant infrastructure devices in infrastructure mode. It is approved for indoor use only except in the United States, which allows for outdoor use on channels 52 through 64.

## Radio Antenna

The type of antenna used depends on your client adapter:

- PC cards have an integrated, permanently attached diversity antenna. The benefit of the diversity antenna system is improved coverage. The system works by allowing the card to switch and sample 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 PC card slot when the card is installed.
- LM cards are shipped without an antenna; however, an antenna can be connected through the card's external connector.
- PCI cards are shipped with a 2-dBi dipole antenna that attaches to the card's antenna connector. However, other types of antennas may be used. PCI cards can be operated through the primary (or right) antenna port only.
- PC-Cardbus cards have an integrated, permanently attached non-diversity antenna that contains two antenna ports, one for transmitting and one for receiving. The card cannot switch and sample between the ports. The antenna is housed within the section of the card that hangs out of the Cardbus slot when the card is installed.

**Note**

Refer to the Antenna Mode (Transmit and Receive) parameters in [Table 6-6](#) for information about setting the client adapter's antenna mode.

**Note**

External antennas used in combination with a power setting resulting in a radiated power level above 100 mW equivalent isotropic radiated power (EIRP) are not allowed for use within the European community and other countries that have adopted the European R&TTE directive or the CEPT recommendation Rec 70.03 or both. For more details on legal combinations of power levels and antennas in those countries, refer to the [“Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC”](#) section on [page C-4](#) and the [“Maximum Power Levels and Antenna Gains”](#) section on [page D-4](#).

## LEDs

The client adapters have two LEDs that glow or blink to indicate the status of the adapter or to convey error messages. Refer to the [“Interpreting the Indicator LEDs”](#) section on [page 9-2](#) for an interpretation of all LED codes.

# Software and Firmware Components

The software and firmware components of the client adapter consist of radio firmware, drivers, client utilities, and desktop controls. These components work together to allow the client adapter to work properly in your workstation. The CD that ships with the client adapter includes an installer utility that contains the drivers, client utilities, and desktop controls; the client adapter firmware is already installed. However, a more recent version of the software or firmware may be available from Cisco.com.

**Note**

Cisco recommends using current software and firmware versions, which are available for download from the Cisco Software Center at Cisco.com. This website identifies the recommended software and firmware versions for your specific client adapter and operating system.

## Radio Firmware

The radio firmware, which is stored in the client adapter's Flash memory, controls the adapter's radio. The firmware is preinstalled on the client adapter hardware. [Chapter 8, "Routine Procedures,"](#) provides instructions for upgrading radio firmware.

## Driver

The driver provides an interface between a computer and the client adapter, thereby enabling the operating system and applications to communicate with the adapter. The CD that ships with the client adapter contains drivers for each operating system and client adapter type. The installer automatically determines the correct driver for your operating system and card type before installing the driver. [Chapter 3, "Installing the Client Adapter,"](#) provides instructions for installing the ACU and drivers.

## Client Utility

The client utility, which is entitled Aironet Client Utility (ACU), is an optional application that interacts with the radio firmware to adjust client adapter settings and display information about the adapter. The CD that ships with the client adapter contains the ACU for each operating system. If you plan to use ACU, install it before using the client adapter. [Chapter 3, "Installing the Client Adapter,"](#) provides instructions for installing the ACU and drivers.

## Desktop Controls

The Aironet desktop controls provide a convenient way to view client adapter status and initiate common client adapter tasks. For the Mac OS X operating system, the desktop control is an icon in the main menu bar. For the Mac OS 9 operating system, the desktop control is a control strip module. The desktop controls are automatically installed with the client utility. If you don't want to use these controls, you can hide them.

# Network Configurations Using the Client Adapter

The client adapter 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 following common network configurations:

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

**Note**

For examples of more complex network configurations involving client adapters and access points, refer to the *Cisco Aironet Access Point Hardware Installation Guide*.

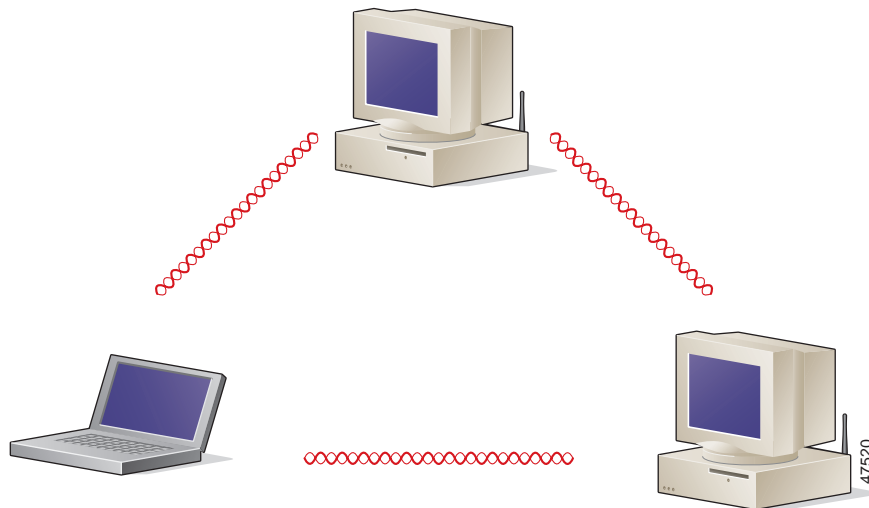
**Note**

For information about setting the client adapter's network mode, refer to [Chapter 6, "Advanced Configuration."](#)

## 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.

**Figure 1-1 Ad Hoc Wireless LAN**

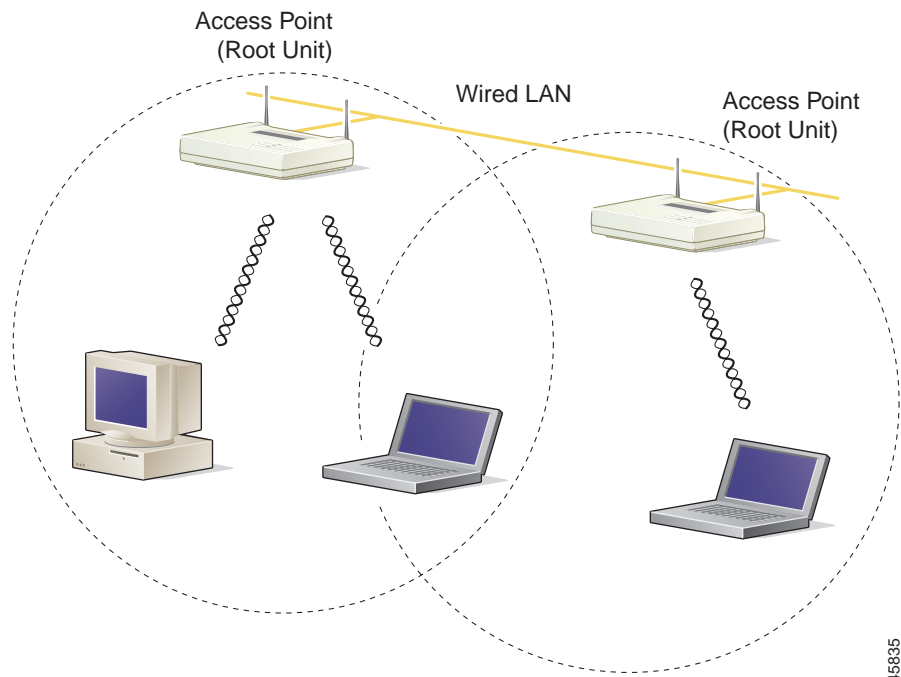


## Wireless Infrastructure with Workstations Accessing a Wired LAN

A microcellular 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 allows 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, once 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*.

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









## Preparing for Installation

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This chapter provides information that you need to know before installing a client adapter.

The following topics are covered in this section:

- [Safety Information, page 2-2](#)
- [Unpacking the Client Adapter, page 2-3](#)
- [System Requirements, page 2-3](#)
- [Site Requirements, page 2-4](#)

# 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

Observe the following safety guidelines when operating the client adapter:

- 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.
- 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. Translated versions of these safety warnings are provided in Appendix B.



**Warning**

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**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**

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

---

**Warning**

In order to comply with RF exposure limits established in the ANSI C95.1 standards, it is recommended when using a laptop with a PC card client adapter that the adapter's integrated antenna is positioned more than 2 inches (5 cm) from your body or nearby persons during extended periods of transmitting or operating time. If the antenna is positioned less than 2 inches (5 cm) from the user, it is recommended that the user limit exposure time.

## 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 it.
  - 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. Any remote antenna and its associated wiring are shipped separately.

---

## Package Contents

Each client adapter is shipped with the following items:

- Standard 2-dBi dipole antenna (PCI cards only)
- *Quick Start Guide: Cisco Aironet Wireless LAN Client Adapters*
- Cisco Aironet Wireless LAN Client Adapters CD (for 2.4-GHz client adapters) or Cisco Aironet 5-GHz 54-Mbps Wireless Adapters CD (for 5-GHz client adapters)
- Cisco product registration card

## System Requirements

As a minimum, your computer system must support the following:

- Macintosh computer with Mac OS 9 or Mac OS X (version 10.1 and higher) operating system
  - Apple PowerMac G3 (Blue and White) or G4 (except G4 Cube)
  - Apple PowerBook G3 Series 1998, G3 Series 1999, or G3 (with firewire)
  - Apple PowerBook G4, or G4 (Gigabit Ethernet, 2nd and 3rd generations)

You also need the following to install and configure the client adapter

- 2.5-GHz client adapters: A Type II or Type III PC card slot or an empty PCI expansion slot
- 5-GHz client adapter: A Cardbus slot

- The following information from your system administrator:
  - The client name to use for your client adapter (optional)
  - The case-sensitive network name or service set identifier (SSID) for your wireless network
  - If you are not connected to a DHCP server, the IP address, subnet mask, and default gateway address for your Macintosh
  - The username and password for your network account
  - If you are using WEP security, the WEP keys for your wireless network
  - If you are using LEAP security, your LEAP username and password

**Note**

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To install the client utility on the Mac OS X operating system, you must have administrator privileges.

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## Site Requirements

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 340 and 350 series client adapters away from microwave ovens and 2.4 GHz cordless phones. These devices operate on the same frequency as the client adapter and can cause signal interference. This restriction does not apply to the 5-GHz client adapters.



## Installing the Client Adapter

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This chapter explains how to insert a client adapter, install the software, configure basic settings, and verify operation.

The following topics are covered in this section:


- [Obtaining the Latest Versions of Driver and ACU, page 3-2](#)
- [Installing the Driver and Client Utility, page 3-2](#)
- [Inserting the Client Adapter into a Computing Device, page 3-9](#)
- [Configuring Basic Client Adapter and Network Parameters, page 3-10](#)

## Obtaining the Latest Versions of Driver and ACU

The drivers and the Aironet Client Utility (ACU) are provided on the CD that shipped with the client adapter; however, a more recent version of each may be available from Cisco.com. Cisco recommends installing current versions of the driver and ACU. This section describes how to identify and download the recommended software from the Cisco web site.

### Cisco Software Center

The Cisco Software Center contains the latest driver and client utility software. To obtain the software from the Cisco web site, follow these steps:

- 
- Step 1** Use your Internet browser to access the Cisco Software Center at the following URL:  
<http://www.cisco.com/public/sw-center/sw-wireless.shtml>
- Step 2** Using the onscreen instructions, navigate to the current release for your client adapter. For example, use the Aironet Wireless Software Selector to locate the files for your client adapter.
-  **Note** Make sure to select a software version that is compatible with your client adapter hardware and computer operating system. Each software version includes compatibility information.
- 
- Step 3** Click on the software filename (such as *MACOSInstallv3x.sit*). The 3x identifies the software package version number.
- Step 4** Read and accept the terms and conditions of the Software License Agreement.
- Step 5** Click on the filename in the Software Download page.
- Step 6** Download and save the file to a temporary directory on your hard drive and then exit your Internet browser.
- Step 7** Double-click the utility installer (.sit) file to expand the file.
- Step 8** Go to the [“Installing the Driver and Client Utility”](#) section.
- 

## Installing the Driver and Client Utility

This section describes the driver and client utility installation procedures. You can install the driver and client utility before or after installing the client adapter. Follow the instructions in the [“Inserting the Client Adapter into a Computing Device”](#) section on page 3-9 to install the client adapter into your PowerBook or PowerMac.

To install the driver and client utility, follow these steps:

**Step 1** Open the folder on your hard driver where you expanded the utility installer (\*.sit) file.

**Step 2** Double-click **Cisco WLAN Install** to activate the installer.



**Note** You should keep the Cisco WLAN Install file. You can use this file later to uninstall your client utility and driver for a clean install.

**Step 3** If you are using Mac OS X, when the Authenticate screen appears, enter your password in the Password field. Your Macintosh user name will appear in the Name field. Click **OK**.



**Note** To install the client utility on Mac OS X, you must have administrator privileges for the Macintosh.

**Step 4** When the Cisco Aironet Wireless LAN Adapter Software screen appears, click **Continue**.

**Step 5** Read the terms and conditions of the Software License Agreement and click **Accept** or **Decline**. If you decline the license agreement, the installation ends.



**Note** You can print or save the software license agreement by clicking **Print** or **Save As**.

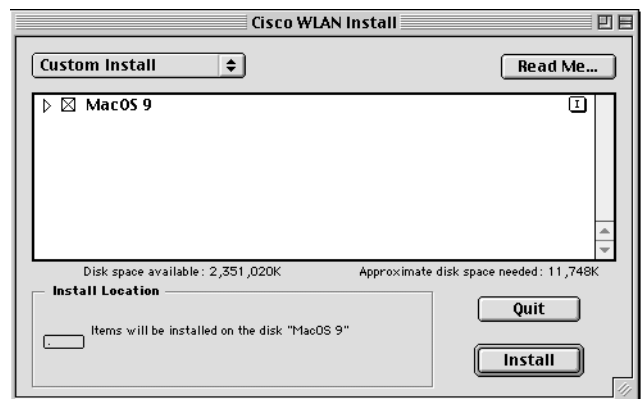
**Step 6** Read the Read Me screen information and click **Continue**.



**Note** You can print or save the read-me information by clicking **Print** or **Save As**.

The Cisco WLAN Installer detects your computer operating system and displays the appropriate installation screen (see [Figure 3-1](#) for Mac OS 9 or [Figure 3-2](#) for Mac OS X).

**Figure 3-1 Mac OS 9 Install Screen**



**Figure 3-2 Mac OS X Install Screen**

**Step 7** When the Cisco WLAN Install screen appears, perform the following operations:

- a. Expand the Mac OS X software component list by clicking the right triangle.

**Note**

By default, both the PCI and PC Card drivers are installed by the installer. You can deselect one of the drivers by clicking the selection box to remove the X; for example: you can deselect the PCI driver when using a PowerBook or you can deselect the PC Card driver when using a PowerMac.

- b. Click **Install** to begin the installation process.

**Step 8** Click **Continue** when a screen appears indicating your computer must restart after installing the software.

**Note**

You can click **Cancel** to terminate the install process.

**Step 9** A message appears indicating “One moment please...” then a screen appears that shows the installation progress. After the files are copied to the Macintosh hard disk, a window appears indicating that the installation was successful. Perform one of the following steps:

- a. Click **Restart** to restart your computer and finish the client utility installation.
- b. Click **Continue** if you need to perform additional installations.
- c. Click **Quit** to leave the installer program and return to your computer desktop screen. You must manually restart your computer at a later time to finish the client utility installation and to manually configure the client adapter using the client utility.

The client utility, the help files, and the drivers have been installed by the installer program.

For Mac OS 9, follow the instructions in the [“Basic Configuration on Mac OS 9”](#) section on page 3-10.

For Mac OS X, follow the instructions in the [“Using the Setup Assistant \(Mac OS X only\)”](#) section on page 3-5.



## Using the Setup Assistant (Mac OS X only)

When your Macintosh completes the power-up process following a successful install, the client adapter setup assistant activates. The setup assistant guides you through the initial configuration options of your client adapter and network settings. Each screen contains descriptive information to assist you in configuring your client adapter.



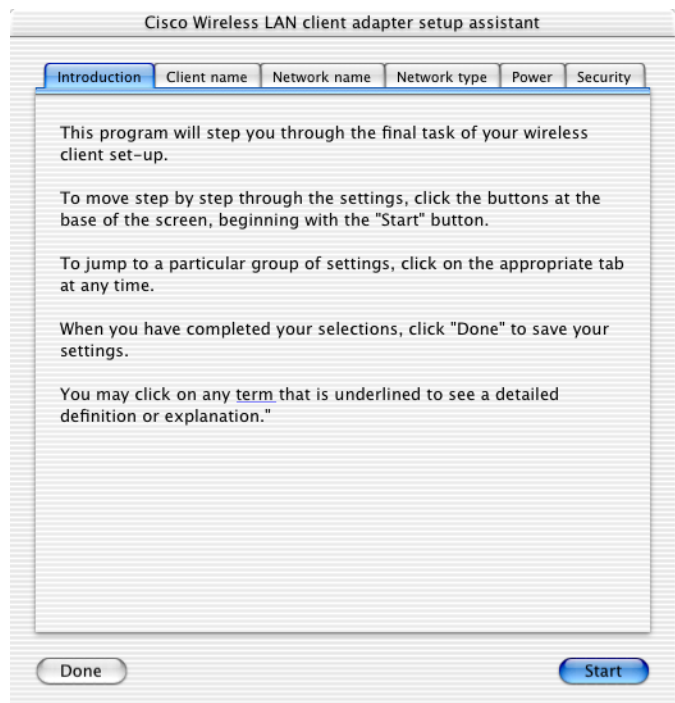
### Note

You can click underlined words or blue colored words on the setup assistant screens to obtain additional descriptive information. You can also click the Back button to return to a previous screen.

Follow the steps below to complete the initial configuration settings for your wireless system:

- Step 1** If the Introduction screen is not visible, click the **Introduction** tab (see [Figure 3-3](#)).

**Figure 3-3 Setup Assistant Introduction Screen**



- Step 2** Read the screen information and click **Start** to continue to the Client Name screen.



### Note

Click the Done button (on any screen) to exit the setup assistant and to manually configure your client adapter using the Aironet Client Utility.

- Step 3** Read the Client Name screen information and enter the client name (case-sensitive) for your client adapter. Click **Next** to continue to the Network Name screen.
- Step 4** Read the Network Name screen information and enter the Network Name or SSID (case-sensitive) for your wireless network. Click **Next** to continue to the Network Type screen.

- Step 5** Read the Network Type screen information. Click the up and down arrows next to the Network Type field and perform one of the following operations:
- If your computer connects to an access point, select **Computer to Access Point**. Click **Next** to continue to the Power screen.
  - If your computer connects to another computer in a peer-to-peer (ad hoc) network, select **Computer to Computer**. Then click the up and down arrows next to the Channel field and select the operating frequency channel for the computers on your network. Click **Next** to continue to the Power screen.
- Step 6** On the Power screen, read the power mode information, click the up and down arrows next to the Power Mode field and select one of the following modes:
- a. Constant Awake Mode—provides the least power savings because your client adapter is always powered on. This is the typical setting for desktop systems with AC power.
  - b. Power Save Mode—provides some power savings because your client adapter is occasionally turned off. This setting is typically used for battery powered systems that need quicker response and have sufficient battery capacity to support higher usage.
  - c. Maximum Power Save Mode—provides the greatest power savings because your client adapter is only occasionally turned on to receive and send data. This setting is typically used for battery powered systems that have limited battery capacity and can tolerate delayed transmissions.
- Step 7** On the Power screen, read the screen information, click the Transmit Power up and down arrows, and select the desired client adapter transmit power level. To help minimize cell overlaps, you should strive to use the lowest power setting that supports full coverage of your wireless cell. Click **Next** to continue to the Security screen.
- Step 8** Read the Security screen information on wireless network security options. If your wireless network uses these security options, click the **Enable WEP** or **Enable LEAP** check boxes.



**Note** For computer-to-access point configurations, you must check with your corporate or enterprise network administrator for the appropriate security settings. For computer-to-computer configurations, you must only determine if WEP is used by the other computers; LEAP is not available for computer-to-computer configurations.

- Step 9** When you have completed all setup assistant screens, click **Done**.
- Step 10** When the summary screen appears, review your selected configuration options and perform one of the following steps:
- a. If the configuration options are correct, click **OK** and go to Step 11.
  - b. If the configuration options are not correct, click **Cancel** and go to Step 1.
  - c. Click **Quit** to exit the setup assistant and to manually configure your client adapter using the Aironet Client Utility.
- Step 11** When a drop-down screen appears stating that your settings have been saved, read the information and perform one of the following steps:
- a. If you previously selected the Enable WEP option, click the Hexadecimal or ASCII check box and enter your WEP key in the entry box. Click **OK**.
  - b. If you previously selected the Enable LEAP option, enter your LEAP username and password in the entry boxes. Click **OK**.

A screen drops down to indicate your client adapter is being configured and trying to associate to an access point.

When the test process completes, one of four screens will appear:

- Congratulations
- Almost There
- Troubleshoot screen
- Done

The screens provide the following status information:

- Saving of configuration settings—indicates whether your settings have been successfully saved in the preferences file.
- Detection of client adapter radio—indicates whether your client adapter radio was detected.
- Access point association—indicates if your client adapter is associated to an access point.
- Data transfer progress—indicates whether your client adapter was able to successfully send data to an access point.

- Step 12** If the Congratulations screen appears, your client adapter has successfully associated and sent data to an access point. Perform one of the following operations:
- a. Click **Network Settings** to configure your Macintosh network parameters. Go to Step 16. Refer to the [“Basic Configuration on Mac OS X”](#) section on page 3-12.
  - b. Click **Quit** to configure your Macintosh network parameters at a later time. When you are ready to complete the configuration of your client adapter go to the [“Basic Configuration on Mac OS X”](#) section on page 3-12.
- Step 13** If the Almost There screen appears, this indicates your client adapter is associated to an access point but is unable to pass data through the access point. Perform one of the following operations:
- a. Click **Finish** to exit the setup assistant and use the client utility to help resolve the problem. See [Chapter 9, “Troubleshooting”](#).
  - b. Click **Return to Setup Assistant** to revise your settings using the setup assistant. Return to Step 4.
- Step 14** If the Troubleshoot screen appears, this indicates your client adapter is unable to associate to an access point. The screen status information identifies the problem area. Perform one of the following operations:
- a. If you want to manually troubleshoot the problem or use the client utility to change your configuration settings, click **Finish**. See [Chapter 9, “Troubleshooting”](#).




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**Note** Installation problems are typically caused by mismatched parameter settings between the client adapter and the access point. Check your settings for the Network Name (or SSID), Network Type, your WEP settings, and your LEAP settings.

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- b. Click **Return to Setup Assistant** to revise your settings using the setup assistant. Return to Step 4.
- Step 15** If the Done screen appears, read the screen information and click **OK**. This message appears when your client adapter is not installed in your Macintosh. Your configuration parameters are saved in your preference file on the hard disk. Perform the following operations:
- a. Refer to the [“Inserting the Client Adapter into a Computing Device”](#) section on page 3-9 for instructions on inserting your client adapter into your computer.




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**Note** If you are using LEAP, a wireless network login screen appears when you restart your computer. Enter your LEAP username and password. Click **OK**.

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- b. Refer to the [“Basic Configuration on Mac OS X”](#) section on page 3-12 for instructions on configuring your Mac OS X Network settings.
- c. Go to [“Verifying a Successful Installation and Configuration on Mac OS X”](#) section on page 3-15.

- Step 16** When the Network screen appears, click the Location up or down arrows and select a location to configure. Alternatively, create a new location.
- Step 17** Click the Show up or down arrows and select **Ethernet Adaptor (enx)** or **PCI Ethernet Slot x** (where x is a number that indicates a specific adapter or slot).
- Step 18** Click the **TCP/IP** tab. The TCP/IP window appears.
- Step 19** Perform one of the following operations:
- If you are connected to a DHCP server, select **Using DHCP** in the Configure drop-down box and type your computer’s unique client name in the DHCP Client ID field. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - If you need to specify a fixed IP address when using your DHCP server, select **Using DHCP with fixed IP Address** in the Configure drop-down box and enter the client adapter IP address. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - If you are connected to a BootP server, select **Using BootP** in the Configure drop-down box. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - If you are not connected to a DHCP or BootP server, select **Manually** in the Configure drop-down box and enter the client adapter IP address, the subnet mask, and the router IP address. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
- Step 20** Click **Apply Now** to apply your TCP/IP configuration options.
- Step 21** Click **System Prefs** on the main menu bar and click **Quit System Prefs**.



**Note** To uninstall the client utilities, follow the instructions in the [“Removing the Driver and Client Utility”](#) section on page 8-6.

You have completed the basic configuration of your client adapter. To verify a successful installation, refer to the [“Verifying a Successful Installation and Configuration on Mac OS X”](#) section on page 3-15.

# Inserting the Client Adapter into a Computing Device

This section provides instructions for inserting a PC card or a PCI client adapter into an Apple Macintosh computing device.

## Inserting a PC Card

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

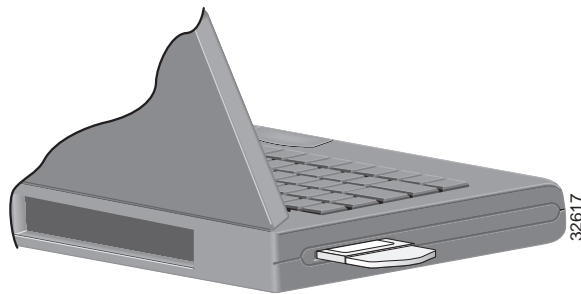


**Caution**

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

- Step 2** Hold the PC card with the Cisco logo facing up and insert it into the PC card slot, applying just enough pressure to make sure it is fully seated (see [Figure 3-4](#)). The PC card slot is usually on the side of the computer, depending on the model.

**Figure 3-4** Inserting a PC Card into a Computing Device



**Note**

You can remove and reinsert your PC card when necessary. Refer to the [“Removing a PC Card” section on page 8-11](#) for instructions.

- Step 3** If you have not already configured the client adapter, go to the [“Configuring Basic Client Adapter and Network Parameters” section on page 3-10](#).

## Inserting a PCI Client Adapter

This procedure explains how to insert a PCI client adapter. To remove a PCI client adapter, see [“Removing a PCI Client Adapter” section on page 8-12](#).



**Caution**

Static electricity can damage your computer and your client adapter. Before opening your computer or removing the adapter from the anti-static packaging, discharge static by touching the metal PCI port covers of your grounded computer (connected to a grounded power connector).

---

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



**Note** Refer to your Macintosh computer manual for instructions on opening or removing your computer cover and on locating the PCI expansion slots.

---

**Step 2** Remove or open the computer cover.

**Step 3** Locate an empty PCI expansion slot in your computer.

**Step 4** Examine the client adapter and ensure the antenna is not attached to the card. The antenna connector and the LEDs face out of your computer and are visible when you put the cover back on. The bottom edge of the adapter is the connector you will insert into the PCI expansion slot.

**Step 5** Tilt the adapter to allow the antenna connector and LEDs to slip through the opening in the computer back panel.

**Step 6** Press the client adapter into the empty PCI expansion slot until the adapter is firmly seated.



**Caution** Do not force or rock the adapter into the expansion slot as this could damage the adapter and the slot. If the adapter does not insert easily, remove the adapter and reinsert it.

---

**Step 7** Replace the computer cover.

**Step 8** Attach the 2-dBi antenna to the adapter's antenna connector until it is finger-tight. Do *not* overtighten.

**Step 9** For optimal reception, position the antenna so it is straight up.

**Step 10** Boot up your computer.

**Step 11** If you have not already configured the client adapter, go to the [“Configuring Basic Client Adapter and Network Parameters” section on page 3-10](#).

---

## Configuring Basic Client Adapter and Network Parameters

This section explains how to configure basic client adapter settings and AppleTalk or TCP/IP network settings.

### Basic Configuration on Mac OS 9

Basic configuration for Mac OS 9 has the following tasks:

1. Configure AppleTalk or TCP/IP
2. Configure the client adapter

## Configuring AppleTalk

Configure AppleTalk only if you use the client adapter for an AppleTalk connection.

To configure the computer to use AppleTalk, perform the following steps:

- 
- Step 1** Click the apple-shaped icon in the top left corner of the desktop.
  - Step 2** Select **Control Panels > AppleTalk**. The AppleTalk window appears.
  - Step 3** Make sure the name of the correct wireless LAN adapter appears in the Connect via field. If it does not, click the up or down arrow on the right side of the Connect via field and select the correct adapter from the drop-down list.
  - Step 4** Close the AppleTalk window.
  - Step 5** If a window appears asking if you want to save changes to the current configuration, click the **Save** button.
- 

## Configuring TCP/IP

Configure TCP/IP only if you use the client adapter for a TCP/IP connection.

To configure the TCP/IP, perform the following steps:

- 
- Step 1** Click the apple-shaped icon in the top left corner of the desktop.
  - Step 2** Select **Control Panels > TCP/IP**. The TCP/IP window appears.
  - Step 3** Select **Cisco Wireless LAN Adapter** in the Connect via drop-down box.
  - Step 4** Perform one of the following:
    - If you are connected to a DHCP server, select **Using DHCP Server** in the Configure drop-down box and type your computer's unique client name in the DHCP Client ID field.
    - If you are not connected to a DHCP server, select **Manually** in the Configure drop-down box and enter the client adapter IP address, the subnet mask, and the router IP address. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - Step 5** Close the TCP/IP window.
  - Step 6** If a window appears asking if you want to save changes to the current configuration, click the **Save** button.
- 

## Configuring Basic Wireless LAN Parameters

To configure the client adapter:

- 
- Step 1** Double-click the Macintosh hard disk icon on the desktop. The Macintosh hard disk window appears.
  - Step 2** Locate and double-click the **Cisco pcm340 Folder** icon. The Cisco pcm340 Folder window appears.
  - Step 3** Double-click the **pcm340PPC** icon. The Cisco pcm340 window appears, and the computer searches for the client adapter. After the adapter is found, the Cisco pcm340 - Basic Properties window appears.
  - Step 4** Under Radio, make sure that radio status is on. If it is off, click the **Turn radio on** button.

- Step 5** Perform one of the following:
- If your computer connects to an access point or to the Cisco Aironet 340 Series Base Station, select **Computer to base station** in the Network subwindow.
  - If your computer connects to another computer in a peer-to-peer (ad hoc) network, select **Computer to computer** in the Network subwindow. Then click the up and down arrows next to the Channel field and select the operating frequency channel for the computers on your network.
- Step 6** Type your RF network's (case-sensitive) SSID in the SSID text field.
- Step 7** Click **Apply**.

The basic configuration of the driver and client utility is complete. If security is not used in your wireless network, your client adapter should now be able to associate to a local access point, base station, or another computer. You can check the association of your client adapter on the bottom of the Cisco Wireless LAN Adapter Utilities screen. If associated, you should also see the MAC address and IP address of the associated device.



**Note** To configure security features, refer to [Chapter 5, "Security Features."](#)

## Basic Configuration on Mac OS X

During the installation process, the setup assistant is typically used to configure the client adapter and the Mac OS X network options. This section describes the process used to set and verify basic configuration options when the setup assistant is not used. If you have used the setup assistant, proceed to "[Verifying a Successful Installation and Configuration on Mac OS X](#)" section on page 3-15.

Basic configuration for Mac OS X has the following tasks:

1. Configure AppleTalk or TCP/IP
2. Configure the client adapter

### Configuring AppleTalk

Configure AppleTalk only if you use the client adapter for an AppleTalk connection.

To configure the computer to use AppleTalk, perform the following steps:

- Step 1** Click the apple-shaped icon in the top left corner of your desktop.
- Step 2** Click **System Preferences**. The System Preferences window appears.
- Step 3** Click the **Network** icon. The Network window appears.



**Note** If a New Port Detected screen appears, click **OK** to activate the new port, such as Ethernet Adapter (en1) or PCI Ethernet Slot 1.

- Step 4** Click the Location up or down arrows and select a location.
- Step 5** Click the Show up or down arrows and select **Ethernet Adaptor (enx)** or **PCI Ethernet Slot x** (where x is a number that indicates a specific adapter or slot).




- Step 6** Select the AppleTalk tab.
- Step 7** Check Make AppleTalk Active.
- Step 8** Select an AppleTalk Zone.
- Step 9** Optionally, select manual configuration and specific AppleTalk settings.
- 

## Configuring TCP/IP

Configure TCP/IP only if you use the client adapter for a TCP/IP connection.

To configure TCP/IP, perform the following steps:

- 
- Step 1** Click the apple-shaped icon in the top left corner of your desktop.
- Step 2** Click **System Preferences**. The System Preferences window appears.
- Step 3** Click the **Network** icon. The Network window appears.
-  **Note** If a New Port Detected screen appears, click **OK** to activate the new port, such as Ethernet Adapter (en1) or PCI Ethernet Slot 1.
- 
- Step 4** Click the Location up or down arrows and select a location.
- Step 5** Click the Show up or down arrows and select **Ethernet Adaptor (enx)** or **PCI Ethernet Slot x** (where x is a number that indicates a specific adapter or slot).
- Step 6** Select the **TCP/IP** tab. The TCP/IP window appears.
- Step 7** Perform one of the following:
- If you are connected to a DHCP server, select **Using DHCP** in the Configure drop-down box and type your computer's unique client name in the DHCP Client ID field. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - If you need to specify a fixed IP address when using your DHCP server, select **Using DHCP with fixed IP Address** in the Configure drop-down box and enter the client adapter IP address. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - If you are connected to a BootP server, select **Using BootP** in the Configure drop-down box. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
  - If you are not connected to a DHCP or BootP server, select **Manually** in the Configure drop-down box and enter the client adapter IP address, the subnet mask, and the router IP address. If required by your wireless network, enter the IP addresses for the domain name servers (obtained from your system administrator).
- Step 8** Click **Apply Now** to save the TCP/IP configuration options you have specified.
- Step 9** Click **System Prefs** on the main menu bar and click **Quit System Prefs**.
-

## Configuring Basic Wireless LAN Parameters

To configure basic wireless LAN parameters, perform the following steps:

- 
- Step 1** Click **Go** on the main Finder menu bar and select **Applications** from the drop-down menu.
- Step 2** Double click **Aironet Client Utility** on the Applications screen.
- Step 3** Click the Network Type up or down arrows and select one of the following options:
- If your computer connects to an access point or to the Cisco Aironet 340 Series Base Station, select **Computer to Access Point**.
  - If your computer connects to another computer in a peer-to-peer (ad hoc) network, select **Computer to Computer**.
- Step 4** If you selected Computer to Computer, click the Channels up or down arrows and select the desired frequency channel from the drop-down list.
- Step 5** Type your network's (case-sensitive) name (or SSID) in the Network Name text field.
- Step 6** Click **Turn Radio On** if the button is visible.

If security is needed, refer to [Chapter 5, "Security Features."](#)

To verify a successful install, refer to ["Verifying a Successful Installation and Configuration on Mac OS X" section on page 3-15.](#)

---

## Verifying a Successful Installation and Configuration on Mac OS 9

The installation and configuration of your client adapter is successful when your client card is associated and authenticated to an access point. If the installation and configuration is correct, the software detects the client adapter, the client adapter associates to an access point, and the Aironet control strip module changes to an image that indicates successful association. If the Mac OS 9 control strip is not visible, use the Control Strip dialog box to display it. Refer to the ["Using the Aironet Control Strip Module \(Mac OS 9\)" section on page 4-4](#) for details about the Aironet control module display. Alternatively, you can use the client utility to verify successful association and authentication.

To verify a successful configuration using the client utility, perform the following steps:

- 
- Step 1** Open the Aironet Client Utility by double-clicking the pcm340PPC icon in the cisco pcm340 folder. Or, click the Aironet control strip module and select **Open Aironet Client Utility**.
- If the Aironet Client Utility icon is not in the pcm340 folder or the client utility screen does not appear, verify that your Macintosh is running Mac OS 9 and reinstall the client utility and driver again. If you continue to have problems refer to the ["Obtaining Technical Assistance" section on page xiv.](#)
- Step 2** When the client utility screen appears, check the status line on the bottom of the screen. The status line should indicate that the radio is associated to an access point, the access point name, and the IP address. The status line should be similar to: *Radio is associated AP: 'AP340-3836b7' IP: 10.0.0.1.*
- If the client utility screen appears but your client card is not associated, verify your settings match with the access point. If you are unable to determine your problem, refer to [Chapter 9, "Troubleshooting."](#)
-

## Verifying a Successful Installation and Configuration on Mac OS X

The installation and configuration of your client adapter is successful when your client card is associated and authenticated to an access point. If the installation and configuration is correct, the software detects the client adapter radio, the client adapter associates to an access point, and the Aironet menu bar icon changes to an image that indicates successful association. Refer to the [“Using the Aironet Menu Bar Icon \(Mac OS X\)” section on page 4-2](#) for details about viewing connection status. Alternatively, you can use the client utility to verify successful association and authentication.

To verify a successful configuration using the client utility, perform the following steps:

- 
- Step 1** Open the Aironet Client Utility by clicking **Go** on the Finder main menu bar and selecting **Applications**. Then double-click **Aironet Client Utility** on the Applications screen. Or, click the Aironet icon on the Mac OS X menu bar and select **Open the Aironet Client Utility**.
- If the Aironet Client Utility icon is not on the Applications screen or the client utility screen does not appear, verify that your Macintosh is running Mac OS X and reinstall the client utility and driver. If you continue to have problems, refer to the [“Obtaining Technical Assistance” section on page xiv](#).
- Step 2** When the client utility screen appears, check the status line on the bottom of the screen. The status line should indicate that the radio is associated to an access point, the access point name, and the IP address. The status line should be similar to: *Radio is associated AP: 'AP340-3836b7' IP: 10.0.0.1*.
- If the client utility screen appears but your client card is not associated, verify your settings match with the access point. If you are unable to determine your problem, refer to [Chapter 9, “Troubleshooting.”](#)
-





## Using the Client Adapter

---

This chapter explains how to perform common client adapter tasks.

The following topics are covered in this section:

- [Aironet Client Adapter Software, page 4-2](#)
- [Desktop Controls, page 4-2](#)
- [Client Utility, page 4-7](#)
- [Client Utility Basics for Mac OS X, page 4-7](#)
- [Client Utility Basics for Mac OS 9, page 4-11](#)
- [Working with Multiple Users, page 4-15](#)

# Aironet Client Adapter Software

The Aironet client software is installed as a package that contains the following components:

- Aironet Client Utility (ACU) application

The ACU is an application that you use to configure, monitor, and troubleshoot the client adapter. This utility provides access to all client adapter features and settings.

- Desktop controls, either a menu bar icon (Mac OS X) or control strip module (Mac OS 9)

These controls display basic adapter status and provide quick access to common user tasks. For example, users can change locations or log on without opening the ACU.

The Cisco WLAN Install utility installs both components when you select the Mac OS Client Utility.

## Desktop Controls

The Aironet desktop controls appear on the on the menu bar or control strip:

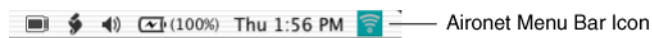
- Mac OS X—Aironet menu bar icon
- Mac OS 9—Aironet control strip module

The Aironet icon or module is displayed by default. This section explains how to interpret icon or module states and activate features.

## Using the Aironet Menu Bar Icon (Mac OS X)

The menu bar icon is displayed in the Mac OS X menu bar at the top of the screen (see [Figure 4-1](#)).

**Figure 4-1 Aironet Menu Bar Icon**



The icon itself displays adapter status and signal strength. Click the icon to access connection information and perform several common client adapter actions. This icon is displayed by default after you install the ACU. To hide the icon, see the [“Performing Common Client Adapter Tasks”](#) section on [page 4-3](#).

## Viewing Radio Status and Signal Strength

The Aironet menu bar icon indicates relative signal strength when the radio is connected to an access point. The icon displays three bars when the signal is strong, one or two bars when the signal is moderate, and no bars when it is weak (see [Figure 4-2](#)).

**Figure 4-2 Radio Signal Strength Indicators When Associated**



When the radio is not associated, the icon is dimmed on a dark green background (see [Figure 4-3](#)). When using LEAP, this state may mean that you are not logged on.

**Figure 4-3 Radio Not Associated**



When the radio is off, the icon is green on a white background (see [Figure 4-4](#)).

**Figure 4-4 Radio Off**



When the radio is not installed or the driver is not loaded, the icon is gray on a white background (see [Figure 4-5](#)). This can occur when a PCMCIA or PC-Cardbus client adapter is removed.

**Figure 4-5 Radio Not Installed**



## Performing Common Client Adapter Tasks

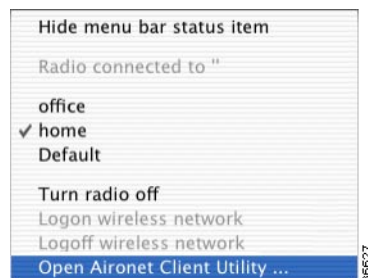
Clicking the icon displays a menu of tasks and provides information about the radio connection. You can perform the following tasks from the desktop control:

- Change locations
- Log on or off the wireless network
- Turn the radio on or off
- Open the Aironet Client Utility
- Hide the menu bar icon

To perform a task, follow these steps:

- 
- Step 1** Click the Aironet icon. The menu opens (see [Figure 4-6](#)).

**Figure 4-6 Action Menu for Mac OS X**



**Step 2** Select an action. The following table describes the actions you can perform on Mac OS X:

**Table 4-1**    *Actions for Mac OS X*

Action	Description
Hide menu bar status	Use this selection to remove the Aironet icon from the Mac OS X menu bar. To redisplay the icon, open the ACU, select <b>Help</b> , and click <b>Show Menu Bar Status</b> .
Radio connection	This menu item displays radio connection information. You cannot select this item.
Location	The popup menu displays a list of configured locations for your client adapter. To change locations, click a location name. The client adapter switches to the new location and prompts for a user name and password if LEAP security is enabled. Initially, the client adapter has a single location named <i>Default</i> .
Turn radio on or off	Use this selection to turn the radio off or on. You may want to turn the radio off when your computer is not near an access point or when you don't need the network.
Logon or logoff	Use this selection to manually logon or logoff when LEAP security is enabled. The radio automatically prompts for a LEAP username and password when you log onto your Mac computer. If multiple users are enabled, the client adapter automatically logs off the radio network when you log out of your computer account. For more information, see the <a href="#">“Working with Multiple Users” section on page 4-15</a> .
Open Aironet Client Utility	Use this selection to launch the Aironet Client Utility.

## Using the Aironet Control Strip Module (Mac OS 9)

The Aironet control strip module is displayed in the Mac OS 9 control strip, typically at the bottom of the screen (see [Figure 4-7](#)).

**Figure 4-7**    *Aironet Control Strip Module*



This vertical bars next to the Aironet icon display adapter status and signal strength. Click the module to access connection information and perform several common client adapter actions.



**Note**

You may need to show, expand, or scroll the control strip to view the Aironet module.



## Viewing Status

The control strip module indicates signal strength when the client adapter is connected to an access point. Unlike the Mac OS X signal strength display, the control strip module indicates relative signal strength with a series of vertical bars to the right of the Aironet icon (see [Figure 4-8](#)).

**Figure 4-8 Radio Associated**



When the radio is associated, the relative signal strength is indicated by the number of dark gray bars and their height. One gray bar indicates poor signal strength, two indicate fair signal strength, three indicate good signal strength, and four indicate excellent signal strength. [Figure 4-8](#) shows the module appearance when the radio is associated to an access point and is receiving fair signal strength.

When the radio is not associated, all four vertical bars have a shaded gray appearance (see [Figure 4-9](#)). When using LEAP, this display may mean that you are not logged on.

**Figure 4-9 Radio Not Associated**



When the radio is off, all four vertical bars have a solid gray appearance with a block outline (see [Figure 4-10](#)).

**Figure 4-10 Radio Off**



When the radio is not installed or the driver is not loaded, no signal strength bars are displayed (see [Figure 4-11](#)). This can occur when a PCMCIA or PC-Cardbus client adapter is removed.

**Figure 4-11 Radio Not Installed**



## Performing Common Client Adapter Tasks

Clicking the control strip module displays a menu of tasks and provides information about the radio connection. You can perform the following tasks from the desktop control:

- Log on or off the wireless network
- Turn the radio on or off
- Open the ACU

Clicking the icon displays a menu of tasks and provides information about the radio connection.

To perform a task, follow these steps:

- Step 1** Click the Aironet module on the control strip. The menu opens (see [Figure 4-12](#)).

**Figure 4-12 Action Items for Mac OS 9**



- Step 2** Select an action. The following table describes the actions you can take with Mac OS 9:

**Table 4-2 Actions for Mac OS 9**

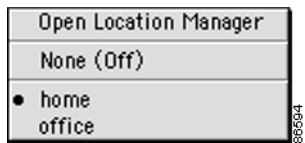
Action	Description
Radio connection	This menu item displays radio connection information. You cannot select this item.
Turn radio on or off	Use this selection to turn the radio off or on. You may want to turn the radio off when your computer is not near an access point or when you don't need the network.
Logon or logoff	Use this selection to manually logon or logoff when LEAP security is enabled. The radio automatically prompts for a LEAP username and password when you log onto your Mac computer. If multiple users are enabled, the client adapter automatically logs off the radio network when you log out of your computer account. For more information, see <a href="#">“Working with Multiple Users” section on page 4-15</a> .
Launch Aironet Client Utility	Use this selection to launch the Aironet Client Utility.



**Note**

You change locations on Mac OS 9 using the Macintosh Location Manager feature, which also has a control strip module (see [Figure 4-13](#)).

**Figure 4-13 Location Manager for Mac OS 9**



Refer to Macintosh help for Location Manager details.

# Client Utility

Using the client utility, you can load new firmware, enable security features, configure your client adapter, and perform user-level diagnostics. The latest client utility software packages for both Mac OS 9 and Mac OS X are available from Cisco's web site.

This chapter describes the client utilities by operating system. Because the client utility screens are very similar, many procedures in this guide show the Mac OS X screens only. Mac OS 9 users should read this section to become familiar with the screen appearances.

## Client Utility Basics for Mac OS X

The client utility for Mac OS X supports three main screens: basic, advanced, and troubleshooting.

### Opening the Client Utility

You can open the client utility from the desktop control or launch it as an application. To open the client utility, perform one of the following actions:

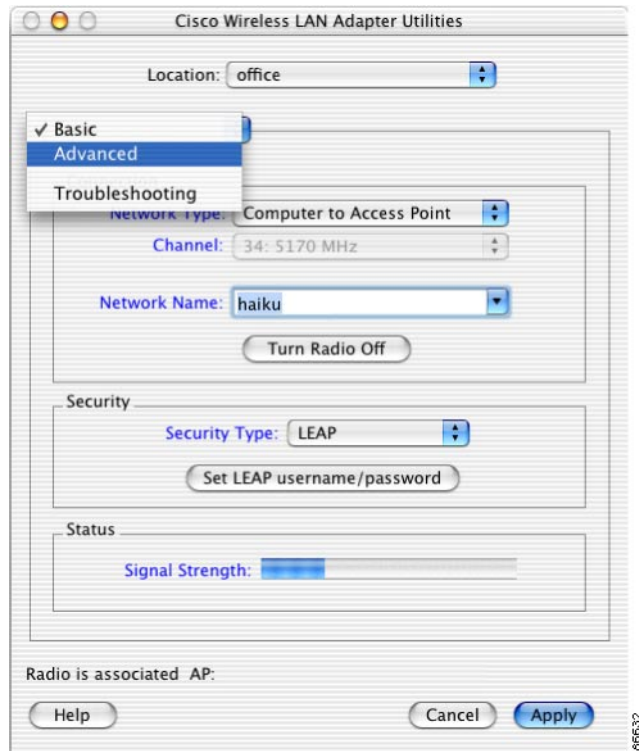
- Click the Aironet icon on the menu bar and select **Open Aironet Client Utility** from the drop-down menu.
- Click **Go** on the menu bar and select **Applications** from the drop-down menu; then expand the Applications folder and double-click the **Aironet Client Utility** icon.

The computer searches for the client adapter. After the adapter is found, the basic properties screen of the client utility appears.

## Switching Screens

You can change the client utility's active screen by clicking the up or down arrows of the screen name. [Figure 4-14](#) shows the screen drop-down selections.

**Figure 4-14** *Client Utility Screen Drop-Down Selections*



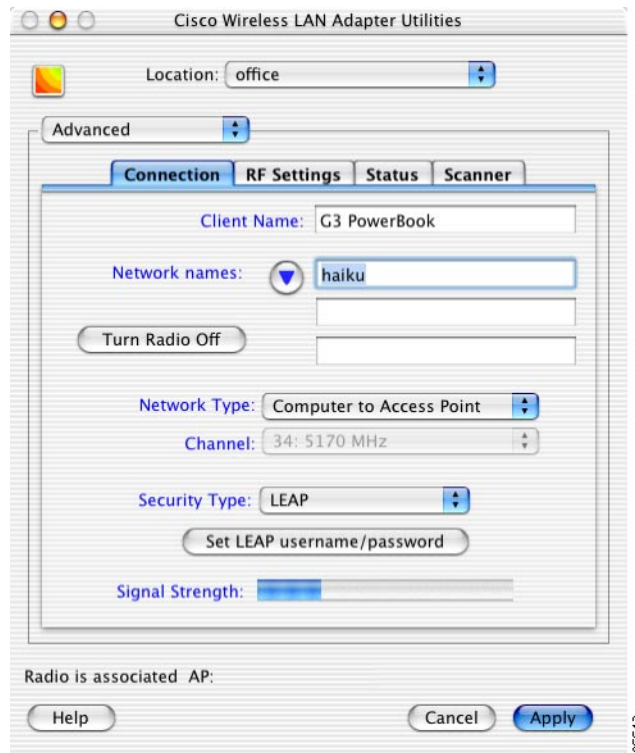
### Note

You can click the highlighted blue text on the client utility screens for more information about the highlighted words. You can also click the **Help** button for detailed information about the client utility parameters and fields.

## Navigating the Advanced Screen

The advanced screen includes tabs that select Connection, RF Settings, Status, and Scanner configuration. You move from one screen to another by selecting a tab.

**Figure 4-15** *Client Utility Advanced Screen for Mac OS X*



## Getting Help

To access help for the client utility, perform one of the following actions:

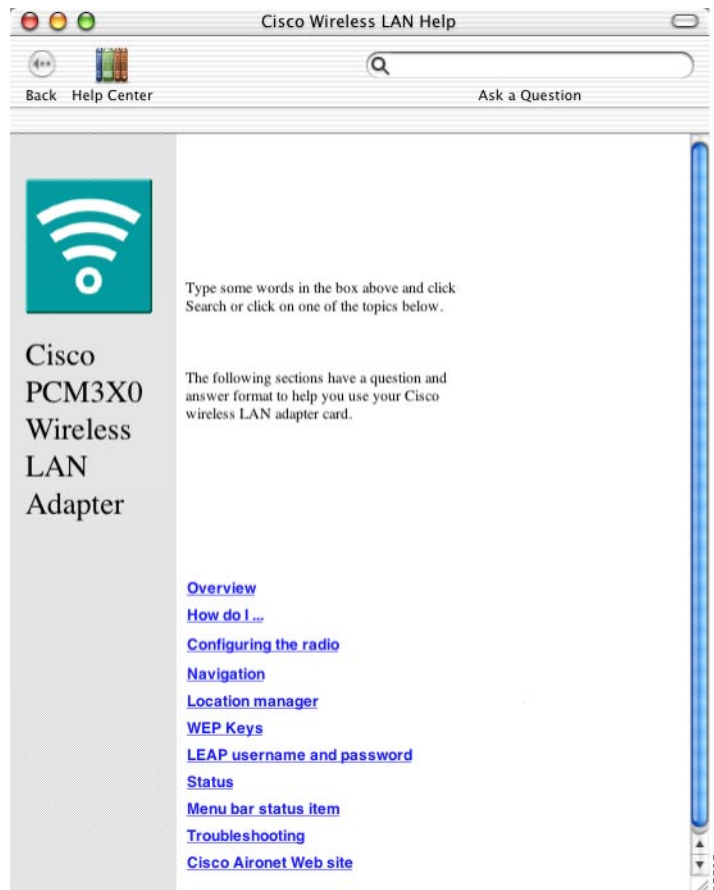
- Click **Help** on the bottom of the client utility screens (see [Figure 4-14](#)).
- Select **Aironet Client Utility Help** from the help drop-down menu (see [Figure 4-16](#)) or use the keyboard equivalent, Apple Command-?.

**Figure 4-16** *Help Drop-Down Menu*



The client utility help screen appears (see [Figure 4-17](#)).

**Figure 4-17 Client Utility Help Screen**



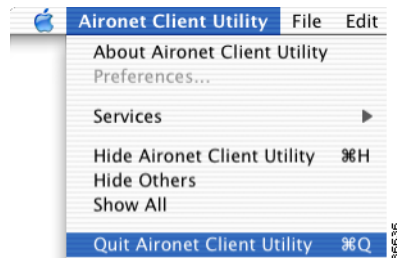
From the client utility help screen, you can access information on the client utility, as follows.

- To search for a specific word or phrase, enter the word or phrase in the Search box at the top of the screen and click **Ask**.
- To access information about a topic, click the topic in the middle of the screen, such as Navigation or Status.

## Exiting the Client Utility

To exit the client utility, click **Aironet Client Utilities** from the main menu bar and select **Quit Aironet Client Utility** (see Figure 4-18), or type the keyboard equivalent, Apple Command-Q.

**Figure 4-18 Client Utility Drop-Down Menu Screen**



## Buttons on the Client Utility Screens and Dialog Boxes

Table 4-3 summarizes the client utility buttons.

**Table 4-3 Client Utility Buttons**

Button	Description
Turn Radio Off	Turns the radio off or on
Turn Radio On	
Set WEP Key	Opens a dialog box to set the WEP keys
Set LEAP Username/Password	Opens a dialog box to set the LEAP username and password
Start	Initiates a RF Link test
Stop	Stops an RF Link test that is running
Detailed Report	Displays detailed troubleshooting information
New	Specifies a name for a new location profile (Mac OS X only)
Rename	Renames an existing location profile name (Mac OS X only)
Delete	Deletes an existing location profile name (Mac OS X only)
Select	Select the location profile name to use (Mac OS X only)

## Client Utility Basics for Mac OS 9

The client utility for Mac OS 9 supports three main screens: basic, advanced, and troubleshooting.

### Opening the Client Utility for Mac OS 9

You can open the client utility from the desktop control or launch it as an application. To open the client utility, perform one of the following actions:

- Click the Aironet control strip module and select **Open Aironet Client Utility** from the menu. If the control strip is not visible, display it using the Control Strip dialog box first.

- Double-click the **Cisco pcm340 Folder** icon; then double-click the **pcm340PPC** icon. If you selected a location other than the default (the Cisco pcm340 folder) during the installation process, select the folder in which the utility was installed.

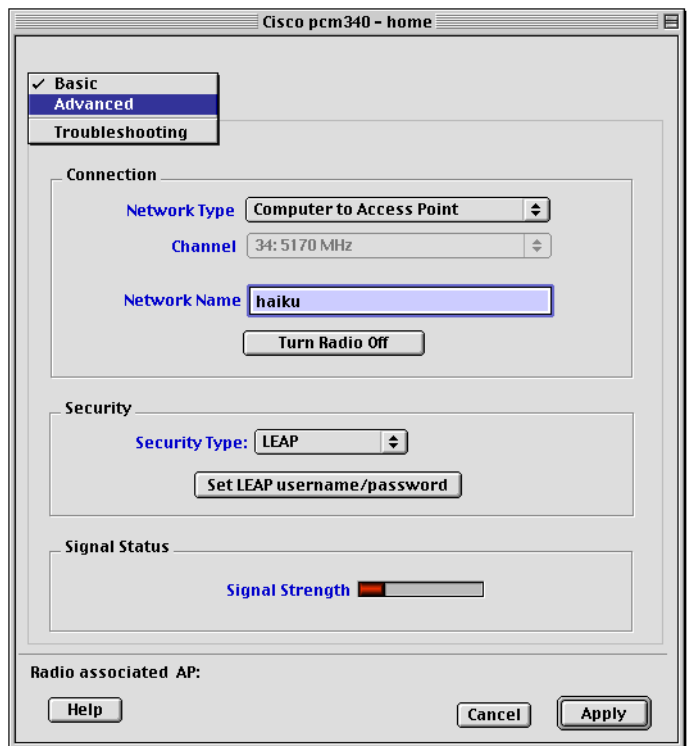
The computer searches for the client adapter. After the adapter is found, the basic properties screen of the client utility appears.

## Switching Screens

You can change the client utility's active screen by clicking the up or down arrows of the screen name. [Figure 4-19](#) shows the screen drop-down selections.

The basic property screen for Mac OS 9 is nearly identical to the corresponding Mac OS X screen (see [Figure 4-14](#)). Except for the Location field, which is unique to Mac OS X, the screens have the same fields in the same location with the same selections. Only the window characteristics, such as title bar appearance and button shape, are different. Therefore, many of the procedures in this guide show the Mac OS X screens only.

**Figure 4-19** Client Utility Basic Screen for Mac OS 9



### Note

You can click the highlighted blue text on the client utility screens for additional information about the highlighted words. You can also click the Help button for detailed information about the client utility parameters and fields.

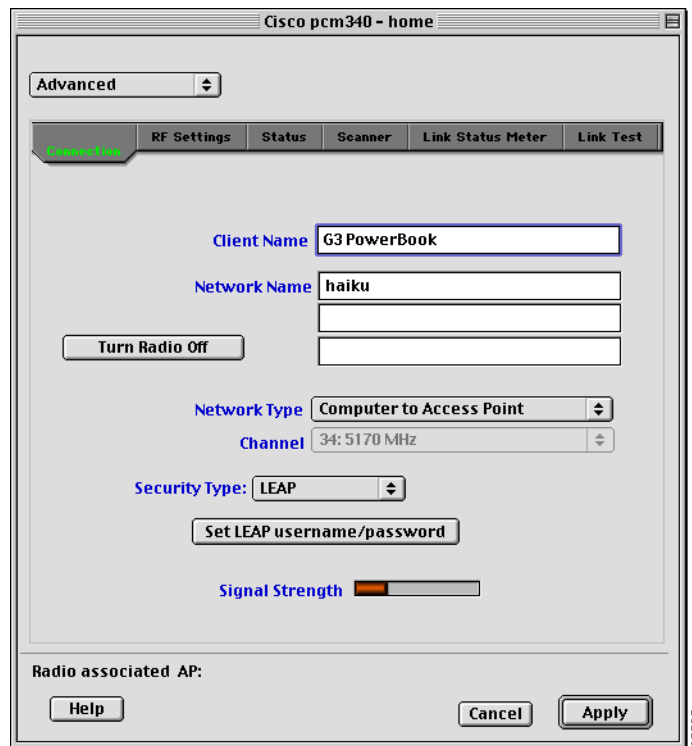


## Navigating the Advanced Screen

The advanced screen includes tabs that select advanced configuration subcategories. You move from one screen to another by selecting a tab, scrolling to the left or right as necessary.

The advanced property screens for connections and RF settings are nearly identical to the corresponding Mac OS X screens (see [Figure 4-15](#)). Except for the Location field and Link Status button, which are unique to Mac OS X, the screens have the same fields in the same location with the same selections. Only the window characteristics, such as title bar appearance and tab shape, are different. Therefore, many of the procedures in this guide show the Mac OS X screens only.

**Figure 4-20** Client Utility Advanced Screen for Mac OS 9

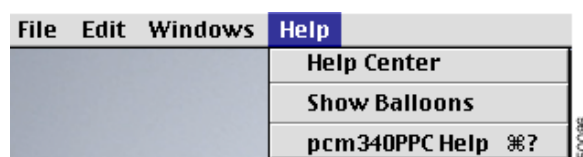


## Getting Help

To access help for the pcm340PPC client utility perform one of the following actions:

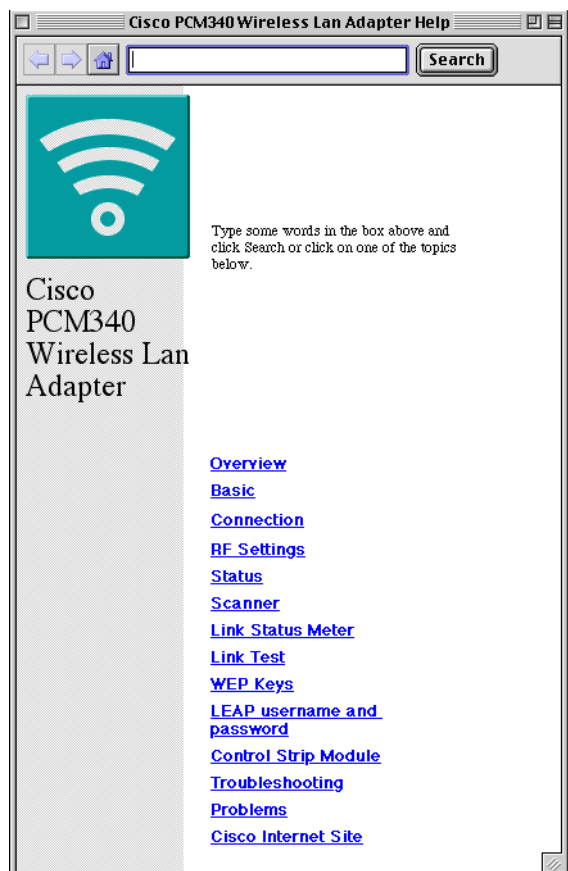
- Click **Help** on the bottom of the client utility screens (see [Figure 4-20](#)).
- Select **pcm340PPC Help** from the Help drop-down menu (see [Figure 4-21](#)) or use the keyboard equivalent, Apple Command-?.

**Figure 4-21** Help Drop-Down Menu



The Cisco PCM340 Wireless LAN Adapter screen (see [Figure 4-22](#)) appears.

**Figure 4-22** Client Utility Help Screen



From the Cisco PCM340 Wireless LAN Adapter screen, you can access additional information:

- To search for a specific word or phrase, enter the word in the Search box at the top of the screen and click **Search**.
- To access information on a specific topic, click the desired topic in the middle of the screen.

## Exiting the Client Utility

To exit the pcm340PPC client utility, select **Quit** from the File drop-down menu (see [Figure 4-23](#)), or type the keyboard equivalent, Apple Command-Q.

**Figure 4-23** File Drop-Down Menu



## Buttons on the Client Utility Screens

The buttons on the bottom of the Mac OS 9 client utility screens are the same as the Mac OS X screens. Refer to the [“Buttons on the Client Utility Screens and Dialog Boxes”](#) section on page 4-11.

## Working with Multiple Users

The Aironet client adapter supports environments where multiple users share a common computer and wireless network. When LEAP security and multiple users are enabled, the client adapter logs off the wireless network when a user logs off, and prompts for a new username and password when a new user logs on. Mac OS X users can simplify the logon process by saving their password in the Mac keychain.

If you are not within range of an access point or cancel the login, you can manually log in later using the one of the following methods:

- Click the desktop control (menu bar icon or control strip module) and select **login**.
- Open the ACU and select **LEAP username and password** from the File menu.
- Open the ACU and click **Set Leap username/password**.

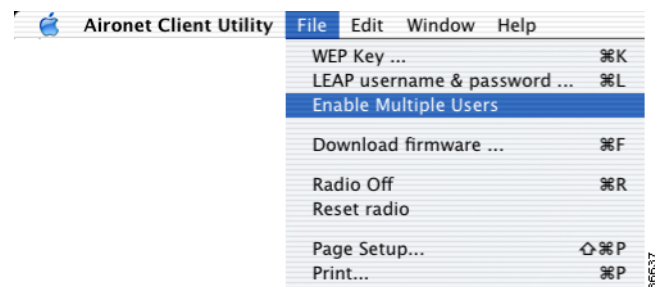
This section explains how to enable and disable the multiple user feature.

## Enabling Multiple Users

To enable the multiple user feature for the client utility, follow these steps:

- 
- Step 1** Launch the Aironet Client Utility if it is not already open on the desktop.
- Step 2** Select **File** from the main menu bar and select **Enable Multiple Users**. [Figure 4-24](#) shows the File menu for Mac OS X.

**Figure 4-24 Enable Multiple Users Menu Item for Mac OS X**



**Note** [Figure 4-23](#) shows the Mac OS 9 file menu.



**Note** For Mac OS 9, you must first enable the Macintosh multiple users feature in the Multiple Users control panel.

## Disabling Multiple Users

To disable multiple users for the client utility, follow these steps:

- 
- Step 1** Launch the Aironet Client Utility if it is not already open on the desktop.
  - Step 2** Select **File** from the main menu bar and select **Disable Multiple Users**. [Figure 4-24](#) shows the File menu for the Mac OS X operating system.
-



## Security Features

---

This chapter describes the security features of your client adapter and provides instructions for enabling WEP key and LEAP security.

The following topics are covered in this section:

- [Overview of Security Features, page 5-2](#)
- [Opening the Client Utility, page 5-5](#)
- [Configuring WEP Key Security, page 5-5](#)
- [Configuring LEAP Security, page 5-12](#)
- [Verifying Security Configurations, page 5-13](#)

# Overview of Security Features

When you use your client adapter with the Mac OS operating system, you can protect your data as it is transmitted through your wireless network by encrypting it through the use of Wired Equivalent Privacy (WEP) encryption keys. With WEP encryption, the transmitting device encrypts each packet with a WEP key, and the receiving device uses that same key to decrypt each packet.

The WEP keys used to encrypt and decrypt transmitted data can be statically associated with your adapter or dynamically created as part of the LEAP authentication process. The information in the sections below can help you to decide which type of WEP keys you want to use. Dynamic WEP keys with LEAP offer a higher degree of security than static WEP keys.

WEP keys, whether static or dynamic, are either 40 or 128 bits in length. The 128-bit WEP keys contain more characters than the 40-bit keys and, therefore, offer a greater level of security.

Message integrity check (MIC) is a security protection feature supported by your client adapter in conjunction with an access point (see the [“MIC” section on page 5-4](#)).

## Static WEP Keys

Each device (or profile) within your wireless network can be assigned up to four static WEP keys. If a device receives a packet that is not encrypted with the appropriate key (as the WEP keys must match in all devices that are to communicate with each other), the device discards the packet.

For the Mac OS X, the Static WEP keys are stored in an encrypted format (for security reasons) in your Macintosh. When the driver loads and reads the client adapter's parameters, it also finds the static WEP keys, decrypts them, and stores them in volatile memory on the client adapter. The WEP keys in the client adapter are temporary and they are lost when power to the adapter is removed or the Macintosh is rebooted. Although the keys in the client adapter are temporary, you do not need to re-enter them when you restore power or reboot because the keys are stored in your Macintosh.

For the Mac OS 9, the Static WEP keys can be permanently or temporarily stored in your client adapter. If the keys are temporarily stored in volatile memory, the keys will be lost when power is removed from your client adapter.

Use the client utility to enable or disable static WEP key security and to add or change WEP key values.

## Dynamic WEP Keys with EAP

The new standard for wireless LAN security, as defined by the Institute of Electrical and Electronics Engineers (IEEE), is called *802.1X for 802.11*, or simply *802.1X*. An access point that supports 802.1X and its protocol, Extensible Authentication Protocol (EAP), acts as the interface between a wireless client and an authentication server, such as a Remote Authentication Dial-In User Service (RADIUS) server, to which the access point communicates over the wired network.

The use of an 802.1X authentication type, which is supported by the client and the authentication server, causes the following to occur:

- After associating to the access point, the client does not gain access to the network until mutual authentication between the client and the authentication server is successful.
- The client and authentication server derive the same dynamic WEP key.
- The authentication server sends the dynamic WEP key to the access point.
- For the length of a session, or time period, the access point and the client use the dynamic WEP key to encrypt and decrypt all unicast packets that travel between the access point and the client.

Cisco Aironet client adapters supports EAP-Cisco Wireless (or LEAP) security.

## EAP-Cisco Wireless or LEAP

Support for EAP-Cisco Wireless or LEAP is provided in a Cisco Aironet client adapter's firmware and the Cisco software that supports it. The RADIUS servers that support LEAP include Cisco Secure ACS version 2.6 and above and Cisco Access Registrar version 1.7 and above.

You enable or disable LEAP using the client utility. When LEAP is enabled, the client adapter uses your LEAP username and password to perform mutual authentication with the RADIUS server through the access point. Unless you save your LEAP username and password in the Mac OS X keychain, they are lost when the radio is turned off, the client adapter is removed, or the Macintosh is powered down. The client adapter prompts for a LEAP username or password when it attempts authentication and cannot retrieve the username and password from the keychain or client adapter volatile memory.

When you enable Network-EAP on your access point and LEAP on your client adapter, authentication to the network occurs in the following sequence:

1. The client adapter associates to an access point and begins the authentication process.

**Note**

The client adapter does not gain access to the network until the mutual authentication with the authentication server is successful.

2. Communicating through the access point, the client adapter and the authentication server complete a mutual authentication process, with the password being the shared secret for authentication. The password is never transmitted during the process.
3. If mutual authentication is successful, the client adapter and the authentication server derive a dynamic, session-based WEP key that is unique.
4. The authentication server transmits the key to the access point using a secure channel on the wired LAN.
5. For the length of a session, or a time period, the access point and the client adapter use this key to encrypt or decrypt all unicast packets that travel between them.

**Note**

Refer to the IEEE 802.11 Standard for more information on 802.1X authentication and to the following URL for additional information on RADIUS servers:

[http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/secur\\_c/scprt2/scrad.htm](http://www.cisco.com/univercd/cc/td/doc/product/software/ios120/12cgcr/secur_c/scprt2/scrad.htm)

## MIC

Your client adapter, in conjunction with a Cisco Aironet Access Point, supports message integrity check (MIC) to protect against bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. The following drivers support MIC:

- Mac OS 9—version 1.0.3 or greater
- Mac OS X—version 1.0.1 or greater

MIC is used only if it is enabled on the access point.

**Note**

If the access point is using MIC, your client adapter's driver and firmware must support MIC; otherwise, the client cannot associate. MIC operation on your client adapter is automatic when the feature is enabled on the access point.



## Opening the Client Utility

The easiest way to open the ACU is to click the Aironet icon on the menu bar (Mac OS X), or Aironet control module (Mac OS 9), and select **Open Aironet Client Utility**. Refer to the [“Desktop Controls” section on page 4-2](#).

As an alternative, you can open the ACU as an application. To open the client utility, follow the steps below.

	Mac OS X	Mac OS 9
<b>Step 1</b>	Double-click the MacOS X icon on the desktop.	Double-click the MacOS 9 icon on the desktop.
<b>Step 2</b>	Expand the Applications folder.	Expand the Cisco pcm340PPC folder.
<b>Step 3</b>	Double-click the Aironet Client Utility icon.	Double-click the pcm340PPC icon.

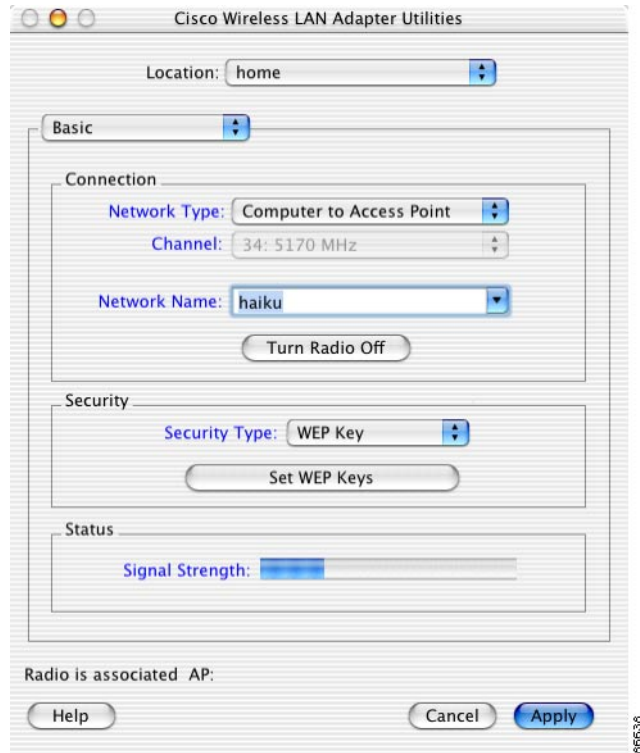
The client utility screen appears, and the computer searches for the client adapter radio. When the radio is found, the basic properties screen appears.

## Configuring WEP Key Security

Use the client utility to select WEP key security, configure WEP keys, and set the authentication type. To use static WEP key security, all client adapters and the access points that communicate with one another must be configured with the same WEP keys in the same key numbers (1-4). This procedure explains how to configure WEP keys for the client adapters.

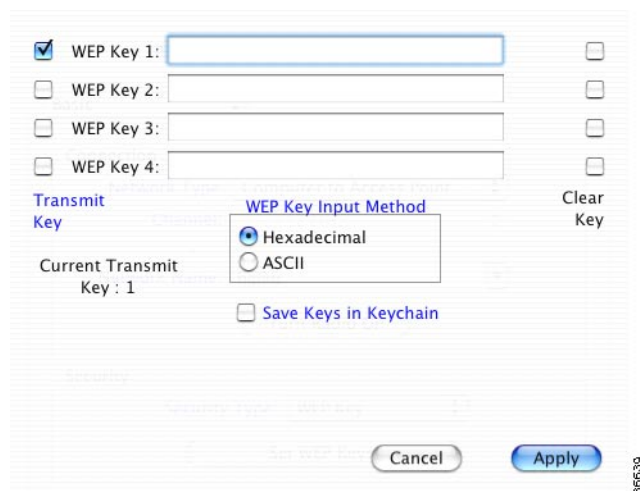
- Step 1** If the client utility is not active on your desktop, open it. The basic properties screen appears (see Figure 5-1).

**Figure 5-1 Client Utility Basic Properties Screen for WEP Key Security**



- Step 2** Select **WEP Key** from the Security Type pop-up menu. The security button changes to Set WEP Keys.
- Step 3** Click **Set WEP Keys**. The WEP Keys Screen appears.

**Figure 5-2 WEP Keys Screen**



**Step 4** Under WEP Key Input Method, select whether the WEP keys are entered in hexadecimal characters (0-9, A-F, and a-f) or ASCII text.

**Step 5** Enter WEP keys in the blank fields for the keys you are adding. Follow the guidelines below when choosing a WEP key:

- Your client adapter's WEP key must match the WEP key used by the access point or clients with which you are planning to communicate.
- When setting more than one WEP key, the WEP keys must be assigned to the same WEP key numbers (1 to 4) for all devices.
- WEP keys can be comprised of ASCII text or hexadecimal characters, depending on the option you selected in Step 3.
- WEP keys must contain the following number of characters
  - For 128-bit ASCII WEP keys, use 13 ASCII characters
  - For 128-bit hexadecimal WEP keys, use 26 hexadecimal characters
  - For 40-bit ASCII WEP keys, use 5 ASCII characters
  - For 40-bit hexadecimal WEP keys, use 10 hexadecimal characters

**Note**

You must enter the number of characters shown above because the client utility does not fill the WEP key with zeros or nulls. The client utility also uses the number of characters entered to determine 40-bit or 128-bit WEP keys.

**Step 6** Optionally, save the WEP keys in non-volatile memory:

- Mac OS X—Check **Save Keys in Keychain**.
- Mac OS 9—Check **Save WEP Keys in Radio**.

**Step 7** Click **Transmit Key** next to the key you want to use to transmit packets.

**Note**

Only one WEP key can be selected as the transmit key.

**Step 8** Click **Apply** when you have finished entering WEP keys.

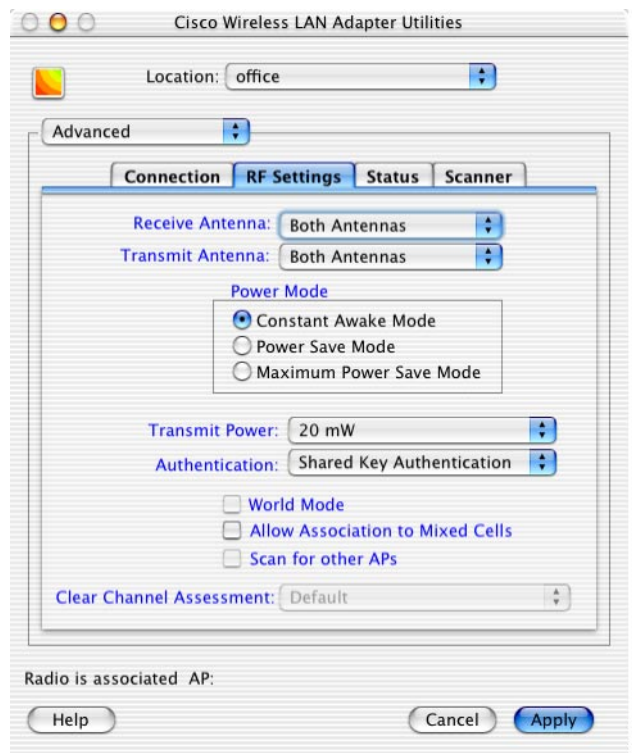
**Step 9** Click **Apply** on the basic screen.

## Setting the Authentication Type

The client adapter can associate with access points using either open or shared key authentication. Open authentication, when used with WEP key or LEAP security, provides the highest level of security. Change this setting to Shared Key Authentication only if your access point requires shared keys to associate.

- Step 1** If the client utility is not active on your desktop, open it. The basic properties screen appears (see [Figure 5-1](#)).
- Step 2** Select **Advanced** from the drop-down menu.
- Step 3** On the Advanced Properties screen, click the **RF Settings** tab (see [Figure 5-3](#)).

**Figure 5-3** Client Utility Advanced RF Settings Screen



**Step 4** Select an authentication type from the Authentication menu.

**Table 5-1 Authentication Types**

Authentication Type	Description
Open Authentication	Allows your client adapter to associate with an access point regardless of the WEP settings. Successful association does not automatically grant network access. The client adapter must subsequently satisfy the requirements of WEP key or LEAP security, when enabled.
Shared Key Authentication	<p>Allows your client adapter to communicate only with access points that have the same WEP keys.</p> <p>The access point sends a known unencrypted “challenge packet” to the client adapter, which encrypts the packet and sends it back to the access point. The access point attempts to decrypt the encrypted packet and sends an authentication response packet indicating the success or failure of the decryption.</p> <p>Because the challenge packet is not encrypted, this authentication type is less secure than Open Authentication used with WEP key security. Use this setting only if your access point requires shared keys to associate with clients.</p>

**Note** If LEAP is enabled on your client adapter, Open is the only available option.

**Note** The Shared Authentication option is available only if the client adapter is assigned a WEP key and WEP is enabled. Refer to the [“Configuring WEP Key Security” section on page 5-5](#) for instructions on setting a WEP key and enabling WEP.

**Step 5** Click **Apply**.

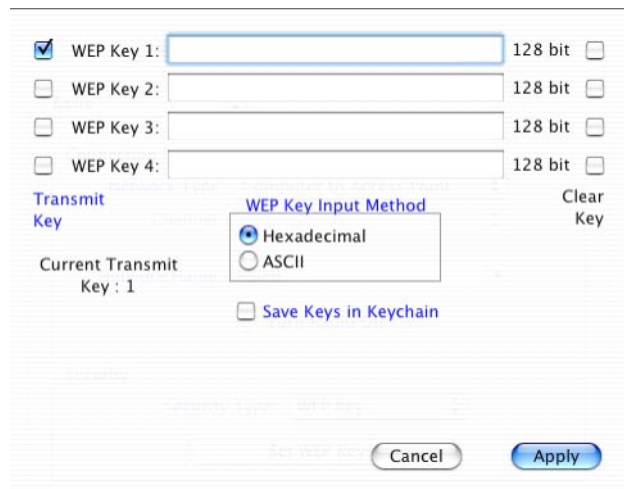
## Changing WEP Keys

If you want your client adapter to use an existing WEP key, or want to change a key value, follow the steps below.

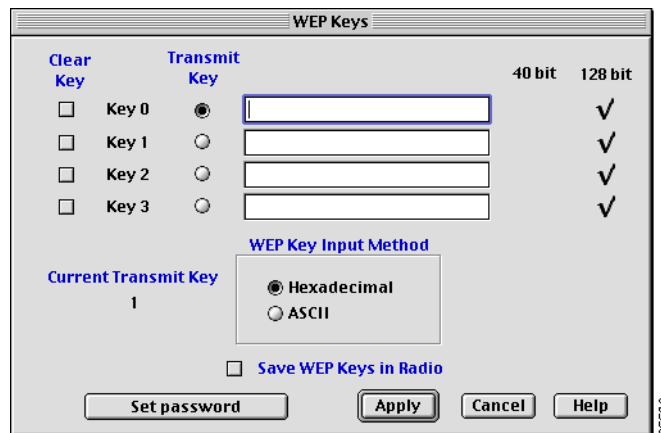
- Step 1** If the client utility is not active on your desktop perform, open it. The basic properties screen appears (see [Figure 5-1](#)).
- Step 2** On the Client Utility Basic Properties screen, click **Set WEP Keys** (see [Figure 5-1](#)), or type the Apple Command-K keyboard equivalent.

The WEP key screen appears (see [Figure 5-4](#) and [Figure 5-5](#)).

**Figure 5-4 WEP Keys Screen (Mac OS X)**



**Figure 5-5 WEP Keys Screen (Mac OS 9)**



The WEP Keys screen displays the following information about existing keys:

**Table 5-2 Existing WEP Key Parameters**

Parameter	Description
Transmit Key	The transmit key preference, indicated by the activated check box or radio button.
Current Transmit Key	The transmit key in use by the radio.
40 bit or 128 bit	The size of existing transmit keys, displayed as a text field or check mark. Empty keys do not display a size or check mark.
WEP key text field	Mac OS X displays WEP keys that are stored in the keychain, but unless you have applied them, they may not be the values in the radio. To protect WEP key security, Mac OS 9 does not display the existing WEP keys.

**Step 3** To use a different WEP key, click the **Transmit Key** check box (or radio button) next to the key you want to use to transmit packets.

**Step 4** To change a WEP key value, select the input method and enter the new value.



**Note** You can delete a WEP key by selecting the **Clear Key** check box to the right of the key.

**Step 5** Optionally, save the changed WEP keys in nonvolatile memory:

- Mac OS X—Check **Save Keys in Keychain**.
- Mac OS 9—Check **Save WEP Keys in Radio**.

**Step 6** Click **Apply**.

## Password Protecting WEP Keys (Mac OS 9 only)

If you password protect the WEP Keys, the client utility prompts for the password before displaying WEP Key screen. This procedure assumes that WEP Key authentication is already configured.

**Step 1** If the client utility is not active on your desktop, open it. The basic properties screen appears (see [Figure 5-1](#)).

**Step 2** Click **Set WEP Keys**.

**Step 3** Click the **Set Password** button. The Set Password screen appears (see [Figure 5-6](#)).

**Figure 5-6** Set Password Screen (Mac OS 9)



**Step 4** Enter a password in the Password field.



**Note** Passwords are case sensitive and must contain at least eight characters.

**Step 5** Re-enter the password in the Verify Password field.

**Step 6** Click **OK** to set the password protection.

**Note**

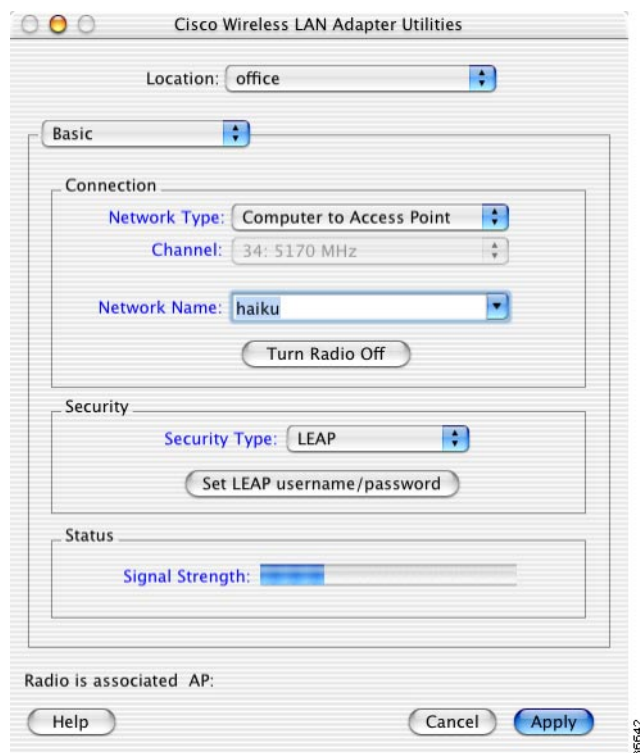
The next time you attempt to enter the WEP Keys screen you will be prompted to enter the correct password. After you enter the screen, the password can be changed using the Change Password button. If you leave the fields blank in the Change Password screen, the password is cleared.

## Configuring LEAP Security

Use the client utility to select LEAP security and to set the LEAP username and password.

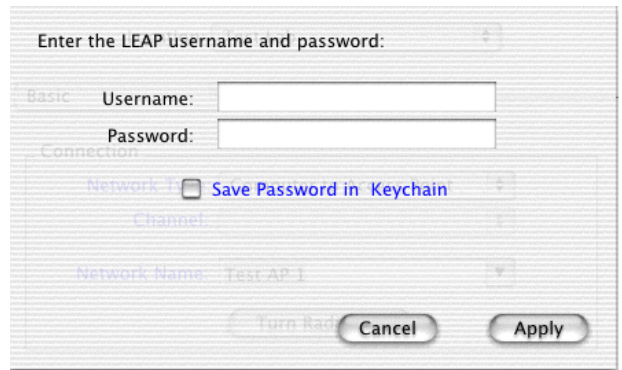
- Step 1** If the client utility is not active on your desktop, open it. The basic properties screen appears (see [Figure 5-7](#)).
- Step 2** Select **LEAP** from the Security Type pop-up menu. The security button changes to Set LEAP Username/Password.

**Figure 5-7** Client Utility Basic Properties Screen for LEAP Key Security



- Step 3** Click **Set LEAP Username/Password**. The LEAP username and password screen appears (see [Figure 5-8](#)).



**Figure 5-8 LEAP Username and Password Screen**

**Step 4** Type your LEAP username and password in the corresponding fields.



**Note** If you work in an environment with multiple domains and want your login domain to be passed to the RADIUS server along with your username, you must append the domain name to your username; for example: domain\username.

**Step 5** For Mac OS X systems, click **Save Password in Keychain**, if you want to save your LEAP password in your Macintosh keychain. When saved, your LEAP password is stored (in an encrypted format) and will be automatically entered into the password field.

**Step 6** Click **Apply** when you have finished entering your username and password.

After LEAP is enabled, your client adapter authenticates to the RADIUS server using your LEAP username and password and receives a session-based WEP key.

## Verifying Security Configurations

If the security configuration is correct, the software detects the client adapter radio, the client adapter associates to an access point, and the Aironet desktop control changes to an image that indicates successful association. For more information, refer to the [“Desktop Controls” section on page 4-2](#). Alternatively, you can use the client utility to verify successful association.

To verify that you have correctly configured security, perform the following steps:

**Step 1** If the client utility is not already active on your desktop, open it. The basic properties screen appears.

**Step 2** Check the status at the bottom of the client utility basic properties screen.

A successful authentication displays *radio is associated* followed by the access point’s IP address.



**Note** If your configuration was unsuccessful or you experienced problems during or after driver installation, refer to [Chapter 9, “Troubleshooting.”](#)





## Advanced Configuration

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This chapter describes the client utility used with a Cisco Aironet Wireless LAN Adapter.

The following topics are covered in this chapter:

- [Overview, page 6-2](#)
- [Opening the Client Utility, page 6-2](#)
- [Basic Properties, page 6-3](#)
- [Location Profiles, page 6-7](#)
- [Advanced Properties, page 6-10](#)
- [Turning Your Client Adapter Radio On or Off, page 6-20](#)

# Overview

This section explains how to use the client utility to load new firmware and to configure your client adapter for use in a wireless network. This section also explains how you can use the client utility to set parameters that govern how the adapter transmits or receives data, and controls the adapter's operation within an infrastructure or ad hoc network.

## Opening the Client Utility

The easiest way to open the ACU is to click the Aironet icon on the menu bar (Mac OS X), or Aironet control module (Mac OS 9), and select **Open Aironet Client Utility**. Refer to the [“Desktop Controls” section on page 4-2](#).

As an alternative, you can open the ACU as an application. To open the client utility, follow the steps below.

	Mac OS X	Mac OS 9
Step 1	Double-click the MacOS X icon on the desktop.	Double-click the MacOS 9 icon on the desktop.
Step 2	Expand the Applications folder.	Expand the Cisco pcm340PPC folder.
Step 3	Double-click the Aironet Client Utility icon.	Double-click the pcm340PPC icon.

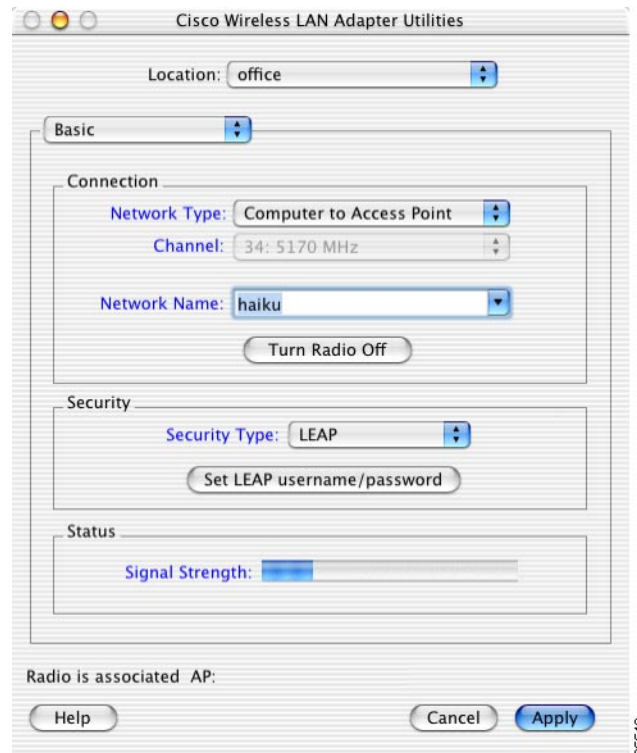
The client utility screen appears, and the computer searches for the client adapter radio. When the radio is found, the basic properties screen appears.

# Basic Properties

The basic properties screen displays when you open the client utility. The screen provides useful information about your client adapter and enables you to quickly set key configuration parameters needed to successfully communicate with an access point or another wireless device.

The basic properties screen for Mac OS X is shown in [Figure 6-1](#). Except for the Location field, it is the same as the Mac OS 9 basic properties screen.

**Figure 6-1 Client Utility Basic Properties Screen**



## Note

You can click the blue words on any client utility screen to obtain descriptive information, such as Security Type and Signal Strength.

The basic properties screen provides the following information:

- **Location**—Selects or defines wireless network profiles for specific operating locations. (Mac OS X only)
- **Connection**—Specifies the network type, the network name, and the frequency channel for computer to computer (Ad-Hoc) networks. You can also turn the radio on or off.
- **Security**—Specifies the WEP and LEAP security settings. You can enable WEP and set up to four WEP keys, enable LEAP and set your LEAP username and password, or disable security.
- **Status**—Shows a bar graph to represent the signal strength of the received RF signal.

- Association Status—Shows the association status of your client adapter.
  - Radio associated—Your client adapter is associated to an access point or other wireless device. For an access point, the name and IP address are shown.
  - Radio not associated—Your client adapter is ready and enabled but not associated to an access point or wireless device.

Table 6-1 lists and describes the parameters that can be set from the basic properties screen. Follow the instructions in the table to initially set or change any parameter. Click **Apply** at the bottom of the basic properties screen to save any changes you make and send the current settings to the radio.

**Table 6-1 Basic Properties Parameters**

Parameter	Description						
Location (Mac OS X only)	<p>Specifies unique radio network profile settings for different locations, such as your office, your home, the factory, or the airport. For each profile, you can specify unique connection and security settings. Click the up and down arrows to select a different profile. For additional information see the <a href="#">“Location Profiles” section on page 6-7</a>.</p> <p><b>Default:</b> Default</p>						
Network Type	<p>Specifies the type of network in which your client adapter is installed.</p> <p><b>Default:</b> Computer to Access Point</p> <table> <tr> <th>Network Type</th><th>Description</th></tr> <tr> <td>Computer to Access Point</td><td>Also referred to as <i>infrastructure</i>. Used to set up a connection to a wired Ethernet network (through an access point).</td></tr> <tr> <td>Computer to Computer</td><td>Also referred to as <i>ad hoc</i> or <i>peer to peer</i>. Used to set up a small network between two or more wireless devices. For example, an ad hoc network could be set up between computers in a conference room so users can share information in a meeting.</td></tr> </table>	Network Type	Description	Computer to Access Point	Also referred to as <i>infrastructure</i> . Used to set up a connection to a wired Ethernet network (through an access point).	Computer to Computer	Also referred to as <i>ad hoc</i> or <i>peer to peer</i> . Used to set up a small network between two or more wireless devices. For example, an ad hoc network could be set up between computers in a conference room so users can share information in a meeting.
Network Type	Description						
Computer to Access Point	Also referred to as <i>infrastructure</i> . Used to set up a connection to a wired Ethernet network (through an access point).						
Computer to Computer	Also referred to as <i>ad hoc</i> or <i>peer to peer</i> . Used to set up a small network between two or more wireless devices. For example, an ad hoc network could be set up between computers in a conference room so users can share information in a meeting.						

Table 6-1 Basic Properties Parameters (continued)

Parameter	Description
Channel	<p>Specifies which frequency your client adapter uses as the channel for communications. These channels conform to the IEEE 802.11 Standard for your regulatory domain.</p> <ul style="list-style-type: none"> <li>In infrastructure mode, this parameter is set automatically and cannot be changed. The client adapter listens to the entire spectrum, selects the best access point to associate to, and uses the same frequency as that access point.</li> <li>In ad hoc mode, the channel of the client adapter must be set to match the channel used by the other clients with which you wish to communicate.</li> </ul> <p><b>Range:</b> Dependent on client adapter radio and regulatory domain  <b>Example for 2.4-GHz client adapters:</b>  1 to 11 (2412 to 2462 MHz) in North America  <b>Example for 5-GHz client adapters:</b>  36, 40, 44, 48, 52, 56, 60, and 64 (5180, 5200, 5220, 5240, 5260, 5280, 5300, and 5320 MHz) in North America</p> <p><b>Default:</b> Dependent on client adapter radio and regulatory domain  <b>Example for 2.4-GHz client adapters:</b>  6 (2437 MHz) in North America  <b>Example for 5-GHz client adapters:</b>  36 (5180 MHz) in North America</p> <p><b>Note</b> Refer to <a href="#">Appendix D, “Channels, Power Levels, and Antenna Gains,”</a> for a list of channel identifiers, channel center frequencies, and regulatory domains for each channel.</p>
Network Name	<p>Network name is the same as service set identifier (SSID) and it identifies the wireless network that you want to access.</p> <p><b>Range:</b> Up to 32 characters (case sensitive)</p> <p><b>Note</b> If you leave this parameter blank, your client adapter can associate to any access point or wireless device on the network that is configured to allow broadcast SSIDs. If the access points or wireless devices with which you wish to communicate are not configured to allow broadcast SSIDs, the value of this parameter must exactly match their SSID or network name. Otherwise, you will not be able to associate with the access point or wireless device.</p>

**Table 6-1 Basic Properties Parameters (continued)**

Parameter	Description								
Security	Specifies the type of security for your client adapter, which must match the security type of your wireless network. Refer to <a href="#">Chapter 5, “Security Features,”</a> for more information about configuring WEP and LEAP security. <b>Default:</b> None								
	<table> <tr> <th>Security Type</th><th>Description</th></tr> <tr> <td>None</td><td>Disable security.</td></tr> <tr> <td>WEP</td><td>Enables Wired Equivalent Privacy (WEP) for your client adapter. You must also set WEP keys.</td></tr> <tr> <td>LEAP</td><td>Enables LEAP (also referred to as <i>EAP - Cisco Wireless</i>) for your client adapter. You must also set a LEAP username and password.</td></tr> </table>	Security Type	Description	None	Disable security.	WEP	Enables Wired Equivalent Privacy (WEP) for your client adapter. You must also set WEP keys.	LEAP	Enables LEAP (also referred to as <i>EAP - Cisco Wireless</i> ) for your client adapter. You must also set a LEAP username and password.
Security Type	Description								
None	Disable security.								
WEP	Enables Wired Equivalent Privacy (WEP) for your client adapter. You must also set WEP keys.								
LEAP	Enables LEAP (also referred to as <i>EAP - Cisco Wireless</i> ) for your client adapter. You must also set a LEAP username and password.								

[Table 6-2](#) describes the buttons on the basic properties screen.

**Table 6-2 Buttons on the Basic Properties Screen**

Button	Description
Turn Radio On Turn Radio Off	Turns the client adapter radio on or off. The button changes to indicate the operation to be performed; for example: <i>Turn Radio On</i> indicates the radio is turned on when you click the button and <i>Turn Radio Off</i> indicates the radio is turned off when you click the button.
Set WEP Key	Opens the WEP keys dialog box, where you can configure up to 4 WEP keys. This button is visible only if you select WEP security. For additional information, see <a href="#">Chapter 5, “Security Features.”</a>
Set LEAP Username/Password	Opens the LEAP username and password prompt. This button is visible only if you select LEAP security. For additional information see <a href="#">Chapter 5, “Security Features.”</a>
Cancel	Exits the application or screen without saving revised settings.
Apply	Saves the revised settings and sends the parameters to the radio.
Help	Opens the client utility help screen. For additional information, see the <a href="#">“Client Utility” section on page 4-7.</a>



# Location Profiles

Using location profiles, you can specify unique client adapter settings for different physical locations, such as your office, home, or the airport. For example, you can specify unique connection and security settings for each location profile. These unique settings are stored in your Macintosh and recalled when you select a new location.

The following list identifies the key configurations for a location:

- Specify unique connection parameters on the basic properties screen (see [Figure 6-1](#)) or the advanced properties screen (see [Figure 6-6](#)).
  - Set the network type
  - Set the network name or SSID
- Specify security parameters on the basic properties screen (see [Figure 6-1](#)) or the advanced properties screen (see [Figure 6-6](#)). Refer to [Chapter 5, “Security Features”](#) for information on LEAP and WEP and instructions on setting these security features.
  - If WEP is selected, set up to four WEP keys
  - If LEAP is selected, set your LEAP username and password

The way you initialize locations depends on the operating system you use:

- Mac OS X—Use the Location Profile feature of the ACU
- Mac OS 9—Use the Macintosh Location Manager in conjunction with the ACU

When using the Mac OS X operating system, you open the ACU and select a location from the location drop-down list. All subsequent configuration changes apply to the selected location. For the Mac OS 9 operating system, you open the Macintosh Location Manager and select a location.

## Selecting a Mac OS X Location Profile

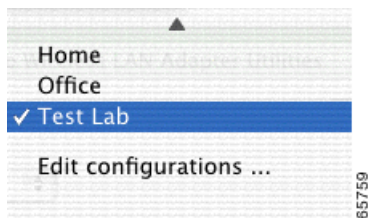
Using the client utility, you can specify different wireless network profile settings for different operating locations, such as your office, your home, the factory, or the airport. You can change location profiles two places:

- Aironet icon on the menu bar
- Client utility basic or advanced screens

The Aironet icon provides the easiest way to change locations. Simply click the Aironet icon and select the desired location. For more information, see [Using the Aironet Menu Bar Icon \(Mac OS X\)](#), page 4-2.

To select a location profile from the client utility basic or advanced screens, follow the steps below:

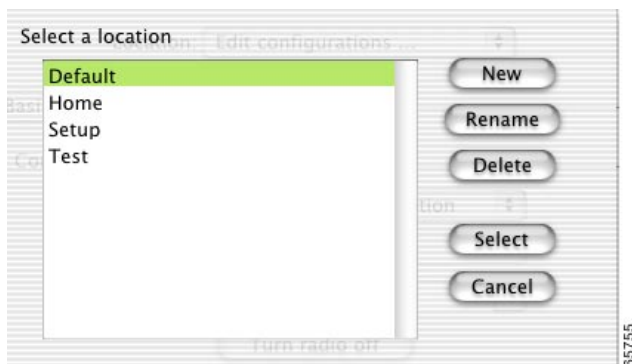
- 
- Step 1** Click the up and down arrows at the end of the Location field and select the desired location from the drop-down menu (see [Figure 6-2](#)).

**Figure 6-2 Location Drop-Down Menu**

**Step 2** Click **Apply** on the basic or advanced properties screen to activate the selected location profile.

## Editing a Mac OS X Location Profile

To add a new location profile name or to rename, delete, or select an existing location profile, click **Edit Configurations** from the location drop-down menu (see [Figure 6-2](#)). The Edit Configurations screen appears (see [Figure 6-3](#)).

**Figure 6-3 Edit Configurations Screen**

Use the buttons on the Edit Configurations screen to perform the following operations:

- To add a new location profile name, click **New** and enter a new name in the drop-down screen. Click **OK** to add the new name or click **Cancel** to return to the basic or advanced screen without setting a new name. When you create a new location profile name, you should enter the specific connection and security settings for that location on the basic or advanced screens.
- To rename an existing location profile, click **Rename** and enter the revised name in the drop-down screen. Click **OK** to revise the name or click **Cancel** to return to the basic or advanced screen without changing the name.
- To delete an existing location profile, select the profile to delete from the Edit Configuration screen and click **Delete**. The basic or advanced screen appears.
- To select an existing location profile as the client utility default location, select the profile from the Edit Configuration screen and click **Select**. The basic or advanced screen appears.
- To exit the Edit Configuration screen without making changes, click **Cancel**. The basic or advanced screen appears.

Table 6-3 lists and describes the buttons on the Edit Configurations screen.

**Table 6-3 Buttons on the Edit Configurations Screen**

Button	Description
New	Allows you to specify a name for a new location profile.
Rename	Allows you to rename an existing location profile name.
Delete	Allows you to delete an existing location profile name.
Select	Allows you to select the location profile name to be used as the client utility default.
Cancel	Exits the application or dialog box without saving revised settings.

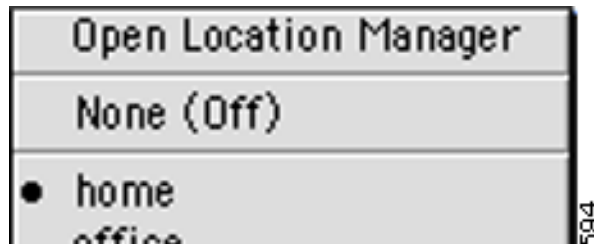
## Selecting a Mac OS 9 Location

You change locations on Mac OS 9 using the Macintosh Location Manager feature, which is also available on the control strip.

To change an Mac OS 9 Location, follow the steps below:

- 
- Step 1** Click the Location Manager icon on the control strip.

**Figure 6-4 Location Manager (Mac OS 9)**



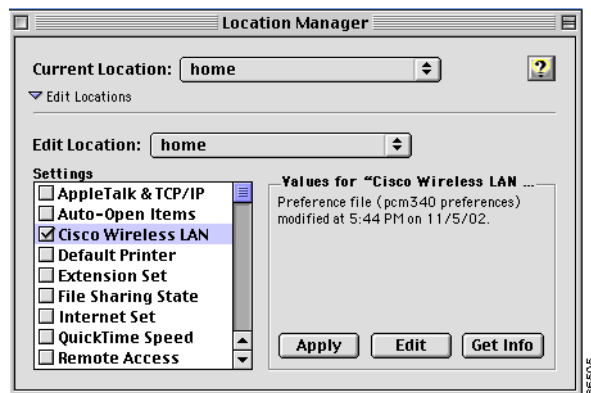
- Step 2** Select a location.
- 

## Editing a Mac OS 9 Location

To select, add, remove, or rename an Mac OS 9 location, refer to Macintosh help. This section summarizes the procedure for initializing a Macintosh location; refer to the Mac help for details.

To initialize a Mac OS 9 Location, follow the steps below:

- 
- Step 1** Open the Mac Location Manager application (see [Figure 6-5](#)). The control strip includes an icon for launching the Mac Location Manager.

**Figure 6-5 Location Manager Screen (Mac OS 9)**

- Step 2** Select the desired Edit Location.
- Step 3** Check the Cisco Wireless LAN checkbox.
- Step 4** Click **Edit** to change the Aironet client adapter properties, as necessary.
- Step 5** Click **Apply**. The system updates the stored configuration information.

## Advanced Properties

The advanced properties screen provides the following tabs (see [Figure 6-6](#)):

- **Connection**—specifies the network type and the network name for your wireless network. You can also turn the radio on or off.
- **RF Settings**—specifies RF (radio) parameters.
- **Status**—displays client adapter status information.
- **Scanner**—displays information about detected access points.

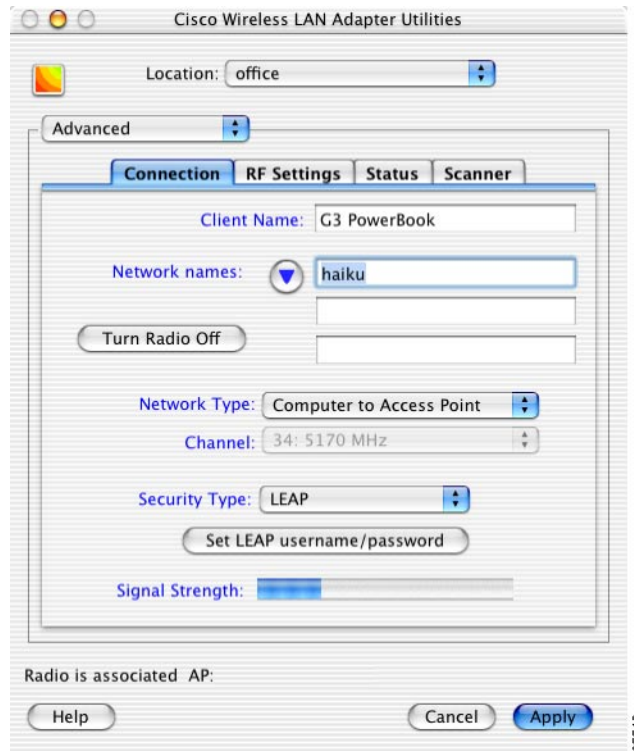
To access the desired advanced properties screen, perform the following steps:

- Step 1** Click the up and down arrows to the right of the basic properties field (see [Figure 6-1](#)).
- Step 2** Select **Advanced** on the drop-down menu. The advanced properties screen appears.
- Step 3** Select the **Connection**, **RF Settings**, **Status**, or **Scanner** tab. The corresponding screen appears.

## Setting Connection Parameters

To access the advanced connection properties screen, click the **Connection** tab (see [Figure 6-6](#)).

**Figure 6-6** Client Utility Advanced Connection Properties Screen



The advanced connection properties screen is similar to the basic properties screen but allows you to specify a client name for your client adapter and up to three network names or SSIDs, and the network type.

[Table 6-4](#) lists and describes the client adapter's system parameters on the advanced connection parameters screen. Follow the instructions in the table to initially set or change any parameter. Click **Apply** at the bottom of the advanced connection properties screen to save any changes you have made and send the current settings to the radio, or click **Cancel** to exit the client utility.

**Table 6-4 Advanced Connection Properties Screen Parameters**

Parameter	Description						
Location (Mac OS X only)	Specifies different wireless network profile settings used in various locations, such as your office, home, factory, or airport. For each profile, you can specify unique connection parameters required for that operating location. For additional information see the <a href="#">“Location Profiles” section on page 6-7</a> . <b>Default:</b> Default						
Client Name	A logical name for your client adapter. It enables an administrator to quickly determine which devices are connected to the access point. This name is included in the access point’s list of connected devices. <b>Range:</b> Up to 16 characters <b>Note</b> Each computer on the network should have a unique client name.						
Network Name	Network name is the same as service set identifier (SSID) and it identifies the wireless network that you want to access. Up to three names can be specified for different wireless networks. For Mac OS X, press the right arrow to display all three names (see <a href="#">Figure 6-6</a> ). <b>Range:</b> Up to 32 characters (case sensitive) for each name <b>Note</b> If you leave this parameter blank, your client adapter can associate to any access point or wireless device on the network that is configured to allow broadcast SSIDs. If the access points or wireless devices with which you wish to communicate are not configured to allow broadcast SSIDs, the value of this parameter must exactly match their SSID or network name. Otherwise, you cannot access the access point or wireless device.						
Network Type	Specifies the type of network in which your client adapter is installed. <b>Default:</b> Computer to access point						
<table> <tr> <th>Network Type</th><th>Description</th></tr> <tr> <td>Computer to Computer</td><td>Also referred to as <i>ad hoc</i> or <i>peer to peer</i>. Used to set up a small network between two or more wireless devices. For example, an ad hoc network could be set up between computers in a conference room so users can share information in a meeting.</td></tr> <tr> <td>Computer to Access Point</td><td>Also referred to as <i>infrastructure</i>. Used to set up a connection to a wired Ethernet network (through an access point).</td></tr> </table>		Network Type	Description	Computer to Computer	Also referred to as <i>ad hoc</i> or <i>peer to peer</i> . Used to set up a small network between two or more wireless devices. For example, an ad hoc network could be set up between computers in a conference room so users can share information in a meeting.	Computer to Access Point	Also referred to as <i>infrastructure</i> . Used to set up a connection to a wired Ethernet network (through an access point).
Network Type	Description						
Computer to Computer	Also referred to as <i>ad hoc</i> or <i>peer to peer</i> . Used to set up a small network between two or more wireless devices. For example, an ad hoc network could be set up between computers in a conference room so users can share information in a meeting.						
Computer to Access Point	Also referred to as <i>infrastructure</i> . Used to set up a connection to a wired Ethernet network (through an access point).						

**Table 6-4 Advanced Connection Properties Screen Parameters (continued)**

Parameter	Description								
Channel	<p>Specifies which frequency your client adapter uses as the channel for communications. These channels conform to the IEEE 802.11 Standard for your regulatory domain.</p> <ul style="list-style-type: none"> <li>In infrastructure mode, this parameter is set automatically and cannot be changed. The client adapter listens to the entire spectrum, selects the best access point to associate to, and uses the same frequency as that access point.</li> <li>In ad hoc mode, the channel of the client adapter must be set to match the channel used by the other clients with which you wish to communicate.</li> </ul> <p><b>Range:</b> Dependent on client adapter radio and regulatory domain  <b>Example for 2.4-GHz client adapters:</b>  1 to 11 (2412 to 2462 MHz) in North America  <b>Example for 5-GHz client adapters:</b>  36, 40, 44, 48, 52, 56, 60, and 64 (5180, 5200, 5220, 5240, 5260, 5280, 5300, and 5320 MHz) in North America</p> <p><b>Default:</b> Dependent on client adapter radio and regulatory domain  <b>Example for 2.4-GHz client adapters:</b>  6 (2437 MHz) in North America  <b>Example for 5-GHz client adapters:</b>  36 (5180 MHz) in North America</p> <p><b>Note</b> Refer to <a href="#">Appendix D, “Channels, Power Levels, and Antenna Gains,”</a> for a list of channel identifiers, channel center frequencies, and regulatory domains for each channel.</p>								
Security	<p>Specifies the type of security for your client adapter, which must match the security type of your wireless network. Refer to <a href="#">Chapter 5, “Security Features,”</a> for more information about configuring WEP and LEAP security.</p> <p><b>Default:</b> None</p> <table> <tr> <th>Security Type</th><th>Description</th></tr> <tr> <td>None</td><td>Disable security.</td></tr> <tr> <td>WEP</td><td>Enables Wired Equivalent Privacy (WEP) for your client adapter. You must also set WEP keys.</td></tr> <tr> <td>LEAP</td><td>Enables LEAP (also referred to as <i>EAP - Cisco Wireless</i>) for your client adapter. You must also set a LEAP username and password.</td></tr> </table>	Security Type	Description	None	Disable security.	WEP	Enables Wired Equivalent Privacy (WEP) for your client adapter. You must also set WEP keys.	LEAP	Enables LEAP (also referred to as <i>EAP - Cisco Wireless</i> ) for your client adapter. You must also set a LEAP username and password.
Security Type	Description								
None	Disable security.								
WEP	Enables Wired Equivalent Privacy (WEP) for your client adapter. You must also set WEP keys.								
LEAP	Enables LEAP (also referred to as <i>EAP - Cisco Wireless</i> ) for your client adapter. You must also set a LEAP username and password.								

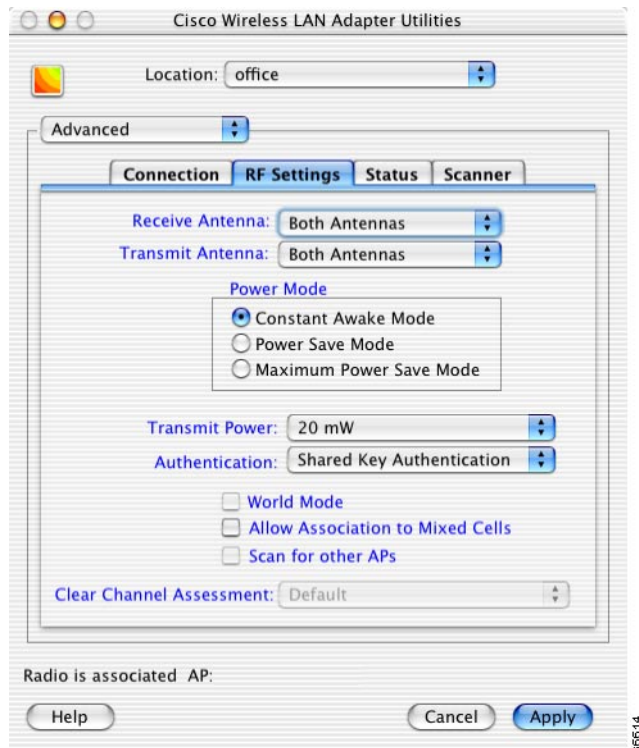
[Table 6-5](#) describes the buttons on the advanced connection properties screen.

**Table 6-5 Buttons on the Advanced Connection Properties Screen**

Button	Description
Turn Radio On Turn Radio Off	Turns the client adapter radio on or off. The button changes to indicate the operation to be performed; for example: <i>Turn Radio On</i> indicates the radio is turned on when you click the button and <i>Turn Radio Off</i> indicates the radio is turned off when you click the button.
Set WEP Key	Opens the WEP keys dialog box, where you can configure up to four WEP keys. This button is visible only if you select WEP security. For additional information, see <a href="#">Chapter 5, “Security Features.”</a>
Set LEAP Username/Password	Opens the LEAP username and password prompt. This button is visible only if you select LEAP security. For additional information see <a href="#">Chapter 5, “Security Features.”</a>
Cancel	Exits the application or screen without saving revised settings.
Apply	Saves the revised settings and sends the current settings to the radio.
Help	Opens the client utility help screen (for additional information see the <a href="#">“Client Utility”</a> section on page 4-7.

## Setting RF Parameters

The advanced RF settings screen (see [Figure 6-7](#)) enables you to set parameters that control how your client adapter transmits and receives data. To access this screen, click the **RF Settings** tab on the advanced properties screen.

**Figure 6-7 Client Utility Advanced RF Settings Screen**



Use the advanced RF settings screen to specify advanced radio parameters. This screen includes the following information:

- Location (Mac OS X only)—defines wireless network profiles for various operating locations. In each profile you can specify a network type, network name, plus WEP and LEAP security settings for that operating location. For additional information, see the [“Location Profiles” section on page 6-7](#).
- Radio Status—Shows the operational mode of your client adapter. If your client adapter is associated to an access point or wireless device, the name and IP address are displayed.
  - Radio associated—Your client adapter is associated to an access point or other wireless device. The access point or wireless device name and IP address are shown.
  - Radio not associated—Your client adapter is ready and enabled but not associated to an access point or wireless device.

[Table 6-6](#) lists and describes the parameters on the Client Utility Advanced RF Network Settings screen. Follow the instructions in the table to initially set or change any parameters. Click **Apply** at the bottom of the screen to save any changes you make and to send the current settings to the radio.

**Table 6-6 Client Utility Advanced RF Settings Screen Parameters**

Parameter	Description
Location (Mac OS X only)	<p>Supports different wireless network profiles for different operating locations. For each profile you can specify unique RF network parameters required for that operating location. For additional information see the <a href="#">“Location Profiles” section on page 6-7</a>.</p> <p><b>Default:</b> Default</p>
Receive Antenna	<p>Specifies the antenna that your client adapter uses to receive data.</p> <ul style="list-style-type: none"> <li>• PC and Cardbus card—The integrated, permanently attached antenna operates best when used in both antennas (also referred to as <i>diversity mode</i>). Diversity mode allows the card to use the better signal from its two antenna ports.               <p><b>Range:</b> Left Antenna, Right Antenna, Both Antennas</p> <p><b>Default:</b> Both Antennas</p> </li> <li>• LM card—The LM card is shipped without an antenna; however, an antenna can be connected through the card’s external connector. If a snap-on antenna is used, diversity mode is recommended. Otherwise, select the mode that corresponds to the antenna port to which the antenna is connected.               <p><b>Range:</b> Left Antenna, Right Antenna, Both Antennas</p> <p><b>Default:</b> Both Antennas</p> </li> <li>• PCI client adapter—The PCI client adapter must use the right antenna.               <p><b>Default:</b> Right Antenna</p> </li> </ul>
Transmit Antenna	<p>Specifies the antenna that your client adapter uses to transmit data. See the Receive Antenna parameter above for information on the options available for your client adapter.</p>

**Table 6-6 Client Utility Advanced RF Settings Screen Parameters (continued)**

Parameter	Description
Power Save Mode	<p>Sets your client adapter to its optimum power consumption setting.</p> <p><b>Range:</b> Constant Awake Mode, Power Save Mode, and Maximum Power Save Mode</p> <p><b>Default:</b> Constant Awake Mode (CAM)</p>
Power Save Mode	Description
Constant Awake Mode (CAM)	<p>Keeps the client adapter powered up continuously so there is little lag in message response time.</p> <p>Consumes the most power but offers the highest throughput. Recommended for desktop computers and devices that use AC power.</p>
Power Save Mode (PSP)	<p>Switches between a PSP mode and CAM mode, depending on network traffic. This mode switches to CAM when retrieving a large number of packets and switches back to PSP after the packets have been retrieved.</p> <p>Recommended when power consumption is a concern but you need greater throughput than that allowed by Max PSP.</p>
Maximum Power Save Mode (Max PSP)	<p>Causes the access point to buffer incoming messages for the client adapter, which wakes up periodically and polls the access point to see if any buffered messages are waiting for it. The adapter can request each message and then go back to sleep.</p> <p>Conserves the most power but offers the lowest throughput. Recommended for devices for which power consumption is the ultimate concern (such as small battery-powered devices).</p>

**Table 6-6 Client Utility Advanced RF Settings Screen Parameters (continued)**

Parameter	Description										
Transmit Power	<p>Defines the level at which your client adapter transmits power. This value must not be higher than that allowed by your country's regulatory agency (FCC in the U.S., DOC in Canada, ETSI in Europe, MKK in Japan, etc.).</p> <p><b>Options:</b> Dependent on the power table programmed into the client adapter; see the table below</p> <p><b>Default:</b> The minimum level allowed by your country's regulatory agency</p> <table> <tr> <th>Client Adapter Type</th><th>Possible Power Levels</th></tr> <tr> <td>340 series PC cards</td><td>30 mW or 1 mW</td></tr> <tr> <td>340 series LM cards and PCI cards</td><td>30 mW, 15 mW, 5 mW, or 1 mW</td></tr> <tr> <td>350 series client adapters</td><td>100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW</td></tr> <tr> <td>PC-Cardbus card</td><td>20 mW, 10 mW, or 5 mW</td></tr> </table> <p><b>Note</b> Reducing the transmit power level conserves battery power but decreases radio range.</p> <p><b>Note</b> When World Mode is enabled, the client adapter is limited to the maximum transmit power level allowed by the country of operation's regulatory agency (refer to <a href="#">Appendix D, "Channels, Power Levels, and Antenna Gains"</a>).</p> <p><b>Note</b> If you are using an older version of a 340 or 350 series client adapter, your power level options may be different than those listed here.</p>	Client Adapter Type	Possible Power Levels	340 series PC cards	30 mW or 1 mW	340 series LM cards and PCI cards	30 mW, 15 mW, 5 mW, or 1 mW	350 series client adapters	100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW	PC-Cardbus card	20 mW, 10 mW, or 5 mW
Client Adapter Type	Possible Power Levels										
340 series PC cards	30 mW or 1 mW										
340 series LM cards and PCI cards	30 mW, 15 mW, 5 mW, or 1 mW										
350 series client adapters	100 mW, 50 mW, 30 mW, 20 mW, 5 mW, or 1 mW										
PC-Cardbus card	20 mW, 10 mW, or 5 mW										

**Table 6-6 Client Utility Advanced RF Settings Screen Parameters (continued)**

Parameter	Description						
Authentication	Defines how your client adapter attempts to authenticate to an access point. <b>Values:</b> Open Authentication or Shared Authentication <b>Default:</b> Open Authentication						
	<table><tr><th>Authentication Type</th><th>Description</th></tr><tr><td>Open</td><td>Allows your client adapter, regardless of its WEP settings, to associate and attempt to communicate with an access point.</td></tr><tr><td>Shared</td><td>Allows your client adapter to associate only with access points that have the same WEP keys.  The access point sends a known unencrypted “challenge packet” to the client adapter, which encrypts the packet and sends it back to the access point. The access point attempts to decrypt the encrypted packet and sends an authentication response packet indicating the success or failure of the decryption back to the client adapter.  Because the challenge packet is unencrypted, Shared Key Authentication is less secure than the WEP Key and Open Authentication. Use this setting only if your access point requires WEP keys to associate.</td></tr></table>	Authentication Type	Description	Open	Allows your client adapter, regardless of its WEP settings, to associate and attempt to communicate with an access point.	Shared	Allows your client adapter to associate only with access points that have the same WEP keys.  The access point sends a known unencrypted “challenge packet” to the client adapter, which encrypts the packet and sends it back to the access point. The access point attempts to decrypt the encrypted packet and sends an authentication response packet indicating the success or failure of the decryption back to the client adapter.  Because the challenge packet is unencrypted, Shared Key Authentication is less secure than the WEP Key and Open Authentication. Use this setting only if your access point requires WEP keys to associate.
	Authentication Type	Description					
	Open	Allows your client adapter, regardless of its WEP settings, to associate and attempt to communicate with an access point.					
	Shared	Allows your client adapter to associate only with access points that have the same WEP keys.  The access point sends a known unencrypted “challenge packet” to the client adapter, which encrypts the packet and sends it back to the access point. The access point attempts to decrypt the encrypted packet and sends an authentication response packet indicating the success or failure of the decryption back to the client adapter.  Because the challenge packet is unencrypted, Shared Key Authentication is less secure than the WEP Key and Open Authentication. Use this setting only if your access point requires WEP keys to associate.					
	<b>Note</b> If LEAP is enabled on your client adapter, Open is the only available option.						
<b>Note</b> The Shared Authentication option is available only if the client adapter has been assigned a WEP key and WEP is enabled. Refer to the <a href="#">“Configuring WEP Key Security”</a> section on page 5-5 for instructions on setting a WEP key and enabling WEP.							
World Mode	Check this check box to learn the legal transmit power level and channel set from the access point to which the client adapter is associated. This parameter is available only in computer-to-access point (infrastructure) mode and helps users who travel between countries use the client adapter in different regulatory domains.  <b>Default:</b> Deselected  <b>Note</b> When World Mode is enabled, only the transmit power levels supported by the country of operation’s regulatory agency are available.						

**Table 6-6 Client Utility Advanced RF Settings Screen Parameters (continued)**

Parameter	Description												
Allow Association To Mixed Cells	<p>If your network's access points are set to communicate with either WEP-enabled or WEP-disabled clients (that is, if the Use of Data Encryption by Stations parameter on the AP Radio Data Encryption screen is set to Optional), you must select this check box, even if your client adapter is not using WEP. If this setting is not enabled, your client adapter cannot establish a connection with the access point.</p> <p><b>Default:</b> Deselected</p> <p><b>Note</b> For security reasons, Cisco recommends that both WEP-enabled and WEP-disabled clients not be allowed in the same cell because broadcast packets will be sent unencrypted, even to clients running WEP.</p>												
Allow Scan For Other Aps	<p>Selecting this check box causes the client to look for a better access point if its signal strength becomes low and to switch associations if it finds one.</p> <p><b>Default:</b> Selected</p> <p><b>Note</b> This parameter is available only if your client adapter is using radio firmware version 4.25.30 or greater.</p>												
Clear Channel Assessment	<p>Specifies the method that determines whether the channel on which your client adapter will operate is clear prior to the transmission of data.</p> <p><b>Options:</b> Firmware Default (XXX), Carrier/Correlation (Car/Cor), Energy Detect (ED), or ED or Car/Cor</p> <p><b>Default:</b> Firmware Default (XXX)</p> <table> <tr> <th>Method</th><th>Description</th></tr> <tr> <td>Firmware Default (XXX)</td><td> <p>The Clear Channel Assessment (CCA) mechanism will report that the channel is busy based on the default value of the client adapter's firmware. The firmware's CCA default value is shown in parentheses (XXX).</p> <p><b>Note</b> The CCA default value is Car/Cor.</p> </td></tr> <tr> <td>Carrier/Correlation (Car/Cor)</td><td>The CCA mechanism will report that the channel is busy upon detection of a direct-sequence spread spectrum (DSSS) signal. This signal may be above or below the ED threshold.</td></tr> <tr> <td>Energy Detect (ED)</td><td>The CCA mechanism will report that the channel is busy upon detection of any energy above the ED threshold.</td></tr> <tr> <td>ED or Car/Cor</td><td>The CCA mechanism will report that the channel is busy upon detection of a DSSS signal or any energy above the ED threshold.</td></tr> <tr> <td colspan="2"> <p><b>Note</b> This parameter is available only for 2.4-GHz client adapters using firmware version 4.25.30 or greater.</p> </td></tr> </table>	Method	Description	Firmware Default (XXX)	<p>The Clear Channel Assessment (CCA) mechanism will report that the channel is busy based on the default value of the client adapter's firmware. The firmware's CCA default value is shown in parentheses (XXX).</p> <p><b>Note</b> The CCA default value is Car/Cor.</p>	Carrier/Correlation (Car/Cor)	The CCA mechanism will report that the channel is busy upon detection of a direct-sequence spread spectrum (DSSS) signal. This signal may be above or below the ED threshold.	Energy Detect (ED)	The CCA mechanism will report that the channel is busy upon detection of any energy above the ED threshold.	ED or Car/Cor	The CCA mechanism will report that the channel is busy upon detection of a DSSS signal or any energy above the ED threshold.	<p><b>Note</b> This parameter is available only for 2.4-GHz client adapters using firmware version 4.25.30 or greater.</p>	
Method	Description												
Firmware Default (XXX)	<p>The Clear Channel Assessment (CCA) mechanism will report that the channel is busy based on the default value of the client adapter's firmware. The firmware's CCA default value is shown in parentheses (XXX).</p> <p><b>Note</b> The CCA default value is Car/Cor.</p>												
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Energy Detect (ED)	The CCA mechanism will report that the channel is busy upon detection of any energy above the ED threshold.												
ED or Car/Cor	The CCA mechanism will report that the channel is busy upon detection of a DSSS signal or any energy above the ED threshold.												
<p><b>Note</b> This parameter is available only for 2.4-GHz client adapters using firmware version 4.25.30 or greater.</p>													

## Turning Your Client Adapter Radio On or Off

Your client adapter radio can be turned on or off. Turning the radio off prevents the adapter from transmitting RF energy. You might want to turn off the client adapter radio when you are not transmitting data and want to conserve battery power or when you are using a laptop on an airplane and want to prevent the adapter's transmissions from potentially interfering with electronic devices.

If the radio is not turned off, it periodically sends out inquiry packets even if it is not associated to an access point, as required by the 802.11 specification. Therefore, it is important to turn it off around devices that are susceptible to RF interference.



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**Note** Your client adapter is not associated while the radio is off.

---

### Turning the Radio On

To turn your radio on, perform one of the following actions:

- Select **Radio On** from the Aironet desktop control (menu bar icon or control strip module).
- Select **Radio On** from the File drop-down menu of the ACU.
- Click the **Turn Radio On** button on the basic properties screen.
- Click the **Turn Radio On** button on the advanced properties screen.



**Note**

---

The menu option changes to Radio Off after you turn the radio on.

---

### Turning the Radio Off

To turn your radio off, perform one of the following actions:

- Select **Radio Off** from the Aironet desktop control (menu bar icon or control strip module).
- Select **Radio Off** from the File drop-down menu of the ACU.
- Click the **Turn Radio Off** button on the basic properties screen.
- Click the **Turn Radio Off** button on the advanced properties screen.



**Note**

---

The menu option changes to Radio On after you turn the radio off.

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## Performing Diagnostics

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This chapter describes the client utility tools that you use to assess the operation and performance of the client adapter and the wireless network.

The following topics are covered in this chapter:

- [Diagnostic Tools for Mac OS 9, page 7-2](#)
- [Diagnostic Tools for Mac OS X, page 7-10](#)
- [Site Survey, page 7-19](#)

# Diagnostic Tools for Mac OS 9

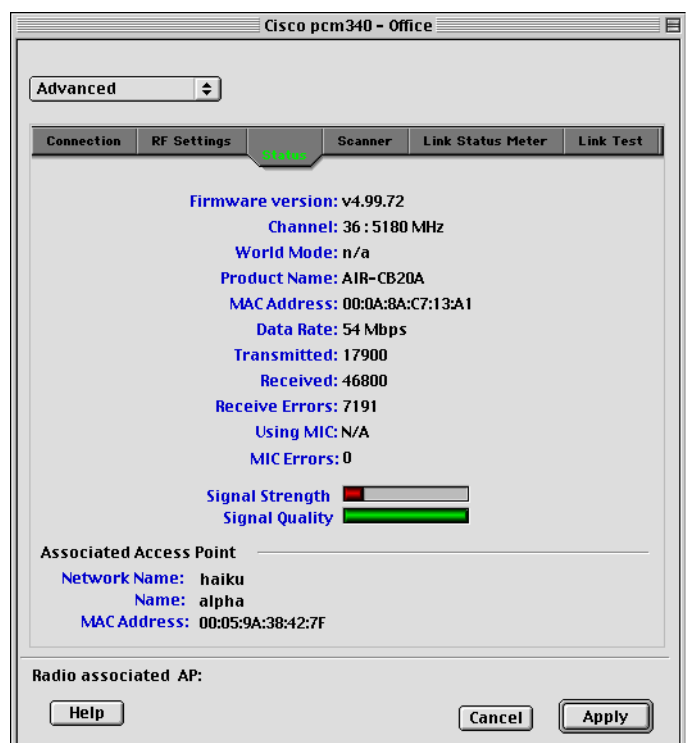
The pcm340PPC client utility provides tools that help you assess the performance of the client adapter and other devices on the wireless network. ACU diagnostic tools perform the following functions:

- Display your client adapter's current status and configured settings
- Run a link test to assess the operation of the RF link between your client adapter and its associated access point
- Run a link test to assess the operation of the wired link between your access point and a wired device
- Obtain information about local access points (configured for broadcast SSID)

## Viewing the Current Status of Your Client Adapter

To view your client adapter's status, select the **Status** tab on the advanced properties screen. The Status Screen appears (see [Figure 7-1](#)).

**Figure 7-1 Status Screen**



[Table 7-3 on page 7-11](#) describes the status information.



## Assessing the Wireless and Wired Links

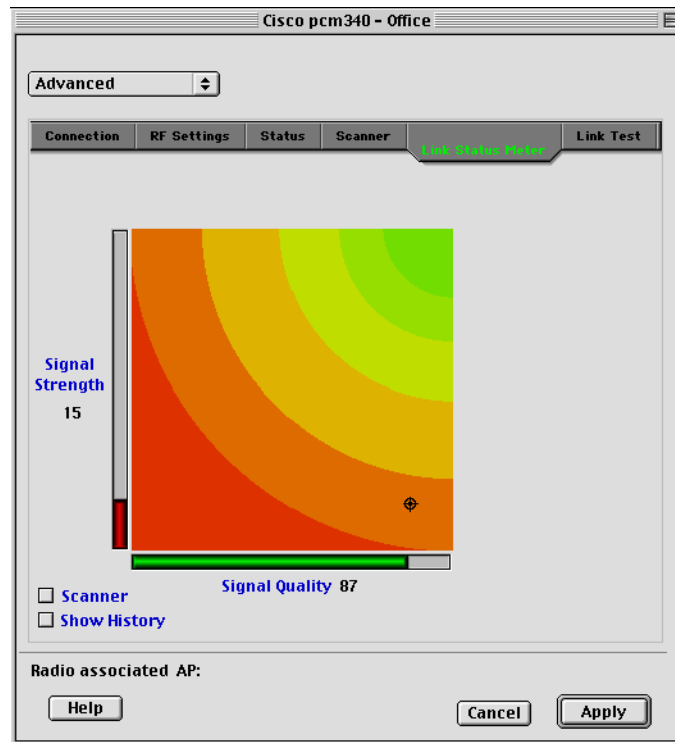
You can determine the performance of the RF link between your client adapter and its associated access point in two different ways:

- You can use the link status meter (LSM) to view a graphical display of the signal strength and quality of the client adapter's radio signal. Go to the [“Viewing the Link Status Meter”](#) section below.
- You can run a link test that allows you to set the number and size of the packets to be transmitted and then to determine the success or failure of those packets. Go to the [“Running a Link Test”](#) section on page 7-4.

### Viewing the Link Status Meter

To access the Link Status Meter screen, select **Link Status Meter** on the advanced properties screen. The Link Status Meter screen appears (see [Figure 7-2](#)).

**Figure 7-2** Link Status Meter Screen



The Link Status Meter screen provides a graphical display of the following:

- **Signal strength**—The strength of the client adapter's radio signal at the time packets are being received. It is displayed as a percentage along the vertical axis.
- **Signal quality**—The quality of the client adapter's radio signal at the time packets are being received. It is displayed as a percentage along the horizontal axis.

The combined result of the signal strength and signal quality is represented by a moving bull's-eye (see [Figure 7-2](#)). Where the bull's-eye falls on the graphical display determines the quality of the RF link between your client adapter and its associated access point. Differences in the quality of the RF link are indicated by the following colors: green (excellent), yellow (good), orange (fair), and red (poor).

This information can be used to determine the optimum number and placement of access points in your RF network. By using LSM to assess the RF link at various locations, you can avoid areas where performance is weak and eliminate the risk of losing the connection between your client adapter and the access point.

Selecting the Show History check box causes the graphical display to show a recent history of the RF performance between your client adapter and its associated access point. Black dots on the graphical display show the performance of the last 20 measurements. These black dots can be cleared from the display by clicking the Clear History button.

**Note**

The access point that is associated to your client adapter and its IP address are indicated at the bottom of the display.

## Running a Link Test

The client utility's link test tool evaluates the operation of the RF link between your client adapter and the associated access point. The test can also be used to check the operation of the wired link connected to the access point. The link test sends out Ping packets to assess the operation of the link (RF link and wired link) between your client adapter and the destination device specified by the IP address. The test is usually performed multiple times at various locations throughout your area and is run at the data rate displayed in the RF Settings section of the advanced screen (see the Data Rate parameter in the [“Setting RF Parameters” section on page 6-14](#)). You can use the results of the link test to determine RF network coverage and ultimately the required number and placement of access points in your network. The test also helps you to avoid areas where performance is weak, thereby eliminating the risk of losing the connection between your client adapter and its associated access point.

**Note**

A link test can also be run from an access point through a Telnet session. Refer to Chapter 4 of the *Cisco Aironet Access Point Software Configuration Guide* for information.

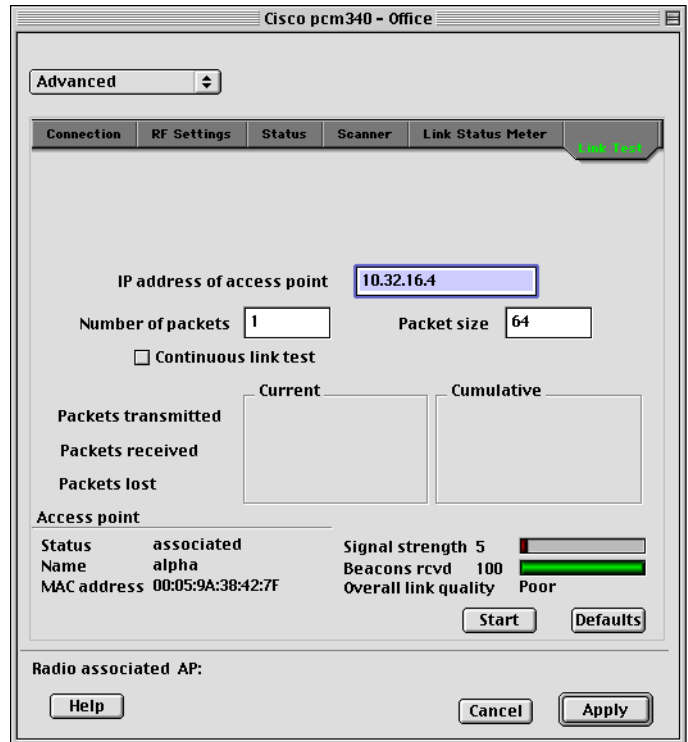
The following prerequisites are required before you can run an RF link test:

- The TCP/IP protocol must be installed on your system.
- Your computer and the access point must have an IP address.
- Your computer must be configured to use the client adapter as its network interface.

Follow the steps below to run a link test.

- Step 1** Select the **Link Test** tab on the advanced properties screen. The Link Test screen appears (see [Figure 7-3](#)).

**Figure 7-3 Link Test Screen**



- Step 2** In the IP Address of access point field, enter the IP address of the access point or wired device with which you want to test the link.



**Note** You can specify the IP address of a device on the wired link connected to the access point. This allows the link test to check both the wireless and wired links.

- Step 3** You can set the link test to run until it has attempted to send a specific number of packets or to run until you stop it. Follow one of the steps below to determine how long the link test will run:

- Type the number of packets that the link test should attempt to send in the Number of Packets field. (The Number of Packets parameter is ignored if the Continuous Link Test check box is selected.)

**Range:** 1 to 1000

**Default:** 1

- Select the Continuous Link Test check box to allow the link test to run continuously.

**Default:** Deselected

- Step 4** Type the size of the data packet that is to be sent to the access point in the Packet Size field.

**Range:** 64 to 1514

**Default:** 64

- Step 5** Click the **Start** button to run the link test. While the test is running, statistics are displayed and updated periodically.

Figure 7-4 shows the Link Test screen while it is running.

**Figure 7-4 Link Test Screen (While Running)**

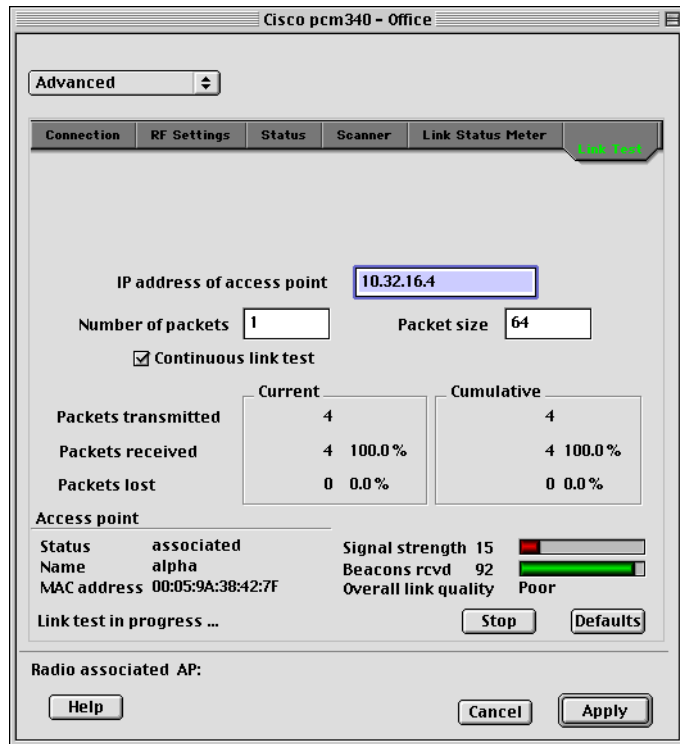


Table 7-1 interprets the statistics that are displayed on the Link Test screen while the link test is running.

**Table 7-1 Link Test Statistics**

Link Test Statistic	Description
Packets Transmitted	The number of packets of the specified size that were transmitted successfully.
Packets Received	The number of packets of the specified size that were received successfully.
Packets Lost	The number of packets of the specified size that were not received successfully.
Status	The operational mode of your client adapter. <b>Value:</b> Error, Configured, Associated, Not Associated, or Ad Hoc Mode
Name	The name of the access point to which your client adapter is associated. It is shown only if the access point was configured with a name and you are in infrastructure mode.
MAC Address	The MAC address of the access point to which your client adapter is associated. It is shown only if you are in infrastructure mode.

**Table 7-1 Link Test Statistics (continued)**

Link Test Statistic	Description
Signal Strength	The current signal strength. The higher the value and the more green the bar graph is, the stronger the signal. <b>Range:</b> 0 to 100%
Beacons Received	The percentage of beacon packets received versus those expected to be received. The higher the value and the more green the bar graph is, the better the quality of the signal. <b>Example:</b> The access point sends out 10 beacons per second, so you would expect the client adapter to receive 50 beacon packets in 5 seconds. If it receives only 40 packets, the percentage of beacons received would be 80%. <b>Range:</b> 0 to 100%
Overall Link Quality	The client adapter's ability to communicate with the access point, which is determined by the combined result of the adapter's signal strength and signal quality. <b>Value:</b> Not Associated, Poor, Fair, Good, Excellent

**Step 6** If you did not set the link test to run continuously, the test ends after the specified number of packets is sent, and the Stop button changes back to the Start button. To stop the link test at any time, click **Stop**.

## Determining Local Access Points

The client utility detects local access points two ways:

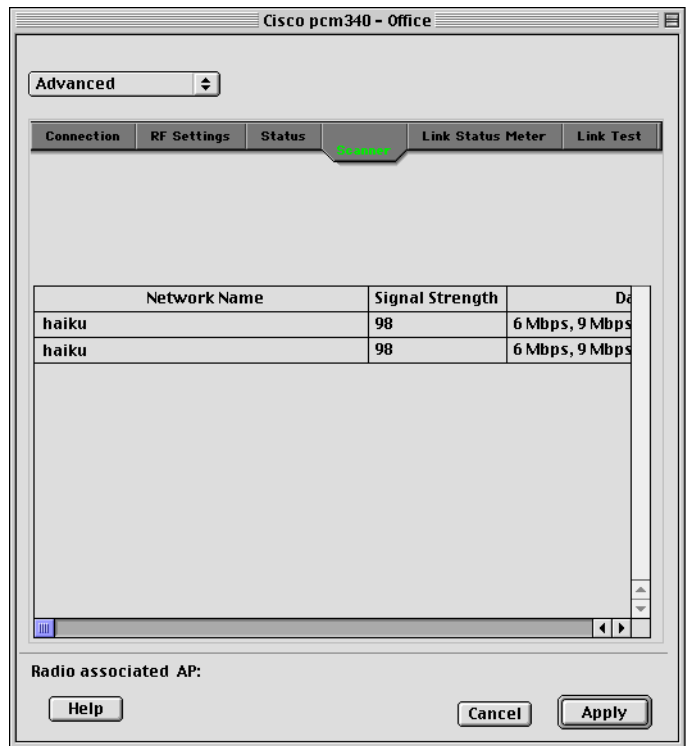
- Scanner tab
- LSM scanner

This section describes how to use these two tools.

## Scanner Tab

Click the Scanner tab on the client utility advanced properties screen to display the Scanner Screen (see [Figure 7-5](#)).

**Figure 7-5 Scanner Screen**



The scanner screen displays information on the detected access points, which can be used to configure your client adapter to associate to an access point.



### Note

The client utility scanner displays only local access points that are configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points configured for security.

[Table 7-2](#) lists and describes the parameters on the scanner details screen.

**Table 7-2 Scanner Screen Parameters**

Parameter	Description
Network Name	The network name or SSID of the access point.
Signal Strength	The signal strength of received signals from the access point. On the Details screen format, the longer the bar graph is, the stronger the signal.
Data Rates	The data rates supported by the access point.
MAC Address	The MAC address of the access point.
Channel	The operating frequency and channel that the access point is using for communications.

**Note**

Use the scroll bar at the bottom of the Scanner Summary Screen to view the fields not in view.

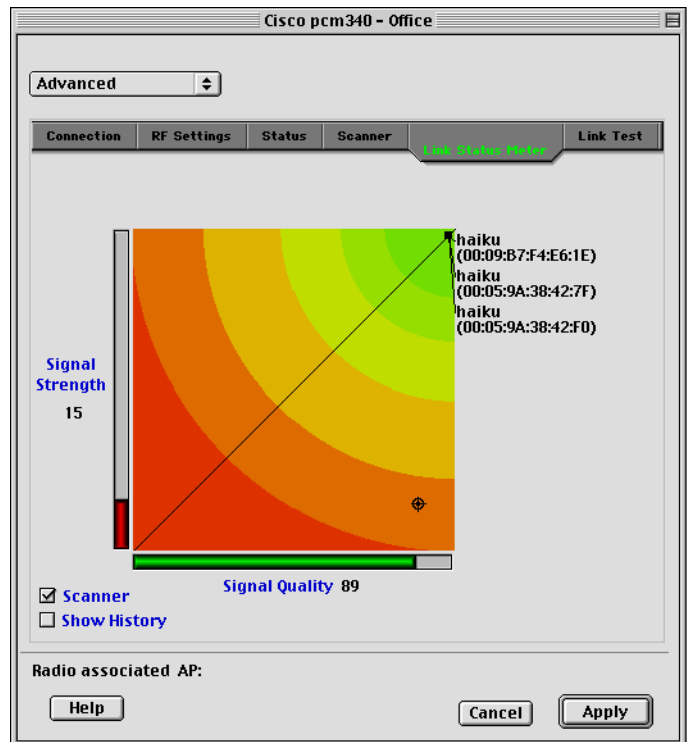
## LSM Scanner

Checking the scanner check box on the bottom of the scanner screen provides a graphical scanner display that shows the signal strength of detected access points on a diagonal line. Access points with strong signals are displayed in the green area; those with weak signals are displayed in the red area. Each access point is identified by network name or SSID. If the network name is not available, only the access point MAC address is displayed. The graphical scanner display provides a quick visual indication of the access points and their signal strengths (see [Figure 7-6](#)).

**Note**

The LSM scanner only displays access points configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points that are configured for security.

**Figure 7-6 LSM Scanner Screen**



# Diagnostic Tools for Mac OS X

In addition to allowing you to configure your client adapter for use in various types of networks, the client utility provides tools that allow you to assess the operation of the client adapter and other devices on the wireless network. The client utility's diagnostic tools to perform the following functions:

- Display your client adapter's current status and configured settings
- Run a link test to assess the operation of the RF link between your client adapter and its associated access point
- Run a link test to assess the operation of the wired link between your access point and a wired device
- Obtain information about local access points (configured for broadcast SSID)

## Viewing the Current Status of Your Client Adapter

To view your client adapter's status, select the **Status** tab on the advanced properties screen. The status screen is displayed (see [Figure 7-7](#)).

**Figure 7-7** Client Utility Advanced Properties Status Screen

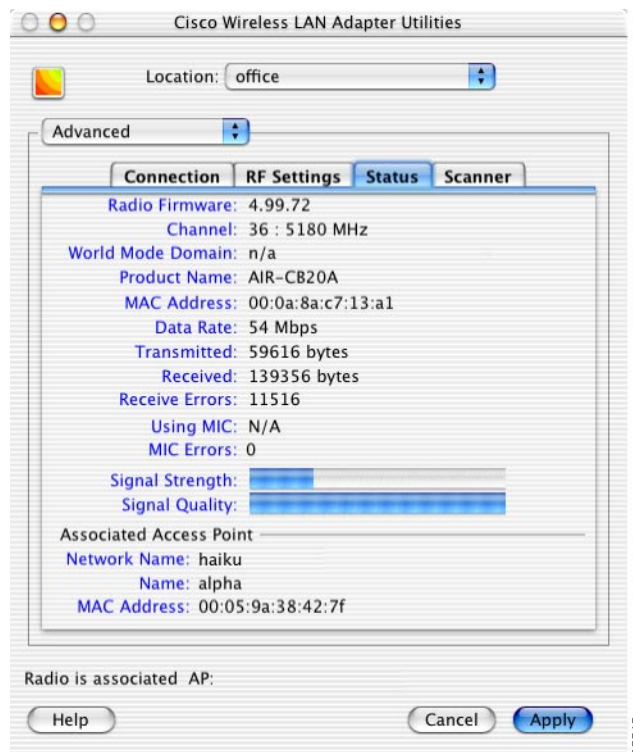




Table 7-3 describes the parameters on the status screen.

**Table 7-3 Client Adapter Status Screen Parameters**

Parameter	Description
Firmware Version	The version of the radio firmware that is currently running on your client adapter.
Channel	<p>Specifies which frequency your client adapter will use as the channel for communications. These channels conform to the IEEE 802.11 Standard for your regulatory domain.</p> <ul style="list-style-type: none"> <li>In infrastructure mode, this parameter is set automatically and cannot be changed. The client adapter listens to the entire spectrum, selects the best access point to associate to, and uses the same frequency as that access point.</li> <li>In ad hoc mode, the channel of the client adapter must be set to match the channel used by the other clients with which you wish to communicate.</li> </ul> <p><b>Range:</b> Dependent on client adapter radio and regulatory domain  <b>Example for 2.4-GHz client adapters:</b>  1 to 11 (2412 to 2462 MHz) in North America  <b>Example for 5-GHz client adapters:</b>  36, 40, 44, 48, 52, 56, 60, and 64 (5180, 5200, 5220, 5240, 5260, 5280, 5300, and 5320 MHz) in North America</p> <p><b>Note</b> Refer to <a href="#">Appendix D, “Channels, Power Levels, and Antenna Gains,”</a> for a list of channel identifiers, channel center frequencies, and regulatory domains for each channel.</p>
World Mode Domain	<p>When world mode is enabled and your client adapter has associated to an access point, this is the channel set adopted by the adapter from the access point.</p> <p><b>Value:</b> Disabled, Unknown, North America, Europe, Japan, Spain, France, Belgium, Israel, Canada, Australia</p>
Product Name	<p>Identifies the type of client adapter you are using.</p> <p><b>Value:</b> 340 series, 350 series, or AIR-CB20 series</p>
MAC Address	The MAC address assigned to your client adapter at the factory.
Data Rate	<p>The rate at which your client adapter is currently transmitting data packets.</p> <p><b>802.11a Values:</b> 6, 9, 12, 18, 24, 36, 48, and 54 Mbps  <b>802.11b Values:</b> 1 Mbps, 2 Mbps, 5.5 Mbps, or 11 Mbps</p>
Transmitted	The number of bytes that were transmitted successfully.
Received	The number of bytes that were received successfully.
Receive Errors	The total number of that were received with errors.

**Table 7-3 Client Adapter Status Screen Parameters (continued)**

Parameter	Description
Using MIC	<p>Indicates whether your client adapter is using message integrity check (MIC) to protect bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. The following drivers support MIC:</p> <ul style="list-style-type: none"> <li>Mac OS 9—version 1.0.3 or greater</li> <li>Mac OS X—version 1.0.1 or greater</li> </ul> <p>MIC is used only if it is enabled on the access point.</p> <p><b>Note</b> If the access point is using MIC, your client adapter’s driver and firmware must support MIC; otherwise, the client cannot associate.</p> <p><b>Values:</b></p> <p>Yes—client adapter radio is MIC capable, MIC is enabled on the access point, and MIC is being used.</p> <p>No—client adapter radio is MIC capable, MIC is enabled on the access point, but MIC is not being used.</p> <p>N/A—client adapter radio is not MIC capable.</p> <p>Disabled—client adapter radio is MIC capable, but MIC is disabled.</p>
MIC Errors	Indicates the total number of MIC errors that have occurred.
Signal Strength	The signal strength for received packets. The longer the bar graph is, the stronger the signal.
Signal Quality	The signal quality for received packets. The longer the bar graph is, the better the signal quality.
Network Name	<p>The network name or SSID of your wireless network.</p> <p><b>Note</b> Refer to <a href="#">Table 6-1</a> for information on setting your wireless network’s network name.</p>
Name	The name of the access point to which your client adapter is associated. It is shown only if the access point was configured with a name and you are in infrastructure mode.
MAC Address	The MAC address of the access point or wireless device to which your client adapter is associated.

## Assessing the Wireless and Wired Links

You can determine the operation of the wireless and wired links from your client adapter in two different ways:

- You can use the link status meter to view a graphical display of the signal strength and quality of the radio signals from the local access points (configured for broadcast SSID). Go to the [“Viewing the Link Status Meter”](#) section below.

- You can run a link test with an access point or a wired device. Go to the [“Running a Link Test” section on page 7-14](#).

## Viewing the Link Status Meter

To access the Link Status Meter (LSM) screen, click the LSM icon on the upper left of the Client Utility Advanced Properties Screen (see [Figure 7-8](#)).

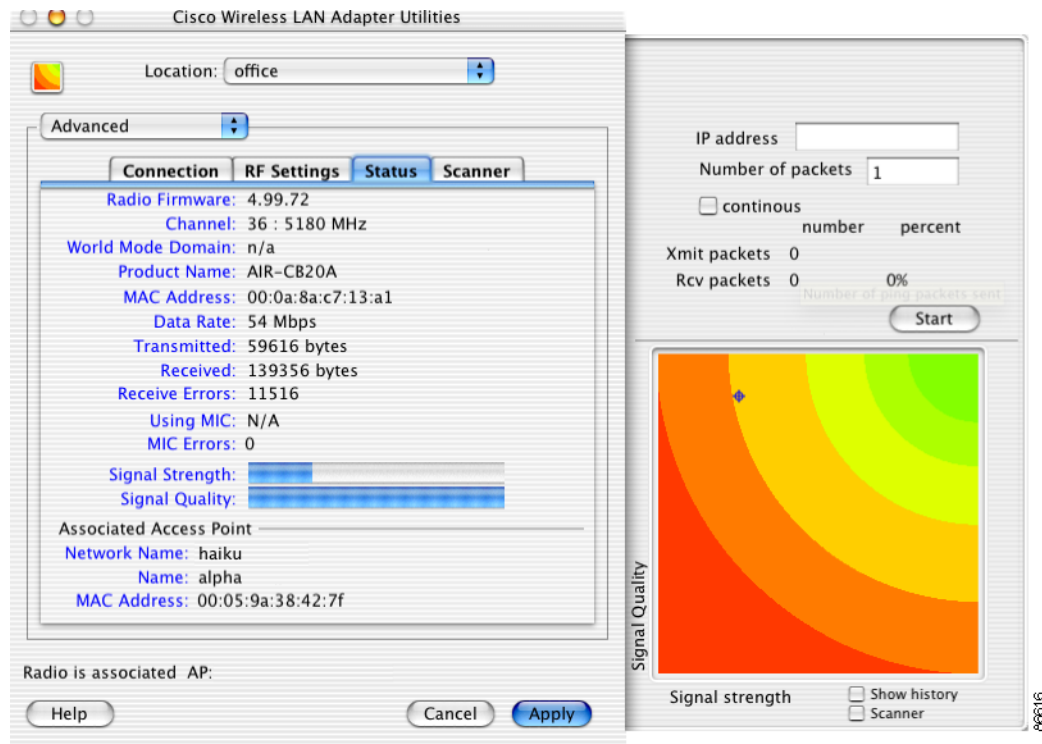
**Figure 7-8 LSM Icon on Client Utility Advanced Properties Screen**



When you click the LSM icon, the LSM screen typically appears on the right side of the client utility screen. If there is insufficient space on the right side of the client utility screen, the LSM screen appears on the left side.

The LSM screen is shown in [Figure 7-9](#).

**Figure 7-9 Status Screen with LSM Screen Displayed**



The LSM screen provides a graphical display of the following:

- **Signal quality**—The quality of the access point's radio signal at the time packets are being received. It is displayed as a percentage along the vertical axis.
- **Signal strength**—The strength of the radio signal received from the associated access point. It is displayed as a percentage along the horizontal axis.

The combined result of the signal strength and signal quality is represented by a moving mark (see [Figure 7-9](#)). Where the mark falls on the graphical display determines the quality of the RF link between your client adapter and its associated access point. Differences in the quality of the RF link are indicated by the following colors: green (excellent), yellow (good), orange (fair), and red (poor).

This information can be used to determine the optimum number and placement of access points in your RF network. By using LSM to assess the RF link at various locations, you can avoid areas where performance is weak and eliminate the risk of losing the connection between your client adapter and the access point.

Selecting the Show History check box causes the graphical display to show a recent history of the RF performance between your client adapter and its associated access point. Black dots on the graphical display show the performance of the last 20 measurements.

Selecting the scanner check box causes the graphical display to show the signal strength of detected access points on a diagonal line. Each access point is identified by Network Name or SSID. If the Network Name is not available, the access point MAC address is displayed. The graphical scanner display provides a quick visual indication of the access point signals.

**Note**

When the scanner check box is checked, only access points configured for broadcast SSID are displayed. Typically, access points configured for security are not shown.

## Running a Link Test

The client utility's link test tool evaluates the operation of the RF link between your client adapter and the associated access point. The test can also be used to check the operation of the wired link connected to the access point. The link test sends out Ping packets to assess the operation of the link (RF link and wired link) between your client adapter and the destination device specified by the IP address. Initially, the IP address of the associated access point is automatically placed in the IP address field.

The link test does more than test the link between two network devices. It verifies that TCP/IP software and the proper drivers have been loaded and are operating properly.

The following prerequisites are required before you can run a link test:

- The TCP/IP protocol must be installed and operational on your Macintosh computer.
- Your Macintosh computer and the access point must have an IP address.
- Your computer must be configured to use the client adapter as its network interface.

Follow the steps below to run a link test:

- 
- |               |  |
|---------------|--|
| <b>Step 1</b> | Click the LSM icon on the upper left of the Client Utility Advanced Properties Screen (see <a href="#">Figure 7-8</a> ). The LSM screen appears (see <a href="#">Figure 7-9</a> ). |
| <b>Step 2</b> | In the IP Address field, you can enter a device IP address or use the IP address of the associated access point that is automatically placed in the field.                         |

**Note**

You can specify the IP address of a device on the wired link connected to the access point. This allows the link test to check both the wireless and wired links.

- Step 3** You can set the link test to run until it has completed a specific number of packets or to continuously run until you stop it. Follow one of the steps below to determine how long the link test will run:
- Specify the number of packets (from 1 to 1000) that the link test sends by typing the number in the Number of Packets field. (The Number of Packets parameter is ignored if the Continuous check box is checked.)
  - Check the **Continuous** check box to allow the link test to run continuously.
- Step 4** Click the **Start** button to run the link test. While the test is running, statistics are displayed and updated periodically. For additional information, see [Table 7-4](#).
- Step 5** If you did not set the link test to run continuously, the test ends after the specified number of packets is sent, and the Stop button changes back to the Start button. To stop the link test at any time, click **Stop**.

[Table 7-4](#) interprets the statistics that are displayed on the LSM screen while the link test is running.

**Table 7-4 Link Test Statistics**

Link Test Statistic	Description
Transmitted Packets	The number of packets that were transmitted successfully.
Received Packets	The number of packets that were received successfully and the percentage of the total transmitted.

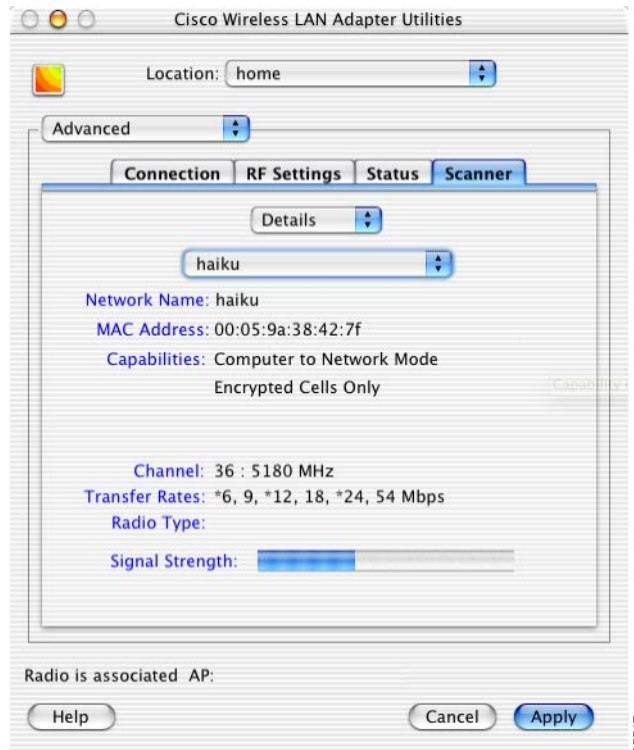
## Determining Local Access Points

The client utility detect local access points two ways:

- Scanner tab
- LSM scanner

### Scanner Tab

When you click the Scanner tab on the client utility advanced properties screen, the Scanner Details Screen is displayed (see [Figure 7-10](#)).

**Figure 7-10 Client Utility Scanner Details Screen**

The scanner function displays information on the detected access points, which can be used to configure your client adapter to associate to an access point.

**Note**

The client utility scanner displays only local access points that are configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points configured for security.

Table 7-5 lists and describes the parameters on the scanner details screen.

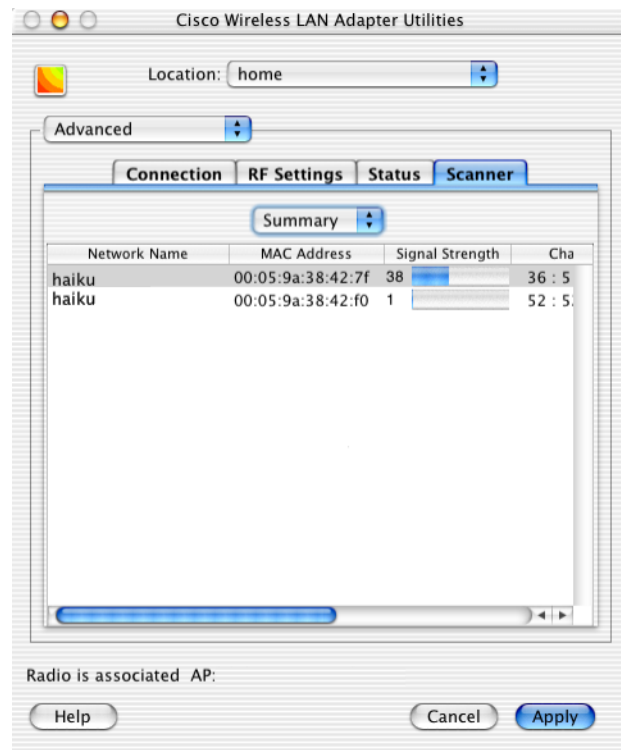
**Table 7-5 Scanner Details Screen Parameters**

Parameter	Description
Screen Format	<p>Selects the scanner screen format. Two options are supported: Details or Summary. The <i>Details</i> option displays information on a single access point. The <i>Summary</i> option displays a tabular list of all detected access points (see Figure 7-11). Use the up and down arrows on the right of the field to select the screen format options.</p> <p><b>Range:</b> Details or Summary</p> <p><b>Default:</b> Details</p>
Detected Access Points	<p>Selects an access point from a drop-down list of detected access points. Use the up and down arrows on the right of the field to display the drop-down list of access points. Only available in the Details screen format.</p>
Network Name	The network name or SSID of the access point.

**Table 7-5 Scanner Details Screen Parameters (continued)**

Parameter	Description
MAC Address	The MAC address of the access point.
Capabilities	The detected capabilities of the access point, such as network type, encrypted cell, and short header. Only available in the Details screen format.
Channel	The operating frequency and channel that the access point is using for communications.
Transfer Rates	The data rates supported by the access point.
Radio Type	The type of radio used by the access point.
Signal Strength	The signal strength of received signals from the access point. On the Details screen format, the longer the bar graph is, the stronger the signal.

When you select the scanner summary screen format option, the client utility provides scanner information in a list format (see [Figure 7-11](#)).

**Figure 7-11 Client Utility Scanner Summary Screen****Note**

You can use the scroll bar at the bottom of the Scanner Summary Screen to view the other fields.

The scanner summary screen provides the following information fields:

- Network Name
- Mac Address
- Signal Strength
- Channel
- Data Rates
- Radio Type

See [Table 7-5](#) for a description of the parameters displayed on the Scanner Summary Screen.

## LSM Scanner

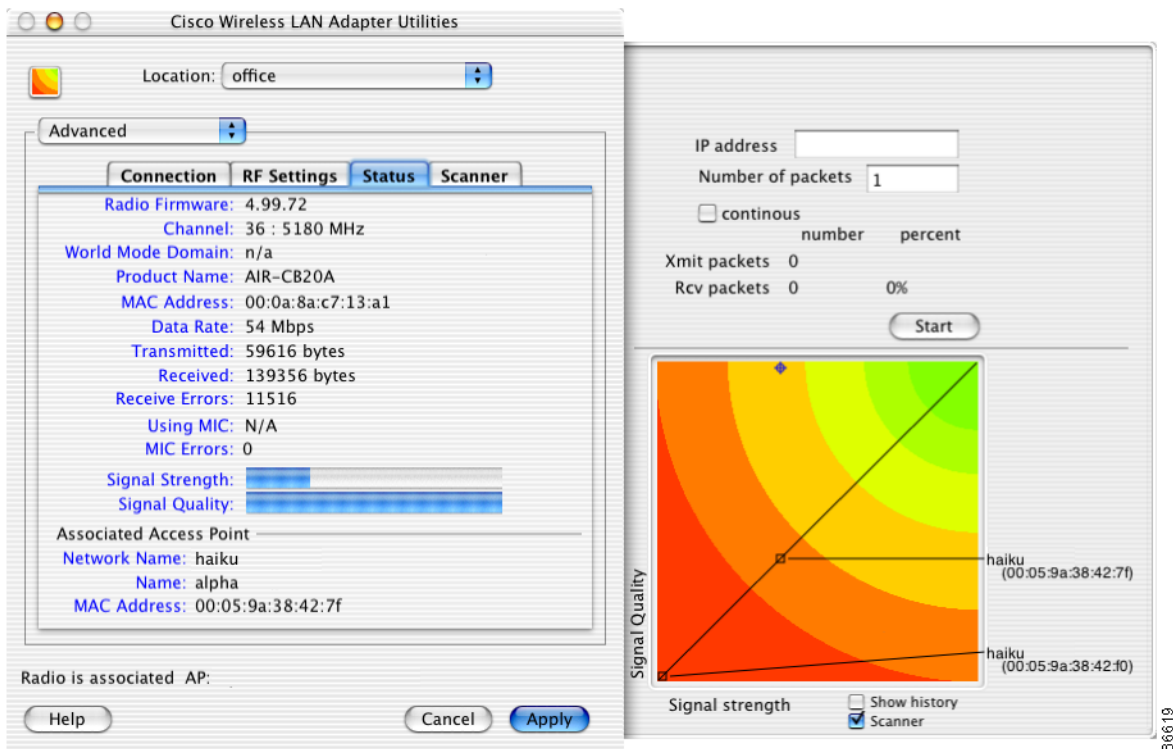
Checking the scanner check box on the bottom of the scanner screen provides a graphical scanner display that shows the signal strength of detected access points on a diagonal line. Access points with strong signals are displayed in the green area; those with weak signals are displayed in the red area. Each access point is identified by network name or SSID. If the network name is not available, only the access point MAC address is displayed. The graphical scanner display provides a quick visual indication of the access points and their signal strengths (see [Figure 7-12](#)).



### Note

The LSM scanner only displays access points configured for broadcast SSID. Typically, broadcast SSID is deactivated on access points that are configured for security.

**Figure 7-12** Status Screen With LSM Scanner Screen Displayed





# Site Survey

Because of differences in component configuration, placement, and physical environment, every network application is a unique installation. You perform a site survey to determine the optimum utilization of networking components and to maximize range, coverage, and network performance.

Consider the following operating and environmental conditions when performing a site survey:

- **Data rates**—Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. A decrease in receiver threshold sensitivity occurs as the radio data increases.
- **Antenna type and placement**—Proper antenna configuration is a critical factor in maximizing radio range. As a general rule, range increases in proportion to antenna height.
- **Physical environment**—Clear or open areas provide better radio range than closed or filled areas. Also, the less cluttered the work environment, the greater the range.
- **Obstructions**—A physical obstruction such as metal shelving or a steel pillar can hinder performance of the client adapter. Avoid locating the workstation in a location where there is a metal barrier between the sending and receiving antennas.
- **Building materials**—Radio penetration is greatly influenced by the building material used in construction. For example, drywall construction allows greater range than concrete blocks. Metal or steel construction is a barrier to radio signals.

## Site Survey Guidelines

Keep the following guidelines in mind when preparing to perform a site survey:

- Perform the site survey when the RF link is functioning with all other systems and noise sources operational.
- Set your client adapter's RF Transmit level at different settings to determine the minimum level required to cover the wireless cell.
- Execute the site survey entirely from a mobile station. Move the mobile computer to the locations where you plan to use wireless devices and record signal strength and signal quality information.

## Site Survey Diagnostic Tools

The following diagnostic tools can be used to perform a site survey:

- Advanced parameters status screen—provides signal strength, signal quality, and data rate of the access point signal.
- Advanced parameters scanner screen—displays a list of detected access points configured for broadcast SSID and provides the signal strength and the transfer rates supported by the selected access point.
- LSM scanner tool—provides a graphical display that shows the signal strength of all detected access points configured for broadcast SSID.

For more information about using diagnostic tools, refer to the corresponding sections in this chapter.





## Routine Procedures

---

This chapter describes routine maintenance tasks for your client adapter.

The following topics are covered in this chapter:

- [Updating Client Adapter Software, page 8-2](#)
- [Updating the Radio Firmware, page 8-8](#)
- [Removing the Client Adapter, page 8-11](#)

# Updating Client Adapter Software

Updating software is a three-step process:

1. Determine your current software version
2. Download a new software installer
3. Install the new ACU and driver software

## Determining the Driver and Client Utility Versions

To determine the driver and client utility versions that your client adapter is currently using follow the procedures for your operating system:

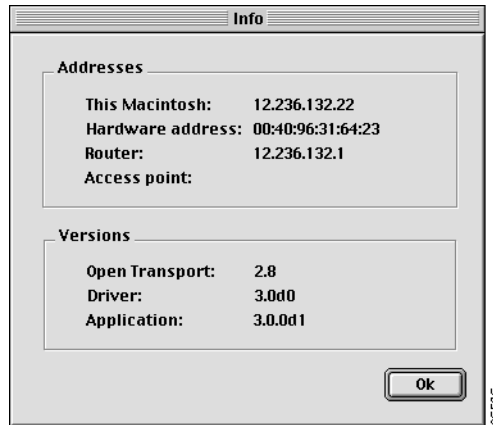
- If you are using Mac OS X, select **About Aironet Client Utility** from the Aironet Client Utility menu on the main menu bar. The Client Utility About screen (see [Figure 8-1](#)) displays the client utility and driver version number.

**Figure 8-1** Mac OS X Client Utility About Screen



- If you are using Mac OS 9, select **Get Info** from the File drop-down menu in the Macintosh client utility. The client utility and driver versions are displayed on the Info screen (see Figure 8-2).

**Figure 8-2 Mac OS 9 Client Utility Info Screen**



The bottom of the Info screen displays the version of the open transport software that is used with the driver, the version of the client adapter driver, and the version of the ACU application.

## Downloading New Software

The current version of the software is displayed on the **About** screen (See the “[Determining the Driver and Client Utility Versions](#)” section on page 8-2). The latest software version for your client adapter is available for download at the Cisco Software Center web site. A single software installer supports both Mac OS 9 and Mac OS X.

To obtain the latest client adapter software from the Cisco Web site, follow these steps:

- 
- Step 1** Use your web browser to access the Cisco Software Center at the following URL:
- <http://www.cisco.com/public/sw-center/sw-wireless.shtml>
- Step 2** Using the onscreen instructions, navigate to the current release for your client adapter. For example, use the Aironet Wireless Software Selector to locate the files for your client adapter.
- Step 3** Click on the software file name, such as MACOSInstallv3x.sit. The 3x identifies the software package version number.



**Note** Make sure to select a software release that is compatible with your client adapter hardware and computer operating system. Each software version includes a description with compatibility information.

---

- Step 4** Read and accept the terms and conditions of the Software License Agreement.
- Step 5** Click on the filename in the Software Download page.
- Step 6** Save the file to your hard drive then exit the web browser.
- Step 7** Double-click the utility installer (.sit) file to expand (uncompress) it.

**Step 8** Go to the “[Updating the Driver and Client Utility](#)” section.

---

## Updating the Driver and Client Utility

Follow the instructions below to update the version of the client utilities and the client adapter driver for both the Mac OS 9 and the Mac OS X operating systems.



**Note**

If a power failure occurs while you are loading new software, your client adapter can become inoperable. If this occurs, start the procedure again.

---

**Step 1** Double-click **Cisco WLAN Install** to activate the installer.



**Note**

You should keep the Cisco WLAN Install file. You can use it later to uninstall your client utility and driver for a clean install.

---

**Step 2** For Mac OS X, when the Authenticate screen appears, enter your password in the Password field. Your Macintosh username appears in the Name field. Click **OK**.



**Note**

For Mac OS X, you must have administrator privileges to install an updated client utility and driver.

---

**Step 3** When the Cisco Aironet Wireless LAN Adapter Software screen appears, click **Continue**.

**Step 4** Read the terms and conditions of the Software License Agreement and click **Accept** or **Decline**. If you decline the license agreement, the client utility installation ends.



**Note**

You can print or save the software license agreement by clicking **Print** or **Save As**.

---

**Step 5** Read the Read Me screen information and click **Continue**.



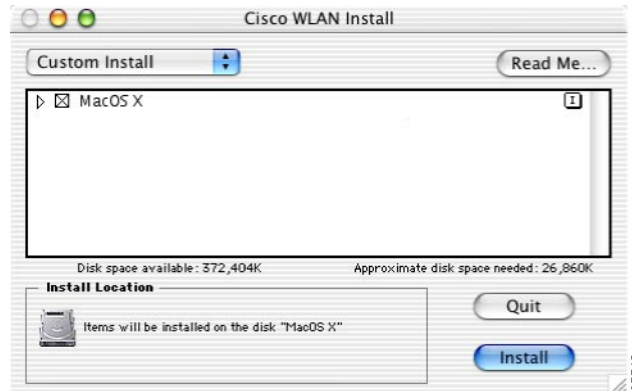
**Note**

You can print or save the read-me information by clicking **Print** or **Save As**.

---

The Cisco WLAN Installer detects your computer operating system and displays the appropriate install screen (See [Figure 8-3](#) for Mac OS X).

**Figure 8-3 Mac OS X Install Screen**



**Step 6** When the Cisco WLAN Install screen appears, perform the following operations:

- a. Expand the software component list by clicking the right triangle to the left of name.



**Note**

Both the PCI and PC Card drivers are normally installed by the installer. You can deselect one of the drivers by clicking the selection box to remove the X; for example, you can deselect the PCI driver when using a PowerBook, or you can deselect the PC Card driver when using a PowerMac.

- b. Click **Install** to begin the installation process.

**Step 7** When a screen appears indicating that you must restart your computer after installing the software, click **Continue**.



**Note**

You can click **Cancel** to terminate the installation process.

**Step 8** A message appears indicating “One moment please...” then a screen appears that shows the installation progress. After the files are copied to the designated folder on the Macintosh hard disk, a screen appears:

**Step 9** If a message appears indicating that the installation was successful, click **Restart** to restart your computer and finish the client utility installation.



**Note**

The client utility, the help files, and the driver are installed by the installer.

**Step 10** If a message appears indicating that the installation is not necessary, click **Quit**. The installer has detected that your installed software is the same version as the software to be installed. To force the installer to install the new software, uninstall the current software and then repeat this procedure.

## Removing the Driver and Client Utility

This section provides instructions for removing the driver and the client utility from your computer. The following procedure removes the driver and the client utility for both Mac OS 9 and Mac OS X.

- Step 1** Locate the client utility installer (Cisco WLAN Install) on your hard drive.
- Step 2** Double-click **Cisco WLAN Install**.
- Step 3** For Mac OS X, when the Authenticate screen appears, enter your password in the Password field. Your Macintosh username will appear in the Name field. Click **OK**.

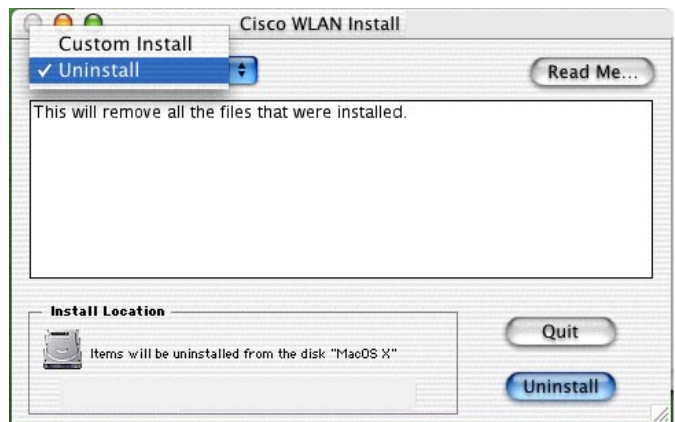


**Note** To uninstall the client utility on Mac OS X, you must have administrator privileges for the Macintosh.

- Step 4** When the Cisco Aironet Wireless LAN Adapter Software screen appears, click **Continue**.
- Step 5** When the Software License Agreement appears, click **Accept**.
- Step 6** When the Read the Read Me screen appears, click **Continue**.

The Cisco WLAN Installer detects your computer operating system and displays the appropriate install screen (see [Figure 8-4](#) for Mac OS X).

**Figure 8-4** Mac OS X Uninstall Screen



- Step 7** When the Cisco WLAN Install screen appears, follow these steps:
  - a. Select **Uninstall** by clicking the up and down arrows on the top left of the screen (see [Figure 8-4](#)).
  - b. Click **Uninstall** to begin the removal process.
- Step 8** When a screen appears indicating that the removal cannot occur with other applications running, click **Continue**.
- Step 9** When a message appears that indicates the removal was successful, click **OK**.
- Step 10** When the Uninstall screen reappears, click **Quit**.
- Step 11** For Mac OS 9, remove the client adapter from the computer desktop by clicking on the **Cisco Wireless LAN Adapter** icon and dragging it to the trash.
- Step 12** Reboot the computer. This removes any loaded drivers.



- Step 13** If the uninstall process is not successful, manually remove the following files and folders by dragging them to the Trash icon. For Mac OS X, you must have root access.

The following table lists the Mac OS 9 files and folders to remove:

**Table 8-1 Mac OS 9 Files**

Folder	Files and Folders to Remove
root	Cisco pcm340PPC folder
System Folder > Extensions	pcm340 file pcm340Enabler file pcm340 Leap Utility file pcm350Enabler file pcm360Enabler file pcm340PCI file pcm350PCI file
System Folder > Extensions > Location Manager Modules	Cisco Wireless LAN Adapter file
System Folder > Control Strip Modules	Cisco Wireless LAN Adapter file
System Folder > Startup Items	pcm340 Background Utility file
System Folder > Preferences	pcm340 preferences file
System Folder > Help	pcm340PPC help folder

The following table lists the Mac OS X files and folders to remove:

**Table 8-2 Mac OS X Files**

Folder	Files and Folders to Remove
/Applications	Aironet Client Utility.app folder
/System/Library/StartupItems	Cisco folder
/System/Library/Extensions	CiscoPCCardRadio.kext file CiscoPCIRadio.kext file
/System/Library	Extensions.mkext file Extension.kextcache file (Mac OS X 10.2 and above)



**Note**

To remove your client adapter, follow the instructions in the [Removing the Client Adapter](#) section.

# Updating the Radio Firmware

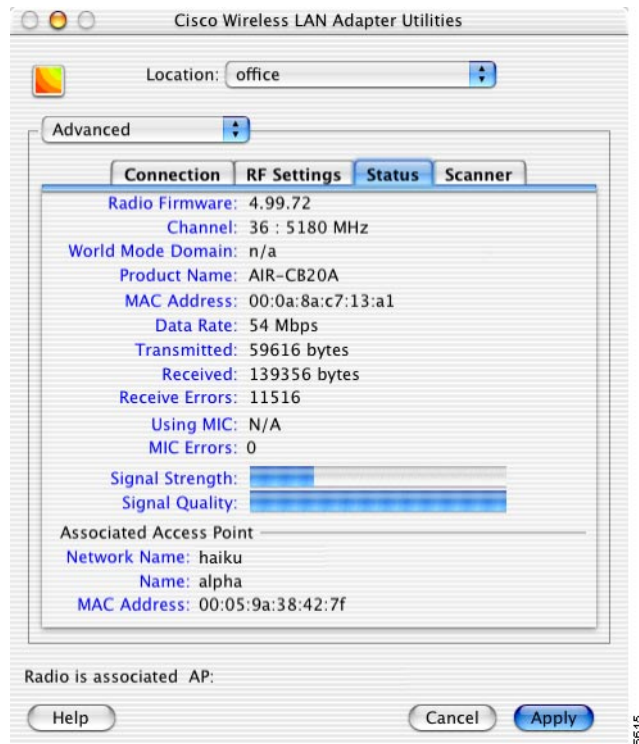
Updating firmware is a three-step process:

1. Determine your current firmware version
2. Download a newer firmware image
3. Update the client adapter firmware

## Determining the Radio Firmware Version Number

To obtain your radio firmware version, click the **Status** tab on the advanced properties screen. The status screen (see [Figure 8-5](#)) appears and displays your client adapter radio firmware version number and other status information.

**Figure 8-5** Client Utility Advanced Properties Status Screen



## Downloading New Radio Firmware

The current version of the firmware is displayed on the **Status** screen (See [“Determining the Radio Firmware Version Number”](#) section on page 8-8). The latest firmware version for your client adapter is available for download at the Cisco Software Center web site.



### Note

If a power failure occurs while you are loading new firmware, your client adapter can become inoperable. If this occurs, start the procedure again.

To obtain the latest client adapter radio firmware from the Cisco Web site, follow these steps:

- 
- Step 1** Use your web browser to access the Cisco Software Center at the following URL:  
<http://www.cisco.com/public/sw-center/sw-wireless.shtml>
- Step 2** Using the onscreen instructions, navigate to the current release for your client adapter. Because the firmware does not depend on the operating system, you may prefer to select the radio firmware from the Aironet Wireless Software Display tables.
- Step 3** Click on the firmware filename, such as 340-PCMCIA-LMC-PCI-v42530.exe or CB-20A-v50102.exe. The 42530 and 50102 identify the version number; the prefix identifies the client adapter type. For example 340-PCMCIA-LMC-PCI refers to the 340 series PCMCIA, LMC, and PCI client adapters. CB-20A refers to the 5-GHz client adapter.



**Note** The firmware image file (\*.exe) is a compressed file. Use the Stuffit Expander to expand (uncompress) this file.



**Note** Make sure to select a firmware release that is compatible with your client adapter hardware. Each firmware version includes a description with compatibility information.



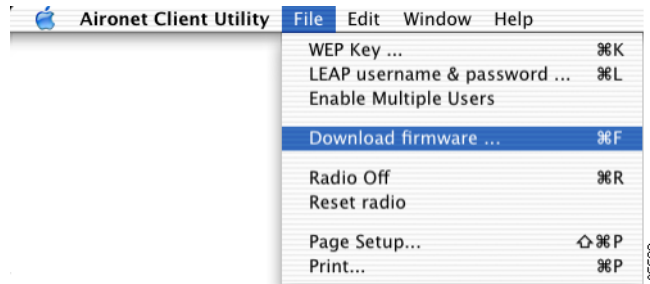
**Note** To support the message integrity check (MIC) feature on the 2.4-GHz client adapters, you must use firmware version 4.25.23 or later.

- Step 4** Read and accept the terms and conditions of the Software License Agreement.
- Step 5** Click on the filename in the Software Download page.
- Step 6** Save the file to your hard drive then exit the web browser.
- Step 7** Locate and use the Stuffit Expander program on your hard drive to expand (uncompress) the radio firmware image file (\*.exe) you copied to your hard drive. This creates an image file (filename.img) in the folder where the compressed file is located.
- 

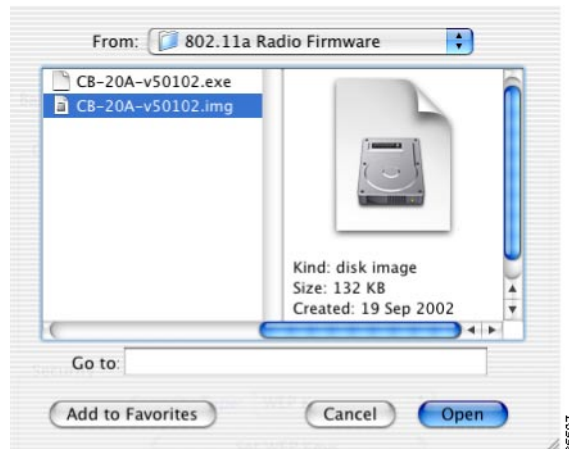
## Loading New Radio Firmware (Mac OS X)

Your client adapter firmware is contained in the adapter's Flash memory, where it can be easily updated.

- 
- Step 1** If you have not already done so, download the new firmware from the Cisco website.
- Step 2** Make sure your client adapter is installed in your computer (refer to the [“Inserting the Client Adapter into a Computing Device”](#) section on page 3-9).
- Step 3** Select **Download firmware** from the File drop-down menu (see [Figure 8-6](#)). The file location screen appears.

**Figure 8-6 File Drop-Down Menu**

- Step 4** Click the up and down arrows on the right of the From field and select the location (volume and folder) of the new radio firmware file on your hard disk.
- Step 5** Click the new radio firmware image file (.img); see [Figure 8-7](#).

**Figure 8-7 Firmware File Location Screen**

- Step 6** Click the **Open** button. A dialog box appears indicating the progress of the download. The selected image is loaded into the client adapter's Flash memory.
- Step 7** Click **OK** when a message appears indicating the firmware download was successful.

## Loading New Radio Firmware (Mac OS 9)

Your client adapter's firmware is contained in the adapter's Flash memory, which allows it to be easily updated in the future.

- Step 1** If you have not already done so, download the new firmware from the Cisco website.
- Step 2** Make sure the client adapter is installed in your computer and is operational.
- Step 3** Select **Load Firmware** from the Edit drop-down menu (see [Figure 8-8](#)). The Firmware window appears (see [Figure 8-9](#)).

Figure 8-8 Edit Drop-Down Menu

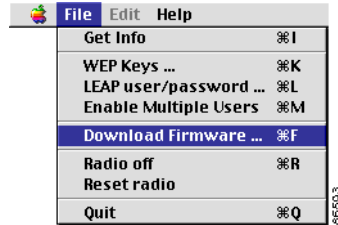
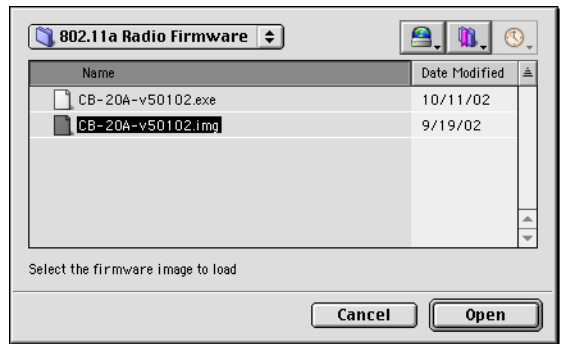


Figure 8-9 Firmware Window



- Step 4** Under Name, select the location of the new firmware (for example, Macintosh HD).
- Step 5** Click the new firmware image file (.img).
- Step 6** Click the **Open** button. A dialog box appears indicating the progress of the download. The selected image is loaded into the client adapter's Flash memory.
- Step 7** When the *Firmware download successful* message appears, click **OK**.

## Removing the Client Adapter

Follow the instructions below whenever you need to remove the client adapter from your computer.

### Removing a PC Card

To remove a PC card from a Mac OS 9 computer after it is successfully installed and configured (such as when your laptop is to be transported), completely shut down your computer and pull the card directly out of the PC card slot. You can remove the PC card while the system is running, provided the card is not being used (that is, the client utility is not running and the card is not selected in the AppleTalk and TCP/IP control panels). When the PC card is reinserted and the computer is rebooted, your connection to the network should be re-established.

For Mac OS X systems, you can remove the card anytime.

## Removing a PCI Client Adapter

**Caution**

Static electricity can damage your computer and your client adapter. Before opening your computer or removing the adapter from the anti-static packaging, discharge static by touching the metal PCI port covers of your grounded computer (connected to a grounded power connector).

PCI client adapters are installed inside desktop computers. To remove the PCI client adapter, follow the instructions below:

---

**Step 1** Completely shut down and power off your computer and all accessories.

**Step 2** Disconnect the client adapter's antenna.

**Step 3** Open or remove your computer cover.

**Note**

Refer to your Macintosh computer manual for instructions on opening or removing your computer cover and on locating the PCI expansion slots.

**Step 4** Locate the PCI expansion slot that holds your client adapter.

**Step 5** Pull up firmly on the client adapter to release it from the slot and carefully tilt the adapter to allow it to clear the opening in the back panel.

**Step 6** Reinstall the expansion slot cover and replace or close the computer cover.

---



# Troubleshooting

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This chapter provides general information for diagnosing and correcting common problems encountered when installing or operating a Cisco Aironet Wireless LAN Adapter.

The following topics are covered in this section:

- [Accessing the Latest Troubleshooting Tips, page 9-2](#)
- [Interpreting the Indicator LEDs, page 9-2](#)
- [Problems after Installing the Driver, page 9-3](#)
- [Radio Not Found, page 9-3](#)
- [Client Adapter Recognition Problems, page 9-3](#)
- [Problems Associating to the Access Point, page 9-4](#)
- [Problems Authenticating, page 9-4](#)
- [Problems Connecting to the Network, page 9-5](#)
- [Running the Troubleshooting Tool, page 9-5](#)

## Accessing the Latest Troubleshooting Tips

This chapter provides basic troubleshooting tips for your client adapter. For more up-to-date and complex troubleshooting information, refer to the TAC web site at <http://www.cisco.com/tac>. For example, you can select **Wireless Troubleshooting Center** under Tools and Utilities.

## Interpreting the Indicator LEDs

The client adapter shows messages and error conditions through its two LEDs:

- **Link Integrity/Power LED (green)**—This LED lights when the client adapter is receiving power and blinks slowly when the adapter is linked with the network.
- **Link Activity LED (amber)**—This LED blinks quickly when the client adapter is receiving or transmitting data and blinks in a repeating pattern to indicate an error condition.

[Table 9-1](#) interprets the LED messages during normal operation. [Table 9-2](#) interprets the LED error condition messages.

**Table 9-1 LED Normal Operating Messages**

Green LED	Amber LED	Condition
Blinking quickly	Blinking quickly	Power is on, self-test is OK, and client adapter is scanning for a network.
Blinking slowly	Blinking quickly	Client adapter is associated to an access point.
Continuously on or blinking slowly	Blinking	Client adapter is transmitting or receiving data while associated to an access point.
Off	Blinking quickly	Client adapter is in power save mode.
On continuously	Blinking quickly	Client adapter is in ad hoc mode.

**Table 9-2 LED Error Condition Messages**

Green LED	Amber LED	Condition
Off	Off	Client adapter is not receiving power or an error has occurred.
Off	1 blink at 2-second rate	RAM failure. Refer to the “ <a href="#">Obtaining Technical Assistance</a> ” section on page xiv for technical support information.
Off	2 fast blinks, 1-second pause, 1 blink, 2-second pause	A configuration error has occurred (for example, WEP is enabled in ACU but the client adapter has not been programmed with a valid WEP key). Recheck your client adapter’s configuration settings in ACU.
Off	2 fast blinks, 2-second pause	Flash boot block checksum failure. Refer to the “ <a href="#">Obtaining Technical Assistance</a> ” section on page xiv for technical support information.
Off	3 fast blinks, 2-second pause	Firmware checksum failure. Reload the firmware.



**Table 9-2 LED Error Condition Messages (continued)**

Green LED	Amber LED	Condition
Off	4 fast blinks, 2-second pause	MAC address error (error reading MAC chip). Reload the firmware.
Off	5 fast blinks, 2-second pause	Physical layer (PHY) access error. Refer to the <a href="#">“Obtaining Technical Assistance”</a> section on page xiv for technical support information.
Off	6 fast blinks, 2-second pause	Incompatible firmware. Load the correct firmware version.

## Problems after Installing the Driver



### Note

If you experience problems during driver installation, you may want to restart the installation process. Go to the [“Removing the Driver and Client Utility”](#) section on page 8-6 to start with a clean installation.

Follow the instructions in this section if you experience difficulty with your client adapter after installing the driver (for instance, your computer does not display the network login screen, the green LED does not blink to indicate that the adapter is active, and so on).

## Radio Not Found

If your computer’s operating system is Mac OS X and a client utility message indicates that the radio cannot be found, verify that the CiscoPCCardRadio.kext driver or the CiscoPCIRadio.kext driver (depending on your client adapter) is installed in the /System/Library/Extensions folder.

- If you cannot find the driver, re-install the package and restart your computer.
- If you find the driver, try removing and re-inserting the client adapter in your computer. Wait a few seconds before reinserting the client adapter. Restart your computer.

## Client Adapter Recognition Problems

If your computer’s operating system is Mac OS 9, verify that the driver (pcm3x0) and enablers (pcm3x0Enabler) are installed. They should be in the Extensions folder of the System folder.

- If you cannot find the driver, reinstall it and restart the computer.
- If the driver is properly installed, eject the client adapter and reinsert it. Wait a few seconds before reinserting the client adapter.

## Problems Associating to the Access Point

Follow the instructions below if your client adapter fails to associate to the access point:

- If possible, move your Macintosh a few feet closer to the access point and try again.
- Make sure the client adapter is securely inserted in your's PC card slot or PCI slot.
- If you are using a PCI client adapter, make sure the antenna is securely attached.
- Make sure the access point is turned on and operating.
- Check that all parameters are set properly for both the client adapter and the access point. These include the network name or SSID, network type and channel, WEP activation, and LEAP activation.
- If the client adapter still fails to establish contact, refer to the [“Obtaining Technical Assistance” section on page xiv](#) for technical support information.
- Try increasing the transmit power level for the client adapter.

## Problems Authenticating

Follow the instructions below if your client adapter fails to authenticate:

- If possible, move your Macintosh a few feet closer to the access point and try again.
- Make sure the client adapter is securely inserted in your's PC card slot or PCI slot.
- If you are using a PCI client adapter, make sure the antenna is securely attached.
- Make sure the access point is turned on and operating.
- Check that all parameters are set properly for both the client adapter and the access point. These include the network name or SSID, network type and channel, WEP activation, LEAP activation, WEP password, and LEAP username and password.
- If your client adapter is a 40-bit card and LEAP is enabled, the adapter can associate to but not authenticate to access points using 128-bit encryption. To authenticate to an access point using 128-bit encryption, you have two possible options:
  - Purchase a 128-bit client adapter. This is the most secure option.
  - Disable WEP for the client adapter and configure the adapter and the access point to associate to mixed cells. This option presents a security risk because your data is not encrypted as it is sent over the RF network.
- If the client adapter still fails to authenticate, refer to the [“Obtaining Technical Assistance” section on page xiv](#) for technical support information.
- Try increasing the transmit power level for the client adapter.

# Problems Connecting to the Network

Follow the instructions below if your client adapter is unable to connect to the network:

- Verify that the client adapter is enabled for your Macintosh Network Preferences panel.
- Verify that the Macintosh Network TCP/IP settings are set properly for the client adapter.
- If the client adapter still fails to authenticate, refer to the [“Obtaining Technical Assistance” section on page xiv](#) for technical support information. Proxy server, network protocols, and further authentication information might be needed to connect to the network.

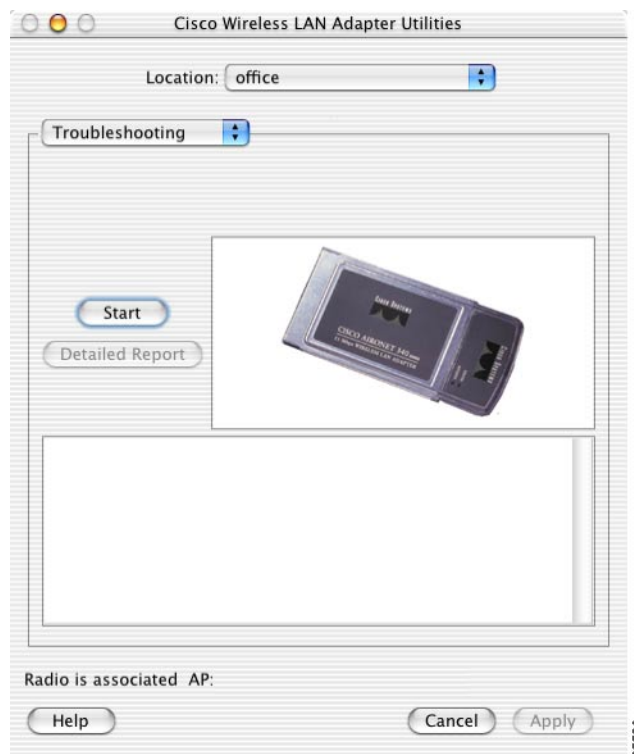
## Running the Troubleshooting Tool

The client utility provides a troubleshooting tool to assist you in identifying and resolving configuration and association problems with your client adapter.

To run the troubleshooting tool perform the following steps:

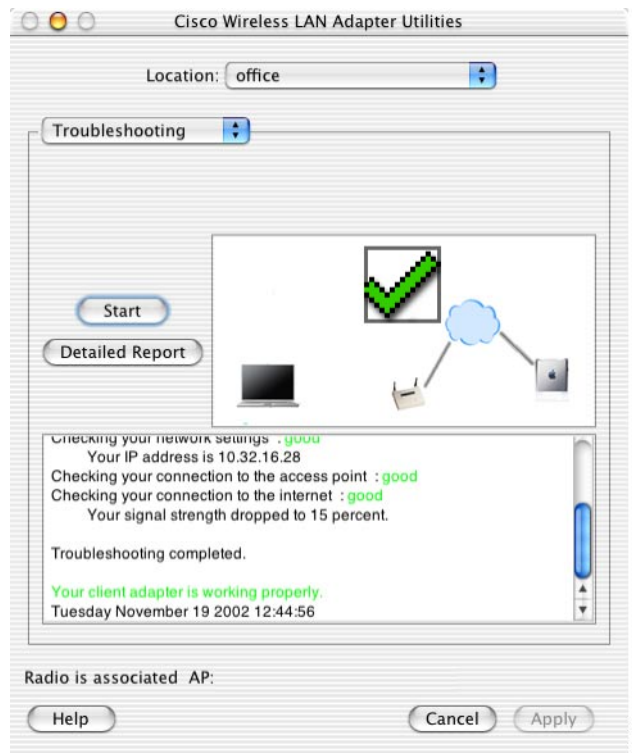
- 
- Step 1** Click the up and down arrows to the right of the basic or advanced properties field.
- Step 2** Select **Troubleshooting** on the drop-down menu and the troubleshooting screen appears (see [Figure 9-1](#)).

**Figure 9-1** Client Utility Troubleshooting Screen



- Step 3** Click **Start** to activate the troubleshooting tool. The troubleshooting tool performs a series of tests to check the operation of the client adapter and presents the results on the troubleshooting screen (see Figure 9-2).

**Figure 9-2 Client Utility Troubleshooting Test Results Screen**



The troubleshooting test results screen indicates the progress of various tests and their results. The troubleshooting tool displays *good* to indicate a test completed successfully, such as *Checking radio: good* or *Checking association with the access point: good*. If a test fails, the troubleshooting tool indicates *error* next to the test. You can scroll through the tests results by clicking the scroll bar on the right side of the screen.

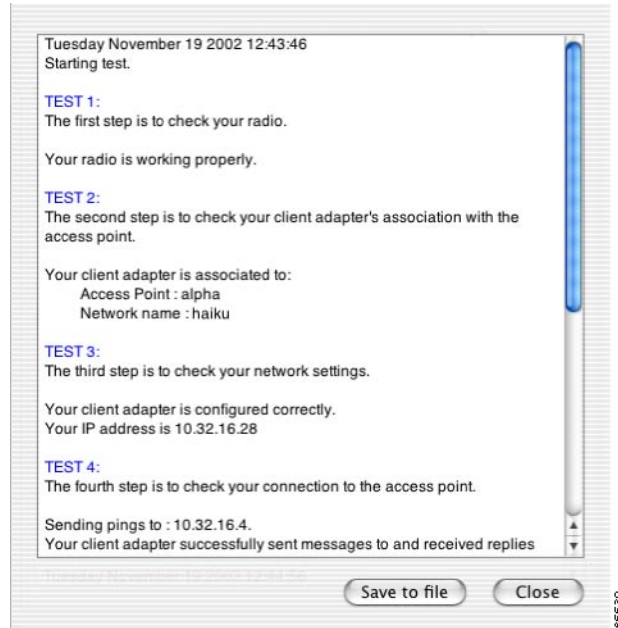


**Note**

You can stop the troubleshooting test at any time by clicking **Stop**.

- Step 4** If you want to view a detailed report of the troubleshooting test results, click **Detailed Report** and the detailed report screen appears (see [Figure 9-3](#)).

**Figure 9-3** Client Utility Troubleshooting Detailed Report Screen



When a troubleshooting test fails, the troubleshooting tool lists possible repair options. You should carefully follow the repair suggestions and run the troubleshooting test again.

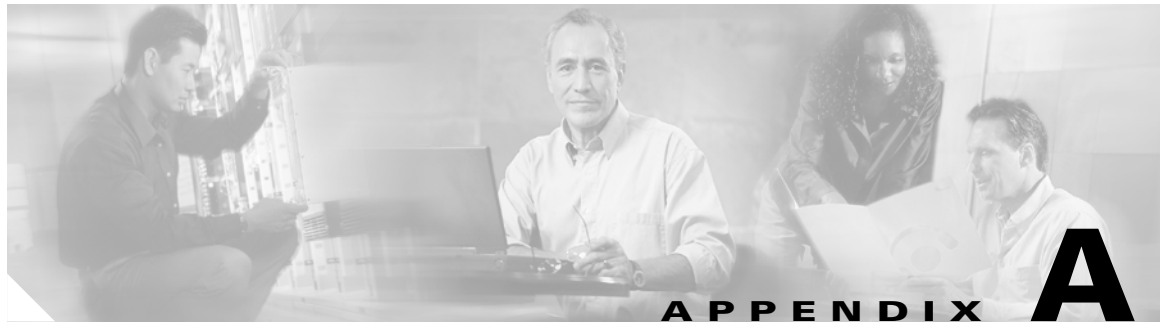


**Note**

The detailed report contains valuable information that can be used by the technical support organization to analyze your problems. You can save the detailed report to a file on your hard disk by clicking **Save to File**.

- Step 5** Click **Close** when you have finished reviewing the test results.
- Step 6** When you have finished running the troubleshooting tests, click the up and down arrows to the right of the troubleshooting field and select basic or advanced properties.





## Technical Specifications

---

This appendix provides technical specifications for the Cisco Aironet Wireless LAN Client Adapters.

The following topics are covered in this appendix:

- [Physical Specifications, page A-2](#)
- [Radio Specifications, page A-3](#)
- [Power Specifications, page A-6](#)
- [Safety and Regulatory Compliance Specifications, page A-7](#)

# Physical Specifications

Table A-1 lists the physical specifications for the Cisco Aironet Wireless LAN Adapters.



## Note

If a distinction is not made between radio or client adapter type, the specification applies to all Cisco Aironet Wireless LAN Client Adapters.

**Table A-1 Physical Specifications for Cisco Aironet Wireless LAN Client Adapters**

Size	
PC card and PC-Cardbus card	4.5 in. L x 2.1 in. W x 0.2 in. H (11.3 cm L x 5.4 cm W x 0.5 cm H)
LM card	3.4 in. L x 2.1 in. W x 0.2 in. H (8.6 cm L x 5.4 cm W x 0.5 cm H)
PCI card	5.8 in. L x 3.2 in. W x 0.5 in. H (14.7 cm L x 8.1 cm W x 1.3 cm H)
Weight	
PC card and LM card	1.3 oz (0.037 kg)
PCI card	4.6 oz (0.13 kg)
PC-Cardbus card	1.5 oz (0.043 kg)
Enclosure	
PC card and PC-Cardbus card	Extended Type II PC card
LM card	Standard Type II PC card with RF connectors
Connector	
PC card and LM card	68-pin PCMCIA
PCI card	PCI card edge
PC-Cardbus card	68-pin Cardbus
Status indicators	Green and amber LEDs; see <a href="#">Chapter 9</a>
Operating temperature	
340 series client adapters	32°F to 158°F (0°C to 70°C)
350 series client adapters	–22°F to 158°F (–30°C to 70°C)
5-GHz client adapters	–22°F to 158°F (–30°C to 70°C)
Storage temperature	–40°F to 185°F (–40°C to 85°C)
Humidity (non-operational)	95% relative humidity
ESD	15 kV (human body model)



# Radio Specifications

Table A-2 lists the physical specifications for the Cisco Aironet Wireless LAN Adapters.

**Table A-2 Radio Specifications for Cisco Aironet Wireless LAN Client Adapters**

Type	
2.4-GHz client adapters	Direct-sequence spread spectrum (DSSS) IEEE 802.11b compliant
5-GHz client adapters	Orthogonal frequency division multiplexing (OFDM) IEEE 802.11a compliant
Transmit power	
<b>Note</b>	Refer to <a href="#">Appendix D, “Channels, Power Levels, and Antenna Gains,”</a> for limitations on radiated power (EIRP) levels in the European community and other countries.
<b>Note</b>	If you are using an older version of a 340 or 350 series client adapter, your power level options may be different than those listed here.
340 series PC card	30 mW (15 dBm) 1 mW (0 dBm)
340 series LM card and PCI card	30 mW (15 dBm) 15 mW (12 dBm) 5 mW (7 dBm) 1 mW (0 dBm)
350 series client adapters	100 mW (20 dBm) 50 mW (17 dBm) 30 mW (15 dBm) 20 mW (13 dBm) 5 mW (7 dBm) 1 mW (0 dBm)
PC-Cardbus card	20 mW (13 dBm) 10 mW (10 dBm) 5 mW (7 dBm)  <b>Note</b> These values are based on the FCC peak measurement method as defined in FCC 15.407(a)(4).
Operating frequency	
2.4-GHz client adapters	2.400 to 2.497 GHz (depending on the regulatory domain in which the client adapter is used)
5-GHz client adapters	5.15 to 5.25 GHz in the UNII 1 band* 5.25 to 5.35 GHz in the UNII 2 band* *Depending on the regulatory domain in which the client adapter is used
Usable channels	
2.4-GHz client adapters	2412 to 2484 MHz in 5-MHz increments
5-GHz client adapters	5170 to 5320 MHz in 20-MHz increments

**Table A-2 Radio Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)**

Interference rejection	
2.4-GHz client adapters	35 dB adjacent channel rejection
5-GHz client adapters	16 dB @ 6 Mbps adjacent channel rejection 15 dB @ 9 Mbps adjacent channel rejection 13 dB @ 12 Mbps adjacent channel rejection 11 dB @ 18 Mbps adjacent channel rejection 8 dB @ 24 Mbps adjacent channel rejection 4 dB @ 36 Mbps adjacent channel rejection 0 dB @ 48 Mbps adjacent channel rejection -1 dB @ 54 Mbps adjacent channel rejection
Data rates	
2.4-GHz client adapters	1, 2, 5.5, and 11 Mbps
5-GHz client adapters	6, 9, 12, 18, 24, 36, 48, and 54 Mbps
Modulation	Binary Phase Shift Keying (BPSK) - 1 Mbps Quaternary Phase Shift Keying (QPSK) - 2 Mbps Complementary Code Keying (CCK) - 5.5 and 11 Mbps Orthogonal frequency division multiplexing (OFDM) - 6 to 54 Mbps
Receiver sensitivity	
340 series client adapters	-90 dBm @ 1 Mbps -88 dBm @ 2 Mbps -87 dBm @ 5.5 Mbps -83 dBm @ 11 Mbps
350 series client adapters	-94 dBm @ 1 Mbps -91 dBm @ 2 Mbps -89 dBm @ 5.5 Mbps -85 dBm @ 11 Mbps
5-GHz client adapters	-85 dBm @ 6 Mbps -84 dBm @ 9 Mbps -82 dBm @ 12 Mbps -80 dBm @ 18 Mbps -77 dBm @ 24 Mbps -73 dBm @ 36 Mbps -69 dBm @ 48 Mbps -68 dBm @ 54 Mbps
Receiver delay spread (multipath)	
2.4-GHz client adapters	500 ns @ 1 Mbps 400 ns @ 2 Mbps 300 ns @ 5.5 Mbps 140 ns @ 11 Mbps (350 series client adapters) 70 ns @ 11 Mbps (340 series client adapters)

**Table A-2 Radio Specifications for Cisco Aironet Wireless LAN Client Adapters (continued)**

Range	
340 series client adapters	<p><b>Outdoor</b>  1500 ft (457.2 m) @ 1 Mbps  1200 ft (365.8 m) @ 2 Mbps  800 ft (243.8 m) @ 5.5 Mbps  400 ft (121.9 m) @ 11 Mbps</p> <p><b>Indoor</b>  300 ft (91.4 m) @ 1 Mbps  225 ft (68.6 m) @ 2 Mbps  150 ft (45.7 m) @ 5.5 Mbps  100 ft (30.5 m) @ 11 Mbps</p> <p><b>Note</b> The above range numbers assume the use of a snap-on antenna with the LM card.</p>
350 series client adapters	<p><b>Outdoor</b>  2000 ft (609.6 m) @ 1 Mbps  1500 ft (457.2 m) @ 2 Mbps  1000 ft (304.8 m) @ 5.5 Mbps  800 ft (243.8 m) @ 11 Mbps</p> <p><b>Indoor</b>  350 ft (106.7 m) @ 1 Mbps  250 ft (76.2 m) @ 2 Mbps  200 ft (61 m) @ 5.5 Mbps  150 ft (45.7 m) @ 11 Mbps</p> <p><b>Note</b> The above range numbers assume the use of a snap-on antenna with the LM card.</p>
5-GHz client adapters	<p><b>Outdoor</b>  1200 ft (365.8 m) @ 6 Mbps  700 ft (213.4 m) @ 18 Mbps  120 ft (36.6 m) @ 54 Mbps</p> <p><b>Indoor</b>  200 ft (61.0 m) @ 6 Mbps  150 ft (45.7 m) @ 18 Mbps  70 ft (21.3 m) @ 54 Mbps</p> <p><b>Note</b> The above range numbers assume that the client adapter is being used with a Cisco Aironet 1200 Series access point with a patch antenna. Different range characteristics are likely when using the client adapter with a non-Cisco access point or a Cisco access point with an omni-directional antenna.</p>
Antenna	
PC card	Integrated diversity antenna
LM card	Two MMCX antenna connectors
PCI card	RP-TNC connector
PC-Cardbus card	Integrated patch antenna

# Power Specifications

Table A-3 lists the physical specifications for the Cisco Aironet Wireless LAN Adapters.

**Table A-3 Power Specifications for Cisco Aironet Wireless LAN Client Adapters**

Operational voltage	
PC, LM, and PCI card	5.0 V ( $\pm 0.25$ V)
PC-Cardbus card	3.3 V ( $\pm 0.33$ V)
Receive current steady state	
PC card and LM card	Typically 250 mA
PCI card	Typically 350 mA
PC-Cardbus card	Typically 580 mA
Transmit current steady state	
340 series PC card and LM card	Typically 350 mA @ 15 dBm
340 series PCI card	Typically 450 mA @ 15 dBm
350 series PC card and LM card	Typically 450 mA @ 20 dBm
350 series PCI card	Typically 550 mA @ 20 dBm
PC-Cardbus card	Typically 520 mA
Sleep mode steady state	
340 series PC card and LM card	Typically 15 mA
340 series PCI card	Typically 110 mA
350 series PC card and LM card	Typically 15 mA
350 series PCI card	Typically 115 mA
PC-Cardbus card	Typically 20 mA

# Safety and Regulatory Compliance Specifications

Table A-4 lists the physical specifications for the Cisco Aironet Wireless LAN Adapters.

**Table A-4 Safety and Compliance Specifications for Cisco Aironet Wireless LAN Client Adapters**

Safety	<p>Designed to meet:</p> <ul style="list-style-type: none"> <li>UL 1950 Third Ed.</li> <li>CSA 22.2 No. 950-95</li> <li>IEC 60950 Second Ed., including Amendments 1-4 with all deviations</li> <li>EN 60950 Second Ed., including Amendments 1-4</li> </ul>
EMI and susceptibility	<p>FCC Part 15.107 &amp; 15.109 Class B ICES-003 Class B (Canada) EN 55022 B AS/NZS 3548 Class B VCCI Class B EN 55024 EN 301.489-1 and EN-301.489-17</p>
Radio approvals	<p>FCC Part 15.247 (2.4-GHz client adapters) FCC Part 15.407 (5-GHz client adapters) Canada RSS-139-1 (2.4-GHz client adapters), RSS-210 Japan Telec 33B (2.4-GHz client adapters) Japan ARIB STD-T71 (5-GHz client adapters) EN 300.328 (2.4-GHz client adapters) EN 301.893 (5-GHz client adapters)</p>
RF exposure	<p>OET-65C RSS-102 ANSI C95.1</p>





## Translated Safety Warnings

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This appendix provides translations of the safety warnings that appear in this publication.

The following topics are covered in this section:

- [Explosive Device Proximity Warning, page B-2](#)
- [Warning for Laptop Users, page B-3](#)
- [Dipole Antenna Installation Warning, page B-5](#)

# Explosive Device Proximity Warning



## Warning

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. (To see translations of the warnings that appear in this publication, refer to the appendix "Translated Safety Warnings.")

## Waarschuwing

Gebruik dit draadloos netwerkapparaat alleen in de buurt van onbeschermde ontstekers of in een omgeving met explosieven indien het apparaat speciaal is aangepast om aan de eisen voor een dergelijk gebruik te voldoen.

## Varoitus

Älä käytä johdotonta verkkolaitetta suojaamattomien räjäytysnallien läheisyydessä tai räjäytysalueella, jos laitetta ei ole erityisesti muunneltu sopivaksi sellaiseen käyttöön.

## Attention

Ne jamais utiliser un équipement de réseau sans fil à proximité d'un détonateur non blindé ou dans un lieu présentant des risques d'explosion, sauf si l'équipement a été modifié à cet effet.

## Warnung

Benutzen Sie Ihr drahtloses Netzwerkgerät nicht in der Nähe ungeschützter Sprengkapseln oder anderer explosiver Stoffe, es sei denn, Ihr Gerät wurde eigens für diesen Gebrauch modifiziert und bestimmt.

## Avvertenza

Non utilizzare la periferica di rete senza fili in prossimità di un detonatore non protetto o di esplosivi a meno che la periferica non sia stata modificata a tale proposito.

## Advarsel

Ikke bruk den trådløse nettverksenheten nært inntil uisolerte fenghetter eller i et eksplosivt miljø med mindre enheten er modifisert slik at den tåler slik bruk.

## Aviso

Não opere o dispositivo de rede sem fios perto de cápsulas explosivas não protegidas ou num ambiente explosivo, a não ser que o dispositivo tenha sido modificado para se qualificar especialmente para essa utilização.

## ¡Advertencia!

No utilizar un aparato de la red sin cable cerca de un detonador que no esté protegido ni tampoco en un entorno explosivo a menos que el aparato haya sido modificado con ese fin.

## Varning!

Använd inte den trådlösa nätverksenheten i närheten av oskyddade tändhättar eller i en explosiv miljö om inte enheten modifierats för att kunna användas i sådana sammanhang.



# Warning for Laptop Users



## Warning

In order to comply with RF exposure limits established in the ANSI C95.1 standards, it is recommended when using a laptop with a PC card client adapter that the adapter's integrated antenna is positioned more than 2 inches (5 cm) from your body or nearby persons during extended periods of transmitting or operating time. If the antenna is positioned less than 2 inches (5 cm) from the user, it is recommended that the user limit exposure time.

## Waarschuwing

In het kader van een in de ANSI C95.1 norm vastgelegde limiet voor blootstelling aan straling veroorzaakt door radiofrequenties, dient u bij langdurig gebruik van een laptop met client adapter pc-kaart een afstand van meer dan 5 centimeter aan te houden tussen de geïntegreerde antenne van de adapter en uzelf en enige andere personen. Als deze afstand niet kan worden aangehouden, dient u de tijd dat het apparaat gebruikt wordt te beperken.

## Varoitus

ANSI C95.1 -standardin radiotaajuuksille asettamien altistumisrajojen mukaisesti on suositeltavaa, että käytettäessä kannettavaa tietokonetta, jossa on PC-kortti-asiakas-adapteri, adapterin integroitu antenni on käännetty yli viisi cm pois vartalosta tai lähellä olevista henkilöistä pitkäaikaistenlähetys- tai käyttöjaksojen aikana. Jos antenni on käännetty alle viisi 5 cm käyttäjästä, on suositeltavaa, että käyttäjä rajoittaa altistumisaikaa.

## Attention

Afin de respecter les limitations en matière d'exposition aux fréquences radioélectriques définies par les normes ANSI C95.1, il est recommandé aux utilisateurs d'ordinateurs portables dotés d'adaptateurs client pour carte PC ou aux personnes se trouvant à proximité de se placer à plus de 5 cm de l'antenne de l'adaptateur lors de longues périodes de transmission ou de fonctionnement. Si l'utilisateur se trouve à moins de 5 cm de l'antenne, il est préférable de limiter le temps d'exposition.

## Warnung

In Übereinstimmung mit den in den Sicherheitsstandards ANSI C95.1 verzeichneten Höchstwerten für den Kontakt mit Radiofrequenz (RF) wird für die Benutzung eines Laptops mit PC-Adapterkarten für Clients empfohlen, bei längerer Inbetriebnahme oder Datenübertragung die integrierte Antenne des Adapters mindestens 5 cm vom Benutzer und anderen sich in der Nähe aufhaltenden Personen entfernt aufzustellen. Befindet sich die Antenne weniger als 5 cm vom Benutzer entfernt, sollte die Benutzungsdauer des Geräts eingeschränkt werden.

## Avvertenza

In conformità con i limiti sull'esposizione a frequenze radio stabiliti nelle direttive ANSI C95.1, quando si utilizza un computer portatile con una scheda PC dotata di adattatore client è consigliabile mantenere l'antenna integrata dell'adattatore a più di 5 cm di distanza durante periodi di esposizione prolungati. Se l'antenna è posizionata a meno di 5 cm di distanza dall'utente, è consigliabile limitare i tempi di esposizione alle frequenze.

## Advarsel

Du må overholde begrensningene for RF-eksponering som er fastsatt i ANSI C95.1-standardene. Derfor anbefaler vi, når du bruker en bærbar PC med et klientkort i PC-format, at kortets innebygde antenne plasseres mer enn 5 cm fra deg eller personer i nærheten under lengre perioder med overføring eller bruk. Hvis antennen er plassert mindre enn 5 cm fra brukeren, anbefaler vi at brukeren begrenser eksponeringstiden.

**Aviso** Para estar em conformidade com os limites de exposição RF estabelecidos nas normas ANSI C95.1 recomenda-se que, aquando da utilização de um laptop com um adaptador de cliente PC card, a antena integrada do adaptador esteja posicionada a mais de 5 cm do seu corpo ou de pessoas na vizinhança durante longos períodos de tempo de transmissão ou operação. Se a antena estiver posicionada a menos de 5 cm do utilizador, recomenda-se que o utilizador limite o tempo de exposição.

**¡Advertencia!** Para cumplir los límites de exposición a radiofrecuencia (RF) que se establecen en la norma ANSI C95.1, al utilizar un equipo portátil con un adaptador cliente de tarjeta PC, sitúe la antena del adaptador al menos a 2 pulgadas(5 cm) del usuario o de las personas adyacentes durante periodos largos de transmisión o funcionamiento. Si la distancia es inferior a 2 pulgadas (5 cm), se recomienda limitar el tiempo de exposición.

**Varning!** För att följa de regler för radiosändare som utfärdats enligt ANSI-standard C95.1, rekommenderar vi att PC Card-adapters inbyggda antenn befinner sig minst 5 cm från dig själv och andra personer när du använder en bärbar dator med PC Card-adaptar under en längre tid. Om antennen befinner sig mindre än 5 cm från användaren, rekommenderar vi inte användning under längre tid.

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# Dipole Antenna Installation Warning



## Warning

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

## Waarschuwing

Om te voldoen aan de FCC radiofrequentie (RF) blootstellingslimieten dienen dipoolantennes zich minstens 20 cm of meer van de lichamen van alle personen bevinden.

## Varoitus

FCC:n antamien radiotaajuuksille altistumista koskevien rajoitusten mukaan dipoliantennien on sijaittava vähintään 20 cm:n päässä kaikista henkilöistä.

## Attention

Pour se conformer aux limites d'exposition à la fréquence radio préconisées par la FCC (Federal Communications Commission), les antennes dipôles doivent se situer à un minimum de 20 cm de toute personne.

## Warnung

Um die in den FCC-Richtlinien festgelegten Expositionshöchstgrenzen für Radiofrequenzen (RF) nicht zu überschreiten, sollten Dipolantennen mindestens 20 cm (7,9 Zoll) vom Körper aller Person entfernt aufgestellt werden.

## Avvertenza

Per conformarsi ai limiti FCC di esposizione a radiofrequenza (RF), le antenne a dipolo devono stare ad una distanza minima di 20 cm dal corpo di ogni persona.

## Advarsel

I henhold til eksponeringsgrensene for radiofrekvenser (RF), skal dipole antenner befinne seg på en avstand av minst 20 cm eller mer fra mennesker.

## Aviso

Para estar de acordo com as normas FCC de limites de exposição para frequência de rádio (RF), as antenas dipolo devem estar distantes no mínimo 20 cm (7,9 pol) do corpo de qualquer pessoa.

## ¡Advertencia!

Para cumplir con los límites de exposición de radio frecuencia (RF) de la Comisión Federal de Comunicaciones (FCC) es preciso ubicar las antenas dipolo a un mínimo de 20 cm (7,9 pulgadas) o más del cuerpo de las personas.

## Varning!

För att följa FCC-exponeringsgränserna för radiofrekvens (RF), bör dipolantennerna placeras på minst 20 cm avstånd från alla människor.





## Declarations of Conformity and Regulatory Information

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This appendix provides declarations of conformity and regulatory information for the Cisco Aironet Wireless LAN Client Adapters.

The following topics are covered in this appendix:

- [Manufacturer's Federal Communication Commission Declaration of Conformity Statement, page C-2](#)
- [Department of Communications – Canada, page C-3](#)
- [European Community, Switzerland, Norway, Iceland, and Liechtenstein, page C-4](#)
- [Declaration of Conformity for RF Exposure, page C-6](#)
- [Guidelines for Operating Cisco Aironet Wireless LAN Adapters in Japan, page C-6](#)

# Manufacturer's Federal Communication Commission Declaration of Conformity Statement



**Models:** AIR-PCM341, AIR-PCM342, AIR-LMC341, AIR-LMC342, AIR-PCI341, AIR-PCI342, AIR-PCM351, AIR-PCM352, AIR-LMC351, AIR-LMC352, AIR-PCI351, AIR-PCI352, AIR-PCM350-A-K9, AIR-PCM350-40-A-K9, AIR-LMC350-A-K9, AIR-LMC350-40-A-K9, AIR-PCI350-A-K9, AIR-PCI350-10-A-K9, AIR-MPI350-xx-A-K9 (where xx is the OEM code), AIR-CB20A-A-K9, AIR-CB20A-A-K9-4

**FCC Certification Number:** LDK102038 (AIR-PCM34x),  
LDK102035 (AIR-LMC34x and AIR-PCI34x),  
LDK102040 (AIR-xxx35x),  
LDK102042 (AIR-MPI350),  
LDK102044 (AIR-CB20A)

**Manufacturer:** Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134-1706  
USA

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

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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

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



## Caution

The Part 15 radio device operates on a non-interference basis with other devices operating at this frequency when using integrated antennas or those listed in [Table C-1](#). Any changes or modification to the product not expressly approved by Cisco could void the user's authority to operate this device.


**Caution**

Within the 5.15-to-5.25-GHz band, UNII devices are restricted to indoor operations to reduce any potential for harmful interference to co-channel Mobile Satellite Systems (MSS) operations.

**Table C-1 2.4-GHz Antennas**

Cisco Part Number	Model	Gain
AIR-ANT3338	Parabolic dish	21
AIR-ANT1949	Yagi	13.5
AIR-ANT4121	Omni-directional	12.0
AIR-ANT3549	Patch	8.5
AIR-ANT2012	Spatial diversity	6.5
AIR-ANT1729	Patch	6.0
AIR-ANT2506	Omni-directional	5.1
AIR-ANT3213	Omni-directional	5.0
AIR-ANT1728	Omni-directional	5.0
AIR-ANT3195	Patch	3.0
AIR-ANT4941	Dipole	2.2
AIR-ANT5959	Omni-directional	2.0


**Note**

AIR-ANT3338 is approved for use only with LM cards.

# Department of Communications – Canada

## Canadian Compliance Statement

This Class B Digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte les exigences du Règlement sur le matériel brouilleur du Canada.

This device complies with Class B Limits of Industry Canada. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Cisco Aironet 11-Mbps 2.4-GHz client adapters are certified to the requirements of RSS-139-1 and RSS-210 for 2.4-GHz spread spectrum devices, and Cisco Aironet 54-Mbps 5-GHz client adapters are certified to the requirements of RSS-210 for 5-GHz devices. The use of these devices in a system operating either partially or completely outdoors may require the user to obtain a license for the system according to the Canadian regulations. For further information, contact your local Industry Canada office.

## European Community, Switzerland, Norway, Iceland, and Liechtenstein

### Declaration of Conformity with Regard to the R&TTE Directive 1999/5/EC

English:	This equipment is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Deutsch:	Dieses Gerät entspricht den grundlegenden Anforderungen und den weiteren entsprechenden Vorgaben der Richtlinie 1999/5/EU.
Dansk:	Dette udstyr er i overensstemmelse med de væsentlige krav og andre relevante bestemmelser i Direktiv 1999/5/EF.
Español:	Este equipo cumple con los requisitos esenciales así como con otras disposiciones de la Directiva 1999/5/EC.
Ελληνας:	Αυτός ο εξοπλισμός συμμορφώνεται με τις ουσιώδεις απαιτήσεις και τις λοιπές διατάξεις της Οδηγίας 1999/5/EK.
Français:	Cet appareil est conforme aux exigences essentielles et aux autres dispositions pertinentes de la Directive 1999/5/EC.
Íslenska:	Þessi búnaður samrýmist lögboðnum kröfum og öðrum ákvæðum tilskipunar 1999/5/ESB.
Italiano:	Questo apparato é conforme ai requisiti essenziali ed agli altri principi sanciti dalla Direttiva 1999/5/EC.
Nederlands:	Deze apparatuur voldoet aan de belangrijkste eisen en andere voorzieningen van richtlijn 1999/5/EC.
Norsk:	Dette utstyret er i samsvar med de grunnleggende krav og andre relevante bestemmelser i EU-direktiv 1999/5/EC.
Português:	Este equipamento satisfaz os requisitos essenciais e outras provisões da Directiva 1999/5/EC.
Suomalainen:	Tämä laite täyttää direktiivin 1999/5/EY oleelliset vaatimukset ja on siinä asetettujen muidenkin ehtojen mukainen.
Svenska:	Denna utrustning är i överensstämmelse med de väsentliga kraven och andra relevanta bestämmelser i Direktiv 1999/5/EC.

The Declaration of Conformity related to this product can be found at the following URL:  
<http://www.ciscofax.com>.



## 2.4-GHz Client Adapters

For the 340 series, the following standards were applied:

- Radio: ETS 300.328
- EMC: ETS 300.826
- Safety: EN 60950

The following CE mark is affixed to the 340 series equipment:



For the 350 series, the following standards were applied:

- Radio: EN 300.328-1, EN 300.328-2
- EMC: EN 301 489-1, EN 301 489-17
- Safety: EN 60950

The following CE mark is affixed to the 350 series equipment (except for the 350 series mini PCI card, or AIR-MPI350):



The above CE mark is required as of April 8, 2000 but might change in the future.

The following CE mark is affixed to the 350 series mini PCI card (AIR-MPI350):

**Note**

This equipment is intended to be used in all EU and EFTA countries. Outdoor use may be restricted to certain frequencies and/or may require a license for operation. For more details, contact your customer service representative.

**Note**

Combinations of power levels and antennas resulting in a radiated power level above 100 mW equivalent isotropic radiated power (EIRP) are considered as not compliant with the above mentioned directive and are not allowed for use within the European community and other countries that have adopted the European R&TTE directive 1999/5/EC or the CEPT recommendation Rec 70.03 or both. For more details on legal combinations of power levels and antennas, refer to the [“Maximum Power Levels and Antenna Gains”](#) section on page D-4.

## 5-GHz Client Adapters

For the 5-GHz client adapters, the following standards were applied:

- Radio: EN 301.893
- EMC: EN 301.489-1, EN 301.489-17
- Safety: EN 60950

The following CE mark is affixed to the 5-GHz equipment:



## Declaration of Conformity for RF Exposure

The radio module has been evaluated under FCC Bulletin OET 65C and found compliant to the requirements as set forth in CFR 47 Sections 2.1091, 2.1093, and 15.247 (b) (4) addressing RF Exposure from radio frequency devices.

## Guidelines for Operating Cisco Aironet Wireless LAN Adapters in Japan

This section provides guidelines for avoiding interference when operating Cisco Aironet Wireless LAN Adapters in Japan. These guidelines are provided in both Japanese and English.

### Japanese Translation

この機器の使用周波数帯では、電子レンジ等の産業・科学・医療用機器のほか工場の製造ライン等で使用されている移動体識別用の構内無線局（免許を要する無線局）及び特定小電力無線局（免許を要しない無線局）が運用されています。

- 1 この機器を使用する前に、近くで移動体識別用の構内無線局及び特定小電力無線局が運用されていないことを確認して下さい。
- 2 万一、この機器から移動体識別用の構内無線局に対して電波干渉の事例が発生した場合には、速やかに使用周波数を変更するか又は電波の発射を停止した上、下記連絡先にご連絡頂き、混信回避のための処置等(例えば、パーティションの設置など)についてご相談して下さい。
- 3 その他、この機器から移動体識別用の特定小電力無線局に対して電波干渉の事例が発生した場合など何かお困りのことが起きたときは、次の連絡先へお問い合わせ下さい。

連絡先 : 03-5549-6500

43768

## English Translation

This equipment operates in the same frequency bandwidth as industrial, scientific, and medical devices such as microwave ovens and mobile object identification (RF-ID) systems (licensed premises radio stations and unlicensed specified low-power radio stations) used in factory production lines.

1. Before using this equipment, make sure that no premises radio stations or specified low-power radio stations of RF-ID are used in the vicinity.
2. If this equipment causes RF interference to a premises radio station of RF-ID, promptly change the frequency or stop using the device; contact the number below and ask for recommendations on avoiding radio interference, such as setting partitions.
3. If this equipment causes RF interference to a specified low-power radio station of RF-ID, contact the number below.

Contact Number: 03-5549-6500





## Channels, Power Levels, and Antenna Gains

---

This appendix lists the IEEE 802.11a and IEEE 802.11b channels supported by the world's regulatory domains as well as the maximum power levels and antenna gains allowed per domain.

The following topics are covered in this appendix:

- [Channels, page D-2](#)
- [Maximum Power Levels and Antenna Gains, page D-4](#)

# Channels

## IEEE 802.11a

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11a 20-MHz-wide channel are shown in [Table D-1](#).

**Table D-1 Channels for IEEE 802.11a**

Channel Identifier	Frequency, in MHz	Regulatory Domains			
		Americas (-A)	Japan (-J)	Singapore (-S)	Taiwan (-T)
34	5170	-	X	-	-
36	5180	X	-	X	-
38	5190	-	X	-	-
40	5200	X	-	X	-
42	5210	-	X	-	-
44	5220	X	-	X	-
46	5230	-	X	-	-
48	5240	X	-	X	-
52	5260	X	-	-	X
56	5280	X	-	-	X
60	5300	X	-	-	X
64	5320	X	-	-	X
149	5745	-	-	-	-
153	5765	-	-	-	-
157	5785	-	-	-	-
161	5805	-	-	-	-



### Note

All channel sets are restricted to indoor usage except the Americas (-A), which allows for indoor and outdoor use on channels 52 through 64 in the United States.

## IEEE 802.11b

The channel identifiers, channel center frequencies, and regulatory domains of each IEEE 802.11b 22-MHz-wide channel are shown in [Table D-2](#).

**Table D-2 Channels for IEEE 802.11b**

Channel Identifier	Frequency, in MHz	Regulatory Domains				
		Americas (-A)	EMEA (-E)	Israel (-I)	China (-C)	Japan (-J)
1	2412	X	X	-	X	X
2	2417	X	X	-	X	X
3	2422	X	X	X	X	X
4	2427	X	X	X	X	X
5	2432	X	X	X	X	X
6	2437	X	X	X	X	X
7	2442	X	X	X	X	X
8	2447	X	X	X	X	X
9	2452	X	X	X	X	X
10	2457	X	X	-	X	X
11	2462	X	X	-	X	X
12	2467	-	X	-	-	X
13	2472	-	X	-	-	X
14	2484	-	-	-	-	X



### Note

Mexico is included in the Americas regulatory domain; however, channels 1 through 8 are for indoor use only while channels 9 through 11 can be used indoors and outdoors. Users are responsible for ensuring that the channel set configuration is in compliance with the regulatory standards of Mexico.

# Maximum Power Levels and Antenna Gains

## IEEE 802.11a

An improper combination of power level and antenna gain can result in equivalent isotropic radiated power (EIRP) above the amount allowed per regulatory domain. [Table D-3](#) indicates the maximum power levels and antenna gains allowed for each IEEE 802.11a regulatory domain.

**Table D-3 Maximum Power Levels Per Antenna Gain for IEEE 802.11a**

Regulatory Domain	Maximum Power Level (mW) with 6-dBi Antenna Gain
Americas (-A) (160 mW EIRP maximum on channels 34-48, 800 mW EIRP maximum on channels 52-64)	20
Japan (-J) (10 mW/MHz EIRP maximum)	20
Singapore (-S) (100 mW EIRP maximum)	20
Taiwan (-T) (800 mW EIRP maximum)	20

## IEEE 802.11b

An improper combination of power level and antenna gain can result in equivalent isotropic radiated power (EIRP) above the amount allowed per regulatory domain. [Table D-4](#) indicates the maximum power levels and antenna gains allowed for each IEEE 802.11b regulatory domain.

**Table D-4 Maximum Power Levels Per Antenna Gain for IEEE 802.11b**

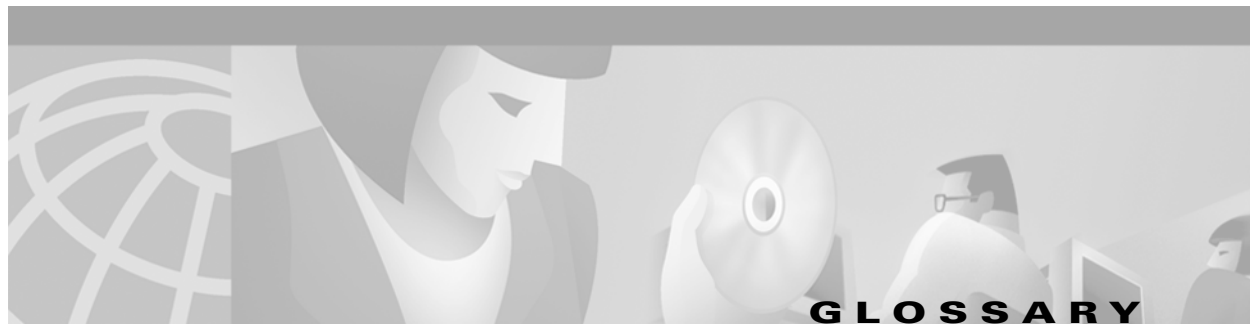
Regulatory Domain	Antenna Gain (dBi)	Maximum Power Level (mW)
Americas (-A) (4 watts EIRP maximum)	0	100
	2.2	100
	5.2	100
	6	100
	8.5	100
	12	100
	13.5	100
	21	20



**Table D-4** Maximum Power Levels Per Antenna Gain for IEEE 802.11b (continued)

Regulatory Domain	Antenna Gain (dBi)	Maximum Power Level (mW)
EMEA (-E) (100 mW EIRP maximum)	0	100
	2.2	50
	5.2	30
	6	30
	8.5	5
	12	5
	13.5	5
	21	1
Israel (-I) (100 mW EIRP maximum)	0	100
	2.2	50
	5.2	30
	6	30
	8.5	5
	12	5
	13.5	5
	21	1
China (-C) (10 mW EIRP maximum)	0	5
	2.2	5
	5.2	n/a
	6	n/a
	8.5	n/a
	12	n/a
	13.5	n/a
	21	n/a
Japan (-J) (10 mW/MHz EIRP maximum)	0	50
	2.2	30
	5.2	30
	6	30
	8.5	n/a
	12	n/a
	13.5	5
	21	n/a





## GLOSSARY

- 802.11** The IEEE standard that specifies carrier sense media access control and physical layer specifications for 1- and 2-megabit-per-second (Mbps) wireless LANs.
- 802.11a** The IEEE standard that governs the deployment of 5-GHz OFDM systems. It specifies the implementation of the physical layer for wireless UNII bands and provides four channels per 100 MHz of bandwidth.
- 802.11b** The IEEE standard that specifies carrier sense media access control and physical layer specifications for 5.5- and 11-Mbps wireless LANs.

---

### A

- Access Point** A wireless LAN data transceiver that uses radio waves to connect a wired network with wireless stations.
- Ad Hoc Network** A wireless network composed of stations without Access Points.
- Alphanumeric** A set of characters that contains both letters and numbers.
- Associated** A station is configured properly to allow it to wirelessly communicate with an Access Point.

---

### B

- Bandwidth** Specifies the amount of the frequency spectrum that is usable for data transfer. It identifies the maximum data rate that a signal can attain on the medium.
- Beacon** A wireless LAN packet that signals the availability and presence of the wireless device. Beacon packets are sent by access points and base stations; however, client radio cards send beacons when operating in computer to computer (Ad Hoc) mode.
- BOOTP** Boot Protocol. A protocol used for the static assignment of IP addresses to devices on the network.
- BPSK** A modulation technique used by IEEE 802.11-compliant wireless LANs for transmission at 1 Mbps.

**Broadcast key rotation** A security feature for use with dynamic WEP keys. If your client adapter uses LEAP or EAP-TLS authentication and you enable this feature, the access point changes the dynamic broadcast WEP key that it provides at the interval you select.

**Broadcast Packet** A single data message (packet) sent to all addresses on the same subnet.

---

## C

**Cardbus** Cardbus is a high-performance variation of the PC Card that can support the high data rates of 802.11a wireless adapter clients. Cardbus slots are reverse-compatible with PC Cards, but Cardbus cards only operate in Cardbus slots.

**CCK** Complementary code keying. A modulation technique used by IEEE 802.11-compliant wireless LANs for transmission at 5.5 and 11 Mbps.

**Cell** The area of radio range or coverage in which the wireless devices can communicate with the base station. The size of the cell depends upon the speed of the transmission, the type of antenna used, and the physical environment, as well as other factors.

**Client** A radio device that uses the services of an Access Point to communicate wirelessly with other devices on a local area network.

**CSMA** Carrier sense multiple access. A wireless LAN media access method specified by the IEEE 802.11 specification.

**Cyclic Redundancy Check (CRC)** A method of checking for errors in a received packet.

---

## D

**Data Rates** The range of data transmission rates supported by a device. Data rates are measured in megabits per second (Mbps).

**dBi** A ratio of decibels to an isotropic antenna that is commonly used to measure antenna gain. The greater the dBi value, the higher the gain, and the more acute the angle of coverage.

**DHCP** Dynamic host configuration protocol. A protocol available with many operating systems that automatically issues IP addresses within a specified range to devices on the network. The device retains the assigned address for a specific administrator-defined period.

**Dipole** A type of low-gain (2.2-dBi) antenna consisting of two (often internal) elements.

<b>Domain Name</b>	The text name that refers to a grouping of networks or network resources based on organization-type or geography; for example: name.com—commercial; name.edu—educational; name.gov—government; ISPname.net—network provider (such as an ISP); name.ar—Argentina; name.au—Australia; and so on.
<b>DNS</b>	Domain Name System server. A server that translates text names into IP addresses. The server maintains a database of host alphanumeric names and their corresponding IP addresses.
<b>DSSS</b>	Direct sequence spread spectrum. A type of spread spectrum radio transmission that spreads its signal continuously over a wide frequency band.

---

## E

<b>EAP</b>	Extensible Authentication Protocol. An optional IEEE 802.1x security feature ideal for organizations with a large user base and access to an EAP-enabled Remote Authentication Dial-In User Service (RADIUS) server.
<b>Ethernet</b>	The most widely used wired local area network. Ethernet uses carrier sense multiple access (CSMA) to allow computers to share a network and operates at 10, 100, or 1000 Mbps, depending on the physical layer used.

---

## F

<b>File Server</b>	A repository for files so that a local area network can share files, mail, and programs.
<b>Firmware</b>	Software that is programmed on a memory chip.
<b>Full Duplex</b>	A means of communication whereby each node receives and transmits simultaneously (two-way). See also <a href="#">Half Duplex</a> .

---

## G

<b>Gateway</b>	A device that connects two otherwise incompatible networks together.
<b>GHz</b>	Gigahertz. One billion cycles per second. A unit of measure for frequency.

---

## H

<b>Half Duplex</b>	A means of communication whereby each node receives and transmits in turn (one-way). See also <a href="#">Full Duplex</a> .
<b>Hexadecimal</b>	A set of characters consisting of ten numbers and six letters (0-9, A-F, and a-f).

---

**I**

<b>IEEE</b>	Institute of Electrical and Electronic Engineers. A professional society serving electrical engineers through its publications, conferences, and standards development activities. The body responsible for the Ethernet 802.3 and wireless LAN 802.11 specifications.
<b>Infrastructure</b>	The wired Ethernet network.
<b>IP Address</b>	The Internet Protocol (IP) address of a station.
<b>IP Subnet Mask</b>	The number used to identify the IP subnetwork, indicating whether the IP address can be recognized on the LAN or if it must be reached through a gateway. This number is expressed in a form similar to an IP address; for example: 255.255.255.0.
<b>Isotropic</b>	An antenna that radiates its signal 360 degrees both vertically and horizontally in a perfect sphere.

---

**L**

<b>LEAP</b>	LEAP, or <i>EAP-Cisco Wireless</i> , is the 802.1X authentication type that is available for use with operating systems that do not have EAP support. Support for LEAP is provided in the client adapter's firmware and the Cisco software that supports it, rather than in the operating system. With LEAP, a username and password are used by the client adapter to perform mutual authentication with the RADIUS server through an access point.
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**M**

<b>MAC Address</b>	Media Access Control address. A unique 48-bit number used in Ethernet data packets to identify an Ethernet device, such as an access point or your client adapter.
<b>MIC</b>	Message integrity check. MIC prevents bit-flip attacks on encrypted packets. During a bit-flip attack, an intruder intercepts an encrypted message, alters it slightly, and retransmits it, and the receiver accepts the retransmitted message as legitimate. The client adapter's driver must support MIC functionality, and MIC must be enabled on the access point.
<b>Modulation</b>	Any of several techniques for combining user information with a transmitter's carrier signal.
<b>Multicast Packet</b>	A single data message (packet) sent to multiple addresses.
<b>Multipath</b>	The echoes created as a radio signal bounces off of physical objects.

---

**O**

<b>OFDM</b>	Orthogonal frequency division multiplexing. A multicarrier modulation method for broadband wireless communications.
<b>Overrun Packets</b>	Packets that were discarded because the access point had a temporary overload of packets to handle.

---

**P**

<b>Packet</b>	A basic message unit for communication across a network. A packet usually includes routing information, data, and sometimes error detection information.
<b>PC Card</b>	A credit-card-sized card that plug into portable computers, and some desktop computers, to add and remove network adapters, modems, hard disks, and other devices without requiring that you open the box. These PC Cards conform to several standards set by the PCMCIA.

---

**Q**

<b>QPSK</b>	Quadruple Phase Shift Keying. A modulation technique used by IEEE 802.11-compliant wireless LANs for transmission.
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**R**

<b>Radio Channel</b>	The frequency at which a radio operates.
<b>Range</b>	A linear measure of the distance that a transmitter can send a signal.
<b>Receiver Sensitivity</b>	A measurement of the weakest signal a receiver can receive and still correctly translate it into data.
<b>RF</b>	Radio frequency. A generic term for radio-based technology.
<b>Roaming</b>	A feature of some Access Points that allows users to move through a facility while maintaining an unbroken connection to the LAN.
<b>RP-TNC</b>	A connector type unique to Cisco Aironet radios and antennas. Part 15.203 of the FCC rules covering spread spectrum devices limits the types of antennas that may be used with transmission equipment. In compliance with this rule, Cisco Aironet, like all other wireless LAN providers, equips its radios and antennas with a unique connector to prevent attachment of non-approved antennas to radios.

---

**S**

- Spread Spectrum** A radio transmission technology that spreads the user information over a much wider bandwidth than otherwise required in order to gain benefits such as improved interference tolerance and unlicensed operation.
- SSID** Service Set Identifier (also referred to as Radio Network Name). A unique identifier used to identify a radio network and which stations must use to be able to communicate with each other or to an access point. The SSID can be any alphanumeric entry up to a maximum of 32 characters.

---

**T**

- TKIP** Temporal Key Integrity Protocol. Also referred to as *WEP key hashing*. A security feature that defends against an attack on WEP in which the intruder uses the initialization vector (IV) in encrypted packets to calculate the WEP key. TKIP removes the predictability that an intruder relies on to determine the WEP key by exploiting IVs.
- Transmit Power** The power level of radio transmission.

---

**U**

- Unicast Packet** A single data message (packet) sent to a specific IP address.
- UNII** Unlicensed National Information Infrastructure. An FCC regulatory domain for 5-GHz wireless devices. UNII bands are 100 MHz wide and divided into four channels when using 802.11a OFDM modulation.
- UNII 1** A UNII band dedicated to in-building wireless LAN applications. UNII 1 is located at 5.15 to 5.25 GHz and allows for a maximum transmit power of 40 mW (or 16 dBm) with an antenna up to 6 dBi. UNII 1 regulations require a nonremovable, integrated antenna.
- UNII 2** A UNII band dedicated to in-building wireless LAN applications. UNII 2 is located at 5.25 to 5.35 GHz and allows for a maximum transmit power of 200 mW (or 23 dBm) with an antenna up to 6 dBi. UNII 2 regulations allow for an auxiliary, user-installable antenna.

---

**W**

- WEP** Wired Equivalent Privacy. An optional security mechanism defined within the 802.11 standard designed to make the link integrity of wireless devices equal to that of a cable.
- Workstation** A computing device with an installed client adapter.





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