Aironet™

User's Guide
4800B Series
Aironet Wireless LAN Adapter

PC4800B	LM4800B
PC4810B	LM4810B
PC4820B	LM4820B

DOC-710-005314-A0

Aironet Wireless Communications, Inc.

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Table of Contents

About the User's Guide

This guide covers the installation, configuration, control, and maintenance of your Aironet 4800B Series PC Card Wireless LAN Adapter. The Guide is arranged as follows:

Section 1 – *Installation* – describes installation of the PC Card.

Section 2 – *Utilities* – provides detailed procedures for using the utilities to load new firmware versions, as well as how to perform link tests and site surveys.

Section 3 – *Error Messages and Troubleshooting* – provides detailed descriptions of the LED messages and error codes, as well as general procedures for correcting common problems.

Appendix A – *Aironet Wireless LAN Adapter Overview* – provides a general introduction to the 4800B Series PC Card, direct sequence radio technology, and the various configurations you can use when operating the 4800B Series PC Card in your infrastructure.

Appendix B – *Specifications* – provides radio and physical specifications.

Appendix C – *Channels* – provides channel identifiers and channel center frequencies for various area regulatory agencies.

Appendix D – *Declarations of Conformity* – provides conformity information about the 4800B Series Wireless LAN Adapter.

Appendix E – *Technical Support* – provides contact information for Aironet.

Typographical Conventions

When reading the User's Guide and Technical Reference Manual, it is important to understand the symbol and formatting conventions used in the documentation. The following symbols are used in the guide.

Convention	Type of Information
	Indicates a note which contains important information.
	Indicates procedures which, if not observed, could result in loss of data or damage to the equipment.
Bold type	An action you must perform, such as typing a character or making a selection with your mouse.

Section 1

Installing the Wireless LAN Adapter

This section describes the procedures for installing the Wireless LAN Adapter.

Here's what you'll find in this section:

- Before You Start
- Installing the Wireless LAN Adapter

Before You Start

For the PC Card to be used with a computing device (desktop personal computer, notebook, laptop computer, portable or hand-held device), the device must be equipped with an internal or external PC Card Type II or Type III slot. All drivers and supporting software (card and socket services) for the PC Card slot must be loaded and configured.

Ask your system administrator for the following information, which you may need to provide during driver installation:

• Your Wireless Client Name

• Your Wireless SSID

• For Windows 98 networking, your computer name and workgroup name

• For your network account, your user name and password

• Your IP address (unless using a DHCP server)

After unpacking the PC Card, make sure the following items are present and in good condition:

• PC4800B Wireless LAN Adapter

• Aironet 4800 Series for Windows 95 & NT CD

• Aironet 4800 Series for Windows 98 CD

If any item is damaged or missing, contact your Aironet supplier. Save all shipping and packing material to repack the unit should service be required.

NOTE: Any remote antenna and its associated wiring for an LM4800B Series Wireless LAN Adapter is ordered and packed separately. (The integrated antenna on the PC4800B Series Wireless LAN Adapter is permanently attached.)

Installing the Wireless LAN Adapter

This section provides instructions for installing an Aironet client card on a computer using Windows 98, Windows 95, and Windows NT.

Before you begin, examine the PC Card. One end is a dual-row, 68-pin PC Card connector. This side will be inserted into the PC Card slot with the Aironet logo on the PC Card facing up. The card is keyed so it can be inserted only one way into the PC Card slot.

CAUTION: The following procedures and physical connections apply generally to normal and conventional PC Card slots. In the cases of custom or non-conventional equipment, be alert to possible differences in PC Card slot configurations.

The PC Card can be connected to a PC Card Type II slot. This includes slots that support both Type II and Type III cards.

CAUTION: Do not force the PC Card into the PC Card slot. Forcing it will damage both the PC Card and the slot. If the PC Card does not go in easily, remove the card and re-insert it.

Aironet Driver Installation Steps

Installing the Driver for Windows 98

If the operating system on your computer is Windows 98, follow these steps (if 95, see page 7; if NT, see page 9):

1. Remove all PC Cards from your computer and turn it on.
2. Hold the Aironet 4800B Series Wireless LAN Adapter with the label facing up, and insert the card into the slot, applying just enough pressure to make sure it is fully seated.

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i   **NOTE:** The PC Card slot will be on the left or right side of the computer, depending on the model.

!   **CAUTION:** Do not force the PC Card into the PC Card slot. Forcing it will damage both the PC Card and the slot. If the PC Card does not go in easily, remove the card and re-insert it.

Windows 98 automatically detects the Aironet 4800B Series PC Card Wireless LAN Adapter, briefly opens a New Hardware Found window, and starts collecting information for a driver information database.

When Windows 98 is ready to configure the new hardware, it opens the Add New Hardware Wizard dialog box. The dialog box states that Windows will search for new drivers for the Aironet PC4800.

3. Click "Next." A dialog box appears asking what you want Windows to do.

4. Select "Search for the best driver for your device (Recommended)" and click "Next."

5. Select "CD-ROM drive," unselect all the other options, insert the Aironet 4800B Series for Windows 98 CD, and click "Next."

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NOTE: If your computer doesn't have a CD-ROM drive, go to the Aironet website (www.aironet.com) and download the drivers for your computer's operating system. Copy the drivers to a 3.5" floppy disk, and use the floppy disk in place of the CD.

After the hardware wizard finds the installation files on the CD, it displays the search results: "Windows driver file search for the device: PC4800 DS Wireless PCMCIA LAN Adapter."

6. Click "Next" to copy the required files.

During the installation, you may be prompted with dialog boxes asking you to enter a path to the required Aironet or Windows 98 files.

If the Windows 98 files are installed on your computer, the Windows 98 files will usually be located in the folder C:\Windows\Options\Cabs. Click "OK" to copy the required files.

If Windows 98 prompts for the Windows CD, insert the Windows 98 CD into your CD-ROM drive. If your CD-ROM drive is drive D, the path in the dialog box should be D:\WIN98. Click "OK" to copy the required files.

7. The Add New Hardware Wizard window appears stating that Windows has finished installing the software that your new hardware device requires.

8. Click "Finish."

9. The Systems Settings Change window states: "To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?" Remove the CD and click "Yes" to reboot the computer.

10. When the computer restarts, double-click the My Computer icon on your desktop.

11. In the My Computer window, double-click the Control Panel icon.

12. In the Control Panel window, double-click the Network icon.

13. Select the PC4800 DS Wireless PCMCIA LAN Adapter. Click the Properties button.

14. On the PC4800 DS Wireless PCMCIA LAN Adapter Properties window, click the Advanced tab.

15. In the Advanced window, select Client Name. Type your computer's unique client name in the Value dialog box.

16. Select SSID. Type your Access Point's SSID in the Value dialog box. Click OK.

17. In the Network window, click OK.

18. The Systems Settings Change window states: "To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?" Click "Yes" to reboot the computer.

    The driver installation is complete.

    Contact your IS department if you have a problem connecting to the network. Proxy server, network protocols, and further authentication information might be needed to connect to the network.

Installing the Driver for Windows 95

If the operating system on your computer is Windows 95, follow these steps (if 98, see page 4; if NT, see page 9):

1. Remove all PC Cards from your computer and turn it on.

2. Hold the Aironet 4800B Series PC Card Wireless LAN Adapter with the label facing up. Insert the card into the PC card slot and apply just enough pressure to make sure it is fully seated.

NOTE: The PC Card slot will be on the left or right side of the computer, depending on the model.

CAUTION: Do not force the PC Card into the PC Card slot. Forcing it will damage both the PC Card and the slot. If the PC Card does not go in easily, remove the card and re-insert it.

Windows 95 automatically detects the Aironet 4800B Series PC Card Wireless LAN Adapter, briefly opens a New Hardware Found window, and starts collecting information for a driver information database.

When Windows 95 is ready to configure the new hardware, it opens the Update Device Driver Wizard dialog box. The dialog box states that Windows will complete the installation of the Aironet-PC4800.

3. Insert the Aironet 4800 Series for Windows 95 and Windows NT CD and click Next.

> **i** **NOTE:** If your computer doesn't have a CD-ROM drive, go to the Aironet website (www.aironet.com) and download the drivers for your computer's operating system. Copy the drivers to a 3.5" floppy disk, and use the floppy disk in place of the CD.

4. The Update Device Driver Wizard displays the following message: "Windows was unable to locate a driver for this device." Click the Other Locations button.

5. The Select Other Location window appears. Click the Browse button.

6. Select your CD-ROM drive and click OK. At the Select Other Location window, click OK.

7. The Update Device Driver Wizard window tells you that it found the driver. Click Finish.

8. When prompted with "Please insert the disk labeled 'Windows 95 CD-ROM', and then click OK", just click OK and do one of the following:
   • If the Windows 95 files are installed on your computer, the Windows 95 files will usually be located in the folder C:\Windows\Options\Cabs. Type C:\Windows\Options\Cabs in the "Copy files from:" dialog box. Click "OK" to copy the required files.

   • If Windows 95 prompts for the Windows CD, insert the Windows 95 CD into your CD-ROM drive. If your CD-ROM drive is drive D, the path in the dialog box should be D:\WIN95. Click "OK" to copy the required files.

9. The Systems Settings Change window states: "To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?" Remove the CD and click "Yes" to reboot the computer.

10. When the computer restarts, double-click the My Computer icon on your desktop.

11. In the My Computer window, double-click the Control Panel icon.

12. In the Control Panel window, double-click the Network icon.

13. Select the PC4800 DS Wireless PCMCIA LAN Adapter. Click the Properties button.

14. On the PC4800 DS Wireless PCMCIA LAN Adapter Properties window, click the Advanced tab.

15. In the Advanced window, select Client Name. Type your computer's unique client name in the Value dialog box.

16. Select SSID. Type your Access Point's SSID in the Value dialog box. Click OK.

17. In the Network window, click OK.

18. The Systems Settings Change window states: "To finish setting up your new hardware, you must restart your computer. Do you want to restart your computer now?" Click "Yes" to reboot the computer.

    The driver installation is complete.

    Contact your IS department if you have a problem connecting to the network. Proxy server, network protocols, and further authentication information might be needed to connect to the network.

Installing the Driver for Windows NT 4.0

If the operating system on your computer is Windows NT 4.0, follow these steps (if 98, see page 4; if 95, see page 7):

1. Turn your computer off.

2. Hold the Aironet 4800B Series PC Card Wireless LAN Adapter with the label facing up. Insert the card into the PC card slot and apply just enough pressure to make sure it is fully seated.

i NOTE: The PC Card slot will be on the left or right side of the computer, depending on the model.

! CAUTION: Do not force the PC Card into the PC Card slot. Forcing it will damage both the PC Card and the slot. If the PC Card does not go in easily, remove the card and re-insert it.

3. Turn your computer on, and wait for Windows NT to fully start.

4. Insert the Aironet 4800 Series for Windows 95 & NT 4.0 CD into your CD-ROM drive.

i NOTE: If your computer doesn't have a CD-ROM drive, go to the Aironet website (www.aironet.com) and download the drivers for your computer's operating system. Copy the drivers to a 3.5" floppy disk, and use the floppy disk in place of the CD.

5. Right-click on the Network Neighborhood icon on your desktop and select Properties. (If your desktop doesn't have a Network Neighborhood icon, open the Control Panel, right-click the Network icon there, and select Properties.)

6. Click the Adapters tab.

7. Click "Have Disk" at the Select Network Adapter window.

8. Enter D:\ in the Copy files from box. (D:\ is the drive letter of your CD-ROM drive. Your drive letter may be different from this example.) Click OK.

9. In the Select OEM Option box, select the "Aironet PC4800 PC Wireless LAN Adapter" option. Click OK.

10. The Aironet Wireless Communications, Inc. Adapter Setup window appears. In the Advanced

window, select Client Name. Type your computer's unique client name in the Value dialog box.

11. Select SSID. Type your Access Point's SSID in the Value dialog box. Click OK.

12. Click Close.

13. When asked to shutdown and restart your computer, remove the CD-ROM disk and click Yes.

The driver installation is complete.

Contact your IS department if you have problems connecting to the network. Proxy server, network protocols, and further authentication information might be needed to connect to the network.

Installing the Aironet 4800B Series PC Card Wireless LAN Adapter Utilities

To install the WinDGS, LinkScope, and WEPKey utilities, follow these steps:

1. Insert the Aironet 4800B Series CD for your operating system into your computer's CD-ROM drive.

2. Click Start > Run and type D:\utils\setup.exe where "D" is your CD-ROM's drive letter.

3. Follow the setup instructions on the screen to complete the installation.

Refer to Section 2 of this User Guide for details on using each utility.

Section 2

Using the WinDGS Utilities

WinDGS is used to perform user-level diagnostics on your Aironet Wireless LAN Adapter Card in the Windows 95, 98, and NT operating system environments.

To install the WinDGS, LinkScope, and WEPKey utilities, follow these steps:

1. Insert the Aironet 4800B Series CD for your operating system into your computer's CD-ROM drive.

2. Click Start > Run and type D:\utils\setup.exe where "D" is your CD-ROM's drive letter.

3. Follow the setup instructions on the screen to complete the installation.

WinDGS Commands Menu

The Commands Menu includes:

- Select Card
- Load New Firmware
- Edit Properties
- Statistics
- Status
- Link Test
- Site Survey
- Radio Off/On
- Exit

Select Card

This allows another installed Aironet Wireless LAN Adapter Card to be chosen. The property screens will change to reflect the parameters specific to each card type.

Load New Firmware

The firmware is contained in the card's flash memory. Flash memory allows for easy updating of the firmware as necessary.

Upgrading Firmware for Windows 95, 98, and NT

The WinDGS program is used to load new firmware.

To load new firmware:

1.   Make sure the PC Card is up and running.
2.   Select **Commands**.
3.   Select **Load New Firmware**.
4.   Select **Look In....**Use the drop down button to select the appropriate path and image file.
5.   Select **Open**. This will flash the card with the selected image.

Edit Properties

WinDGS allows you to change the configuration parameters of your currently installed Aironet 4800B Series Wireless LAN Adapter. See "Using Edit Properties" on page 20 for details on this command.

Statistics

The Statistics screen shows the current statistics from the PC Card. Statistics are updated at the rate specified by the Screen Update Timer. Clear the current statistics by clicking on **Reset**. Exit the Statistics screen by clicking on **OK**, or by

clicking on the **X** in the upper right hand corner of the dialog box.

Status

The Status screen shows the current status from the PC Card. Status is updated at the rate specified by the Screen Update Timer. Exit the Status screen by clicking on **OK**, or by clicking on the **X** in the upper right hand corner of the dialog box.

Link Test

You can use WinDGS to assess the performance of RF links. TCP/IP protocol must be installed on your system to run this link test. See the Windows 95/98/NT Help for more information on installing and setting up TCP/IP. An IP address must also be configured for the Access Point.

1.   From the Link Test command menu, enter the following parameters:

   • **IP address of Aironet Access Point:**
     This parameter specifies the IP address of the Access Point with which you want to test the RF link. Set this value before running the link test.

   • **Number of Packets:**
     This parameter specifies the number of packets the link test will attempt to send. The display will show the number of packets of the specified size that are successfully transmitted and received. This parameter is ignored if Continuous Link Test is selected.

   • **Packet Size:**
     This parameter specifies the size of the data packet to be sent to the Aironet Access Point. Be aware that the TCP/IP stack that comes with Windows 95 will fragment packets greater than 512 bytes. Therefore, the number of packets transmitted will not match the number of packets received (even if none are lost) if the packet size is greater than 512 bytes.

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- **Continuous Link Test:**
  Selecting this item causes the link test to run contin-uously until Stop, OK, or Cancel is selected. The Number of Packets parameter is ignored if Continu-ous Link Test is selected.

2. Once the parameters have been entered, click on the Start button at the bottom of the dialog box to start the link test. When the link test is running, necessary statis-tics will be displayed and updated periodically.

3. To stop the link test, click on Stop, OK, or Cancel at the bottom of the dialog box. Once the link test has sent the number of packets specified, the Stop button will toggle back to a Start button.

Using Windows 95 or Windows 98 to Perform a Link Test Through Telnet

You can perform a link test outside the WinDGS Utility through a telnet session. Follow these steps:

1. Install the drivers.

2. Configure the drivers for network operation.

3. Ensure unique IP assignments of mobile/portable PC Card devices and Aironet Access Point.

4. Set up an Aironet Access Point for the intended operation (set fragmentation thresholds, RTS thresholds, etc.)

5. Start the operating system on the mobile station.

6. Configure the adapter.

7. Make sure the mobile station is associated to the Aironet Access Point.

8. Start a telnet session on the mobile station to the Aironet Access Point. Depending on the system in use, the telnet application may have logging and note taking capability. If so, enable these modes.

9. Navigate through the Aironet Access Point menu to the link test option. See the appropriate Access

    Point Technical Reference Manual for more information.

10. Set up the test options to accurately model the system.

11. Set the test for continuous operation with a 1-second delay.

12. Begin traversing the area around the Aironet Access Point to determine its coverage. If logging and notes are not possible with the telnet application, maintain a manual log.

The telnet session packets are interspersed with test packets which may increase the round-trip time for some frames. The link test will show progress changes as the test is being conducted.

The first-time delivery success rate for the packet may not be important for transaction-based systems, and can result in a slightly larger range. Using longer packets can provide some degree of safety margin in the range estimate.

> **i** **NOTE:** Roundtrip time will be affected by the telnet session maintenance.

Site Survey

To perform a meaningful site survey, you need to conduct a test that will accurately model the intended use of the system. It is important to perform a site survey using equipment which is similar to the equipment that will be implemented. Common survey items include:

- Transmit power
- Antenna type(s)
- Antenna location(s)
- Packet (fragment) size
- Interference

You should always conduct a site survey with all variables set to the operational values. You should also try to perform the survey during the time the RF link will generally be functioning with all other systems and noise sources operational. For efficiency, you should execute the site survey application entirely from the mobile station.

The link test tool helps determine the RF network coverage. The results of the link test will help eliminate low RF signal level areas that can result in loss of connection between the PC Card and the Aironet Access Point.

It is important to remember the information being displayed is from the Aironet Access Point's viewpoint. Therefore, packets sent are from the Aironet Access Point to the PC Card client. Packets received are from the PC Card to the Aironet Access Point. Signal quality is an estimate of the signal strength recorded at the time of packet reception by the radio.

> **i** **NOTE:** If your Wireless LAN Adapter contains new firmware, you can use WinDGS's Active Mode Survey. See "Using the Site Survey Active Mode Feature" on page 28 for details.

The Overall Link Quality rating on the Site Survey window indicates the ability of the Aironet Wireless LAN Adapter to successfully communicate with an Access Point. Ratings are Excellent, Good, Fair, and Poor. The rating is derived from the Current Signal Strength (PC4500/PC4800) and Current Signal Quality.

- Excellent: Both values are greater than 75%
- Good: Both values are greater than 40%, but one or both are less than 75%
- Fair: Both values are greater than 20% but one or both are less than 40%
- Poor: One or both values are less than 20%

Radio Off/On

Radio Off/On allows you to selectively turn off or on the power to the radio. Turning the radio off prevents all RF energy from being transmitted by the PC Card.

Exit

Closes all windows and exits WinDGS.

Options Menu

The Options Menu includes:

Options Help
Preferences...
Core Dump...
NDIS Driver Core Dump...

• Preferences

• Core Dump

• NDIS Driver Core Dump
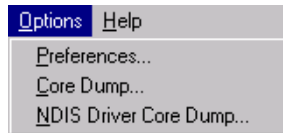
Preferences

The WinDGS Preferences allow you to customize various parameters that control the operation of WinDGS. For example, you can set the rate at which the values are updated in the status and statistics screens via the Screen Update Timer. You can also set the Save Properties Options, which controls what is done with changes to the current settings.

Screen Update Timer

The Screen Update Timer controls how often the statistics and status screens are updated. The screen can be updated in one second increments, from once a second to once every 60 seconds. The default is once every five seconds. You can use either the edit box or the slider to change this value.

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Status Bar Options

Use the Status Bar Options to include seconds on the clock display on the WinDGS main screen.

Core Dump

Core Dump allows you to perform a core dump of the Wireless LAN Adapter's firmware. Enter file names for core dumps 1 and 2, or accept the defaults (C:\Aironet\WinDGS\Core4800.1 and Core4800.2). Click the Do Core Dump button to perform the dump.

NDIS Driver Core Dump

NDIS Driver Core Dump allows you to perform a core dump of the Wireless LAN Adapter's drivers. Enter a file name for the core dump, or accept the default (C:\Aironet\WinDGS\Core4800.cor). Click the Do Core Dump button to perform the dump.

Using Edit Properties
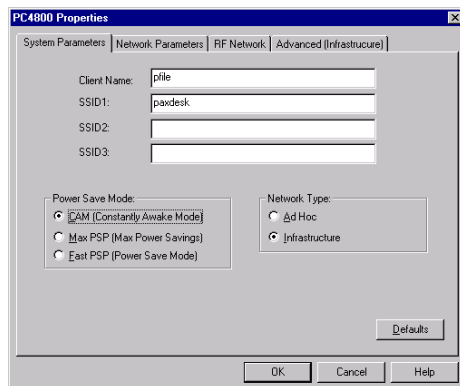
The Edit Properties screen, which you access from the Commands menu, includes four "pages," which you select by clicking the tabs at the top of the window:

- System Parameters

- Network Parameters

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- RF Network Parameters
- Advanced (Infrastructure or Ad Hoc)

Each sub-screen is described below.

System Parameters

System parameters include:

- Name
- SSID
- Network Type (Infrastructure or Ad Hoc)
- Constant Awake Mode (CAM)
- Power Save Mode
- Fast Power Save Mode
- Maximum Power Save Mode

Name

The station name is displayed in the table of connected devices on the Access Point. It provides a logical name to determine which machines are connected without having to memorize every MAC address. The name can be up to 16 characters.

SSID

The Service Set Identifier (SSID) controls access to a given wireless network. This value MUST match the SSID of any/all Access Points that you want to communicate with. If the value does not match, access to the system is not granted. The SSID can be up to 32 characters (case sensitive).

Network type (Infrastructure Mode)

This mode is used to set up a connection to a wired network, such as Ethernet or Token Ring. This mode requires an Access Point to gain access to the wired network.

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Network type (Ad Hoc Mode)

This mode is used to set up a small, temporary network between two or more computers. For example, you might set up an ad hoc network between computers in a conference room so users can share information in a meeting.

Constant Awake Mode (CAM)

Constant Awake Mode is the normal mode for desktop machines or other machines where power consumption is not an issue. It keeps the radio powered up continuously so there is little latency for responding to messages. This mode is recommended for devices where high availability is desired.

Power Save Mode

Power Save Mode is recommended for devices where power consumption is a major concern, such as small battery powered devices. If the client node is powered from an AC line, PSP should not be used. Power Save Mode causes the Access Point to buffer incoming messages. The Aironet 4800B Series Wireless LAN Adapter must wake up periodically and poll the Access Point to see if there are any buffered messages waiting. The PC Card can request each message and then go back to sleep.

Fast Power Save Mode

Fast Power Save Mode (Fast PSP Mode) switches between PSP and CAM based on network traffic. When retrieving a high number of packets, Fast PSP Mode will switch to CAM to retrieve the packets. Once the packets are retrieved, it switches back to PSP.

Maximum Power Save Mode

Maximum Power Save Mode (Max PSP Mode) can only be used in conjunction with PSP or Fast PSP Modes.This mode allows the Aironet 4800B Series

Wireless LAN Adapter to conserve the most power while still maintaining an infrastructure connection. Using Max PSP Mode conserves power but will reduce throughput.

RF Network Parameters

RF Network Parameters include:

- **Fragment Threshold**: This parameter defines a threshold above which the RF packet will be split up or fragmented. If a packet is fragmented or transmission of part of it is interfered with, only the portion that was unsuccessful would need to be re-sent. The throughput will generally be lower for fragmented packets since the fixed packet overhead consumes a higher portion of the RF bandwidth.

- **Data Retries**: This parameter defines the number of times a packet will be re-sent if the initial transmission is unsuccessful. If the network protocol automatically re-tries itself, set this to a small value. A "bad" packet status will be sent up the protocol stack more quickly so the application can re-transmit the packet.

- **Data Rate**: This parameter determines the data rate used to transfer all management frames by the client device when associated within a given Basic Service Set (BSS). When operating in Infrastructure Mode, this parameter should be set to correspond to the Access Point setting. When operating in Ad Hoc Mode, all stations should have the same setting.

Model	Allowable Selections
4800B Series	Auto Rate Selection, 1 Mbps Only, 2 Mbps Only, 5.5 Mbps Only, or 11 Mbps Only

- **Authentication type**: This parameter controls the validation of the WEP Key. Shared Key Authentication validates that the client is using the same WEP Key as the Access Point. The Access Point sends a known, un-

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encrypted "challenge packet" to the client. The client then encrypts the challenge packet and sends it back to the Access Point. The Access Point then attempts to decrypt the encrypted challenge packet, and sends an Authentication response packet indicating the success or failure of the decryption back to the client. Open Authentication does not check for a matching WEP Key. The Shared Key selection is not available if the client's WEP Key is not set.

- **Modulation**: This parameter determines the type of radio modulation that the Wireles LAN Adapter uses at the 5.5 Mbps and 11 Mbps data rates. Older versions of firmware use MOK modulation, while newer firmware versions use the IEEE 802.11 Standard CCK modulation. The modulation that the PC4800 uses *must* match the modulation of the Access Point (in an Infrastructure Mode configuration) or other Wireless LAN Adapters (in an Ad Hoc Mode configuration). Otherwise, the radio will not communicate with the other devices.

- **Use Short Radio Headers**: Select this checkbox to use short radio headers when transmitting. Short radio headers improve throughput performance. Long radio headers ensure compatibility with all models of Aironet Wireless LAN adapters. The PC4800B Series Wireless LAN Adapter supports short radio headers, but earlier models of Aironet's Wireless LAN Adapter (PC4800 and PC4800A) require long headers.

- **Channel**: Use this parameter to select the radio channel the PC card will use. Channel 6 (2437 MHz) is the default setting.

- **Transmit Power**: Use this parameter to set the transmit power of the card to 1 mW, 5 mW, 20 mW, 50 mW, or 100 mW.

- **Allow Association To Mixed Cells**: Select this checkbox to allow the PCI/ISA Wireless LAN Adapter to communicate with mixed cells. A mixed cell is a radio network in which some devices use WEP and some do not.

- **Enable WEP**: Select this checkbox to enable WEP (Wired Equivalency Protocol). The checkbox will be inaccessible (grayed-out) until you set a WEP key using the WEPKey utility (see page 34).

Advanced (Infrastructure)

The following parameters are contained in both the Infrastructure and Ad Hoc Modes:

- Antenna Mode
- Specified Access Point
- RTS Threshold
- RTS Retry Limit

Antenna Mode

The PC4800B Series Wireless LAN Adapter has an integrated, permanently attached antenna, and is always set to Diversity mode.

For the LM4800B Series Wireless LAN Adapter, three options are available for the type of antenna you have connected to the LM4800B Series card:

- **Antenna Diversity**: This allows the LM Card to use the stronger signal from the two antenna ports. Diversity can help the radio maintain the RF connection in areas of interference. Due to the nature of how RF signals are affected by the surroundings, one antenna may be in an RF "null" where the signal is very weak, but the other antenna (even though it is only a small distance away) may have a stronger signal strength. The PC Card would automatically select the antenna that has the highest signal strength. Antenna Diversity is the recommended setting for the standard antenna.

- **Right Antenna Only (J1)**: Choose this option if the antenna you are using is connected to the right antenna port. The LM Card will not attempt to com-

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municate using the left antenna port since no antenna is connected to it.

- **Left Antenna Only (J2)**: Choose this option if the antenna you are using is connected to the left antenna port. This tells the LM Card not to attempt to communicate using the right antenna port since no antenna is connected to it.

Specified Access Point

This parameter is the MAC address of the preferred Access Point you want to associate with. It is important to note that if you specify the Access Point, you MAY associate to another Access Point if the Specified Access Point is not found. If you roam out of range, you will probably associate with another Access Point. Setting a Specified Access Point will slow down the roaming process. Thus, for normal operation for the majority of users, leave this field blank.

RTS Threshold

This parameter controls what size data packet the low level RF protocol issues to an RTS packet. There are several trade-offs to consider when setting this parameter. Setting this parameter to a small value causes RTS packets to be sent more often, consuming more of the available bandwidth, therefore reducing the apparent throughput of other network packets. However, the more often RTS packets are sent, the quicker the system can recover from interference or collisions. Refer to the IEEE 802.11 Standard for more information on the RTS/CTS mechanism.

RTS Retry Limit

This parameter controls the number of times the PC Card will re-send the RTS packet if it does not receive a CTS from the previously sent RTS packet. Setting this to a large value will decrease the available bandwidth whenever interference is encountered, but will make

the system more immune to interference and collisions. Refer to the IEEE 802.11 Standard for more information on the RTS/CTS mechanism.

Advanced (Ad Hoc/IBSS)

In Ad Hoc Mode, you can also modify the following parameters:

• Channel
• Beacon Period
• Wake Duration

Channel

This parameter specifies the channel identifier the unit will use if it must start its own network. For all other situations, the radio will scan for the proper frequency. See **Appendix C** for channel identifier parameters.

Beacon Period

This parameter specifies the duration between beacon packets that are used by IEEE 802.11 systems to synchronize the "hops" (change to another frequency). The beacon packet contains timing information and hop pattern information that is broadcast over the airwaves. Any station that can hear the beacon packet can then synchronize their internal timer so that it can hop at the correct time. The default beacon period is one-half of the dwell period so two beacons are transmitted per hop dwell period (default is 100 Kµsec). Refer to the IEEE 802.11 Standard for more information on the timing and scanning mechanism.

Wake Duration

This parameter specifies the amount of time per Hop Dwell Period that the adapter stays awake listening for data packets. This is only used in Power Save Mode.

Using the Site Survey Active Mode Feature

If your PC4800B Series Wireless LAN Adapter contains the latest firmware, and if you have the latest drivers on your system, you can use the Site Survey Active Mode feature to set up a customized link test.

When you select Site Survey from the Commands menu and click the Setup button at the bottom of the window, the Setup window appears. Each setting is described below.
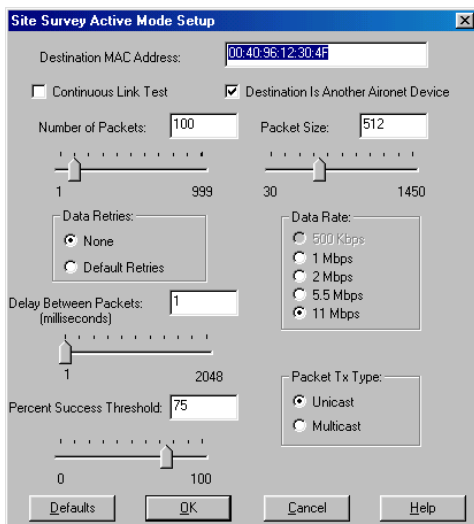
Destination MAC Address

This parameter specifies the Access Point that will be involved in the test. The default is the MAC address of the AP the Aironet Wireless LAN Adapter is currently associated with.

Continuous Link Test

If you click this check box, the Active Mode test will run repeatedly until you press the OK or Stop buttons on the Site Survey page. (The test will loop repeatedly for the num-

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ber of packets you specify on the Number of Packets setting.)

Destination is Another Aironet Device

Click this check box if the Access Point you named in the Destination MAC Address field is an Aironet Access Point.

Number of Packets

This parameter sets the quantity of packets that will be sent during the test.

Packet Size

This parameter sets the size of the packets that will be sent during the test. You should use a packet size that will be typical during normal use of the system.

Data Retries

This parameter sets the number of times a transmission will be retried if an ACK is not returned by the destination device. Click None for no retries, or Default Retries for the firmware's default value for retries.

Data Rates

This parameter sets the bit rate at which packets will be transmitted. No rate shifting will occur during the test.

Delay Between Packets

This parameter sets the delay (in milliseconds) between successive transmissions.

Packet Tx Type

This parameter sets the packet type that will be used during the test. If you select Unicast, the system will expect an ACK back from the destination, and retries can occur. If you select Multicast, no packet retries will occur during the test.

Percent Success Threshold

This parameter controls the red line on the "Percent Suc-cessful" histogram. Percentages greater than or equal to this value will show up as green bars, while percentages below this value will show up as yellow bars on the Percent Successful histogram.

When the Site Survey Active Mode is running, this window appears:
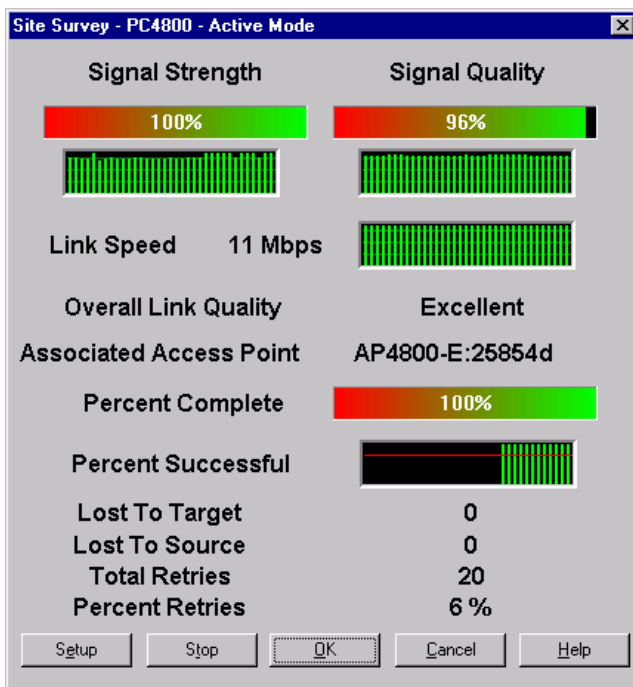
Using the Linkscope Utility

The Linkscope utility provides a graphical display of:

- Signal Quality
- Signal Strength

Linkscope determines the performance of the RF link between a PC Card and an Aironet Access Point. Any Windows 95, Windows 98, or Windows NT unit associated to an Aironet Access Point can run the linkscope test.

Signal strength is displayed along the vertical axis of the graphical display. Signal quality is displayed along the horizontal axis. The combined result is represented by a diagonal line. The Aironet Access Point associating with the PC Card is indicated along the bottom of the display as well as its MAC address.
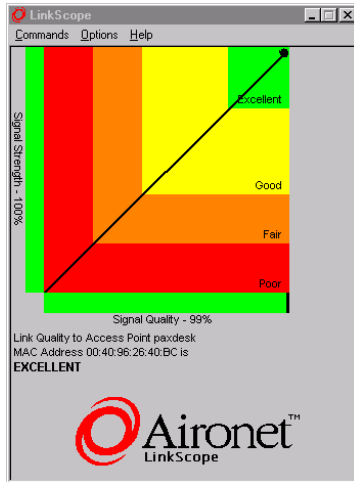
Commands

The Commands pull-down menu includes the following commands:

Select Card

Use Select Card if you have more than one Wireless LAN Adapter installed on your computer. A window appears that allows you to choose the card you want to examine with Linkscope.
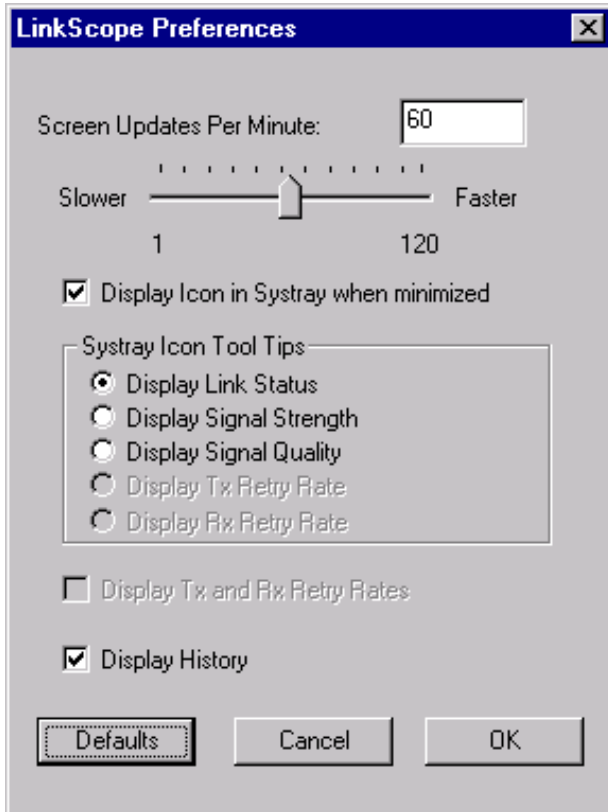
Exit

Use Exit to close the Linkscope utility.

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Options

The Options pull-down menu includes the following options:

Preferences

When you select Preferences, this window appears:

Four parameters are available on the Preferences window:

- **Screen Updates Per Minute**: This parameter sets the screen update frequency on the Linkscope

main window. Type a value in the entry field or use the slider bar to adjust the setting.

- **Display Icon in Systray when Minimized**: Select this checkbox to display a Linkscope icon at the bottom of your screen when Linkscope is mini-mized. The Icon type options allow you to choose the information that appears when you hold your mouse pointer on the icon.

- **Display Tx and Rx Retry Rates**: Select this check-box to display Tx and Rx rates on the Linkscope main screen.

- **Display History**: Select this checkbox to display the signal history on the Linkscope main screen. At each screen update, a black dot appears for that status.

Using the WEPKey Utility

This section briefly explains how to use the Aironet WEP-Key Utility to configure a WEP key on the Aironet client card.

WEP Overview

WEP-40 and WEP-128 are optional IEEE 802.11 features that provide data confidentiality equivalent to the confidentiality of a wired LAN that does not use cryptographic techniques to enhance privacy. WEP (Wired Equivalent Privacy) makes the wireless LAN link in a system only as secure as the wired link.

As specified in the standard, WEP uses the RC4 algorithm with a 40-bit key for WEP-40 and a 128-bit key for WEP-128. When WEP is enabled, each station (client and Access Point) has a key. The key scrambles the data before it is transmitted over the airwaves. If a station receives a packet that is not scrambled with the appropriate key, the station discards the packet and never delivers it to the host.

Using WEPKey

1. Install the Aironet WEPKey Utility (along with WinDGS and LinkScope) from the Aironet Wireless LAN Adapter Utility disk.

2. Start the application with one of these steps:
   - Double-click the WEPKey icon on the Desktop, or
   - From the Windows Start Menu, select Programs | Aironet | WEPKey, or
   - From a DOS Window, change to the C:\Aironet\WinDGS directory (or to the directory you selected when installing WinDGS) and type wepkey.

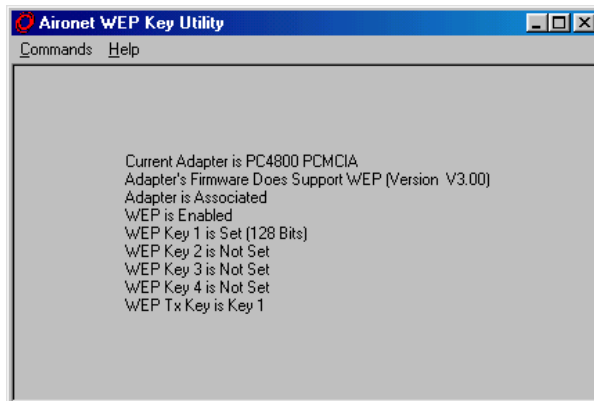The following login screen appears:

Passwords are case sensitive, and can contain up to 256 characters. The default password is **Aironet** (upper-case *A* followed by lower-case *ironet*).

3. Enter the correct password and click OK. The main screen appears:

The Commands pull-down menu provides options that allow you to select a wireless adapter card, change the password, and enter a WEP key.

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To enable or disable WEP, set the WEP key with the WEPKey utility, and then open WinDGS. At the WinDGS main screen, select Edit Properties from the Commands pull-down menu. Click the RF Network tab. The Enable WEP checkbox is in the bottom left corner of the window.

4. If you have more than one adapter card installed on your computer, you can use the WEPKey utility to select the card you want to use. To select an adapter card, choose Select Card from the Commands pull-down menu. This screen appears:

Highlight the card you want to use, and click OK to select it.

5. To change the default password, select Change Password from the Commands pull-down menu. This screen appears:
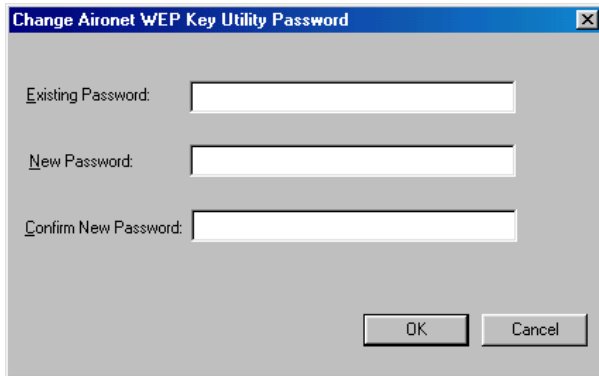
Passwords are case sensitive, and can contain up to 256 characters. The default password is **Aironet** (upper-case *A* followed by lower-case *ironet*).

6. To enter a WEP Key, choose Enter WEP Key from the Commands pull-down menu on the main screen. This screen appears:
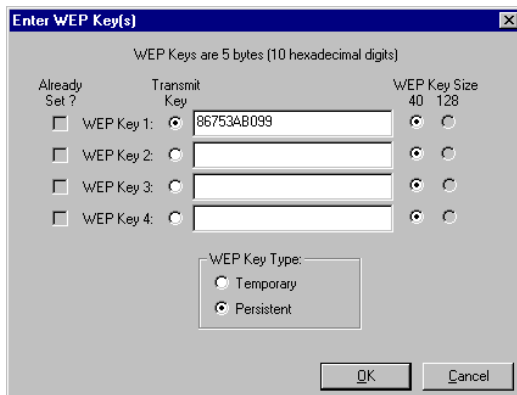
You can create up to four WEP Keys. Ten characters are required for WEP-40 keys. Twenty-six characters are required for WEP-128 keys.

Select the size of each key by clicking the 40 or 128 button beside each key entry field.

Click the Transmit Key button next to the key you want to use.

A check appears in the Already Set box next to existing keys. To protect key security, existing key codes do not appear in the key entry fields. You can write over existing keys, but you cannot edit them or delete them.

There are two types of WEP Keys: Temporary and Persistent. You should choose Persistent if you want the card to retain the WEP Key when you reboot the machine.

NOTE: Entering a WEP key does not enable WEP. To enable or disable WEP, set the WEP key with the WEPKey utility, and then open WinDGS. At the WinDGS main screen, select Edit Properties from the Commands pull-down menu. Click the RF Network tab. The Enable WEP checkbox is in the bottom left corner of the window.

7. If you purchase WEP as an upgrade for your Wireless LAN Adapter, you need to enter the WEP Option Code. Aironet or your Aironet reseller will give you the Option Code when you purchase the feature.

Select Option Code from the Commands pull-down menu. This screen appears:

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Type the Option Code and click OK. You can then set up WEP keys and use the WinDGS utility to enable WEP.

8. You can exit the WEPKey utility by selecting Exit from the Commands menu.

Section 3

Error Messages and Troubleshooting

The Wireless LAN Adapter provides LED messages and error codes. This section provides the general procedures for correcting common problems encountered when installing the PC Card system.

Indicator LEDs

The PC Card has two indicator LEDs (green and amber) on the face of the card.

The green indicator is the Link Integrity/Power LED. It lights when the card is receiving power and flashes slowly when the PC Card is linked with the network.

The amber indicator is the Link Activity LED. It flashes when the PC Card is receiving or transmitting data or in a pattern to indicate an error condition.

See Tables 3.1 and 3.2 for an explanation of the LED Messages.

Table 3.1 – Green LED Operating Messages

Green LED	Condition
Off	No power or error
Flashing Quickly	Power on, self-test OK, scanning for network
Flashing Slowly	Associated with an infrastructure network

Table 3.2 – Amber LED Operating Messages

Amber LED	Green LED	Condition
Flashing	Continuously on or flashing slowly	PC Card is transmitting or receiving data while associated with an Access Point
Flashing in a Pattern	Continuously on	Indicates an error condition

If Your Radio Fails to Establish Contact

- Change your location or the location of the antenna by a few feet and try again.

- Make sure the antenna is securely attached.

- Make sure the PC Card is securely inserted in the PC Card slot.

- Make sure the receiving equipment is turned on and operating.

- Make sure the receiving equipment is properly connected to the host computer.

- Check that all parameters are set properly for both the PC Card and the Aironet Access Point.

If the radio fails to establish contact, contact Aironet Technical Support for additional assistance:

Phone - (330) 664-7903
Fax - (330) 664-7990
e-mail - techsupp@aironet.com
           http://www. aironet.com

Appendix A

Aironet Wireless LAN Adapter Overview

The Aironet 4800B Series Wireless LAN Adapter is a PC Card radio module that provides transparent wireless data communications between fixed, portable, or mobile devices and other wireless devices or a wired network infrastructure. Host devices can be any device equipped with a PC Card Type II or Type III slot. These devices include:

- Desktop systems
- Portable laptops
- Notebook computers
- Personal digital assistants
- Pen based computers
- Other data collection devices

The PC Card is fully compatible when used in a device supporting Plug-and-Play (PnP) technology.

The PC Card can also be built into peripheral devices such as printers to provide a transparent wireless connection to a wired network.

Safety Information

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

- Do not touch or move antenna(s) while the unit is transmitting or receiving.

- Do not hold any component containing the radio so that the antenna is very close or touch-ing any exposed parts of the body, especially the face or eyes, while transmitting.

- Do not operate a portable transmitter near unshielded blasting caps or in an explosive environment unless it is a type especially qualified for such use.

- Do not operate radio or attempt to transmit data unless the antenna is connected; if the antenna is not con-nected, the radio may be damaged.
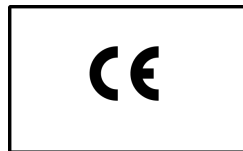
Dipole Antenna[*]

Always orient the antenna so that it is at least 15 cm (six inches) away from your body.

High Gain Antennas*

High gain wall mount or mast mount antennas are designed to be professionally installed and should be located at a minimum distance of 30 cm (12 inches) or

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[*] Applies to LM4800B Series Wireless LAN Adapters only. PC4800B Series Wireless LAN Adapters have integrated, permanently attached antennas.

more from your body. Please contact your professional installer, VAR, or antenna manufacturer for proper installation requirements.

Warning for Laptop User

To comply with the FCC RF exposure limits, it is recommended when using a laptop with the integrated antenna, that the antenna should not be positioned closer than 5 cm (two inches) from your body or nearby persons for extended periods of time while it is transmitting (or operating). If the antenna is positioned less than 5 cm (two inches) from the user, it is recommended that the user limit exposure time.

Other Devices in the Wireless Network

Refer to the User's Guide and Technical Reference manual for the Access Point, Universal Client, or Bridge for additional information.

Radio Characteristics

The PC Card operates in the 2.4 GHz license-free Industrial Scientific and Medical (ISM) band. Data is transmitted over a half-duplex radio channel operating up to 11 Mbps.

Direct Sequence Radio Technology

The Aironet 4800B Series Wireless LAN Adapter uses Direct Sequence Spread Spectrum (DSSS) transmission originally developed for military "anti-jamming" and "low probability of intercept" radio systems. The signal is transmitted over a wide frequency range, using multiple frequencies simultaneously. This protects the data transmission from interference.

If a particular frequency encounters a level of noise and/or interference, there is enough redundancy built into the signal on other frequencies that the Aironet 4800B Series

Wireless LAN Adapter will usually still be successful in its transmission.

Data Transparency and Protocols

The Aironet 4800B Series Wireless LAN Adapter transports data packets transparently as they move through the wireless infrastructure. The PC Card operates similarly to a standard network product except the wire is replaced with a radio connection. No special wireless networking functions are required. All existing applications, which operate over a network, will operate using the Aironet 4800B Series Wireless LAN Adapter.

Protocols Supported

The Aironet 4800B Series Wireless LAN Adapter can be used in a variety of infrastructure configurations. Aironet Access Points provide connections to wired network. When using the Aironet standard device drivers, the PC Card is fully compliant with the following operating systems:

Drivers	Operating System
NDIS3	Windows 95
NDIS4	Windows NT
NDIS5	Windows 98, Windows 2000

Radio Ranges

This section provides general guidelines on factors that influence network performance (see **Section 2** - *Site Survey and Link Test*).

Site Survey

Because of differences in component configuration, placement and physical environment, every network

application is a unique installation. Before installing the system, users should perform a site survey to determine the optimum utilization of networking components and to maximize range, coverage and network performance.

Here are some operating and environmental conditions you should consider:

- **Data Rates.** Sensitivity and range are inversely proportional to data bit rates. The maximum radio range is achieved at the lowest workable data rate. There will be a decrease in receiver threshold sensitivity as the radio data rate increases.

- **Antenna Type and Placement.** Proper antenna configuration is a critical factor in maximizing radio range. As a general guide, range increases in proportion to antenna height.

    For a detailed explanation of antenna types and configurations along with guidelines on selecting antennas for specific environments, see the Aironet Antenna Guide.

- **Physical Environments.** 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 the performance of the PC Card, particularly when using the small integrated antenna. Avoid locating the computing device and antenna 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.

Link Test

> The link test tool is used to determine RF coverage.
> The test results help the installer eliminate low RF sig-
> nal level area that can result in loss of connection.

Radio Antenna

The integrated diversity antenna comes standard with the
PC Card and provides omni-directional coverage.

A benefit of the diversity antenna system is improved cover-
age. At the edges of the RF coverage or fringe areas, there
are often multiple signals reaching the receiver, all from the
same transmitter. These signals travel in different paths
(multipath) and are caused by reflection and shadows of the
RF signals. When the signals combine, the receiver may
have trouble decoding the data. The Aironet radio's ability
to switch and sample between these antennas allows it to
select the optimum antenna for receiving the packet.

Security Features

The Aironet 4800B Series Wireless LAN Adapter employs
Direct Sequence Spread Spectrum Technology, previously
developed for military "anti-jamming" and "low probability of
intercept" radio systems.

The Aironet Access Point must be set to the same Service
Set Identifier (SSID) as all other Aironet devices on the
wireless infrastructure. Units with a different SSID will not
be able to directly communicate with each other.

Terminology

When configuring your system, and when reading this man-
ual, keep in mind the following terminology:

Association – Each root unit or repeater in the infrastruc-
ture contains an association table that controls the routing
of packets between the Access Point and the wireless infra-

structure. The association table maintains entries for all the nodes situated below the Access Point on the infrastructure including repeaters and client nodes.

End Node – A client node that is located at the end of the Network Tree.

Infrastructure – The wireless infrastructure is the communications system that combines Access Points, mobile nodes and fixed nodes. Access Points within the infrastructure can be either root units, which are physically wired to the LAN backbone, or can act as wireless repeaters. Other RF enabled devices serve as fixed nodes or mobile client nodes.

Parent/Child Node – Refers to the relationships between nodes in the wireless infrastructure. The complete set of relationships is sometimes described as a Network Tree. For example, the Access Point (at the top of the tree) would be the parent of the end nodes. Conversely, the end nodes would be the children of the Access Point.

Power Saving Protocol (PSP) and Non-Power Saving Protocol – The Power Saving Protocol allows computers (usually portable computers) to power up only part of the time to conserve energy. If a client node is using the Power Saving Protocol to communicate with the network, the Aironet Access Point must be aware of this mode and implement additional features such as message store and forward. If the client node is powered from an AC line, PSP should not be used.

Repeater – A repeater is an Access Point that extends the radio range of the infrastructure. A repeater is not physically attached to the wired LAN, but communicates via radio to another Access Point, which is either a root unit or another repeater.

Root Unit – The root unit is an Access Point that is located at the top, or starting point, of a wireless infrastructure. A root unit provides the physical connection to the wired LAN (such as Ethernet or Token Ring) and contains configura-

tion information in its association table that covers all nodes that access the wired network (backbone). All Access Points directly attached to the wired LAN backbone are root units.

System Configurations

The Aironet 4800B Series Wireless LAN Adapter can be used in a variety of network system configurations. Aironet Access Points provide connections to your wired networks or act as repeaters, increasing wireless communication range. The maximum communication range is based on how you configure your wireless infrastructure.

Examples of some common system configurations are shown on the pages that follow, along with a description of each.

Figure A.1 - Ad Hoc Wireless LAN
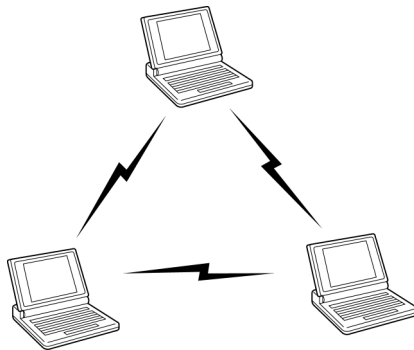
An ad hoc wireless LAN is the simplest wireless LAN con-figuration. In a wireless LAN, all devices equipped with the PC Card can be linked together and communicate directly with each other.

Figure A.2 - Wireless Infrastructure

Access Point
(Root Unit)

Workstation   Workstation
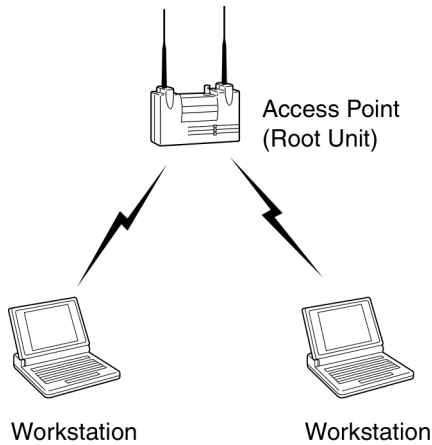
In a wireless infrastructure, an Aironet Access Point is used as a stand-alone root unit. The root unit is not attached to any wired LAN, but functions as a hub linking all stations together. This configuration is similar to the ad hoc network, except the Aironet Access Point serves as the focal point for communications. This increases the effective communication range over the ad hoc LAN since both stations are not required to be in direct communication range of each other.

Figure A.3 - Wireless Infrastructure with Workstations Accessing a Wired LAN
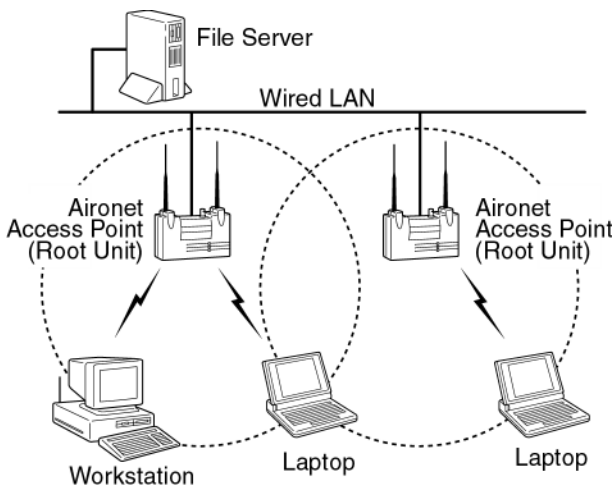
A Micro-Cellular Network can be created by placing two or more Aironet Access Points on a LAN.

The Aironet roaming protocols allow remote workstations to move from one microcell domain to another. The process is seamless and transparent. The connection to the file server or host is maintained without disruption. This configuration is useful with portable or mobile stations allowing them to be directly connected to the wired network, even while moving about (roaming). When an infrastructure is configured using multiple Aironet Access Points and/or repeaters, a mobile station is automatically associated and re-associated to the Aironet Access Point which provides the best performance. This is referred to as seamless roaming.

Figure A.4 - Extended Infrastructure Using Repeaters
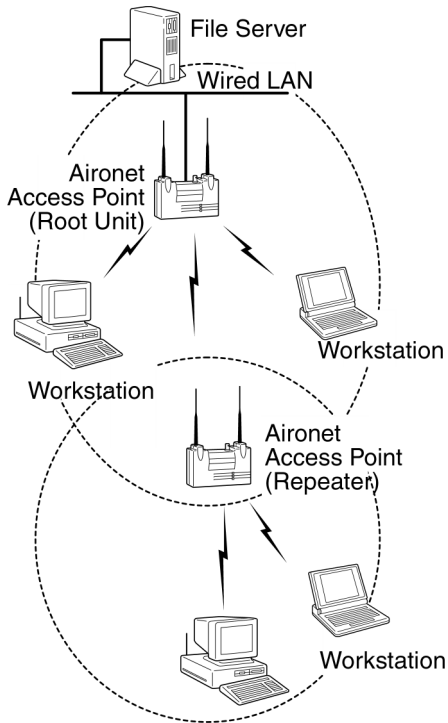
An Aironet Access Point can be configured as a stand-alone repeater to extend the range of your infrastructure, or to overcome an RF blocking obstacle. The repeater forwards traffic between the Aironet 4800B Series Wireless LAN Adapter equipped workstations and devices and the wired LAN by sending packets to either another repeater or to another Aironet Access Point attached to the wired LAN. The data is sent through whichever route provides the greatest performance for the client. Multiple repeater hops can be supported in the path to the wired LAN.

Coverage Options

The system architecture options of the wireless station and Access Points provide for a variety of coverage alternatives and flexibility. The system can be designed to provide a wide coverage area with minimal overlap (Figure 1.5) or coverage with heavy overlap (Figure 1.6). The latter improves system performance and protection against downtime in the event of a component failure.

Figure A.5 - Minimal Overlap Coverage Option
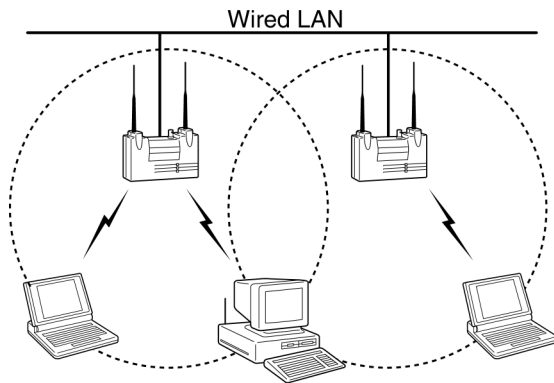
By arranging the Access Points so the overlap in coverage area is minimized, a large area can be covered with minimal system cost. The total bandwidth available to each mobile station will depend on the amount of data each mobile station desires to transfer and the number of stations located in each cell. Seamless roaming is supported as a mobile station moves in and out of range of each Access Point, thereby maintaining a constant connection to the wired LAN. Each device in the radio network must be configured with the same Service Set Identifier (SSID) to provide the roaming capability.

Figure A.6 - Heavy Overlap Coverage Option
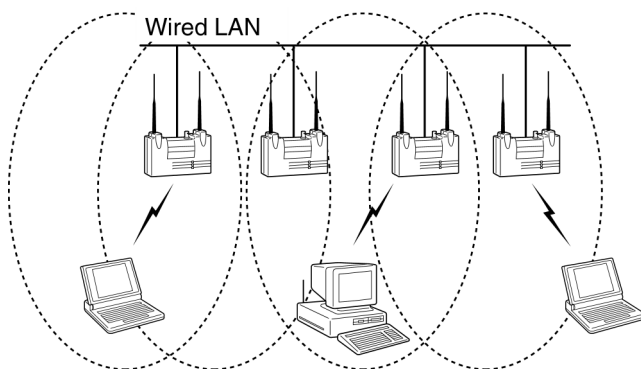
By arranging the Access Points so the overlap in coverage area is nearly maximized, a large number of mobile stations can be supported in the same wireless infrastructure. However, units in overlapping coverage areas on the same frequency will detect adjacent cell traffic and delay transmissions that would cause collisions. This reduces the aggregate radio system throughput. Heavy cell overlap is not recommended for maximum system throughput. Due to the redundancy in coverage overlap, system access is not lost in the event of an Access Point failure. Upon failure of the Access Point, the station will automatically roam to an operational Access Point. With this architecture, each device in the radio network must be configured with the same Service Set Identifier (SSID).

Figure A.7 - Multiple Overlapping Systems Coverage Option
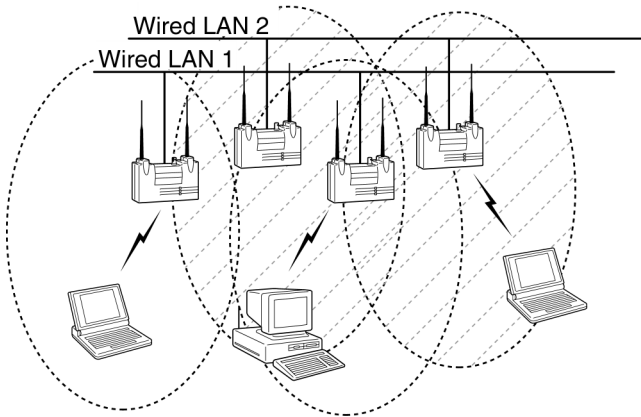
Multiple systems can operate in the same vicinity. The architecture provides multiple channels, which can exist in the same area with virtually no interference to each other. In this mode, each system must be configured with different Service Set Identifiers (SSID) and different channels, which prevent clients from roaming to Access Points of a different wireless system.

Appendix B

PC Card Specifications

LAN Drivers Supported

Table B.1 – Supported Drivers:

Drivers	Operating System
NDIS3	Windows 95
NDIS4	Windows NT
NDIS5	Windows 98, Windows 2000

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Radio Specifications

Table B.2 – Radio Specifications

Item	Specification	Description
Radio Type	Direct Sequence	2.4 GHz ISM Band
Operating Frequency	2400-2497 MHz	North American, ETSI, and Japan channel coverage, factory configurable
FCC ID	PC4800B Series: LOZ102038 LM4800B Series: LOZ102035	FCC approval
Channeling	1 MHz increments	Programmable for IEEE 802.11
Type of Modulation	BPSK 1 Mbit/s QPSK 2 Mbit/s CCK 5.5 and 11 Mbits/s	Nominal 10 MHz BW (-6 db)
Power Output (North American Configuration)	30 mW	Meets FCC Part 15.247 requirements
Antenna Type	Diversity	Integrated antenna (not included on LM4800B Series Wireless LAN Adapters)
PCMCIA Connector		Card Connector Per PC Card (Nov 95) Physical Specification 4.1

Power Requirements

Table B.3 – Power Requirements

Specification	Value
Operational Voltage	5.0V ±0.25 Volts
Receive Mode Current	280 mA (250 mA typically)
High Power Transmit Mode Current (30 mW)	400 mA (350 mA typically)
Sleep Mode Current	10 mA

Physical Specifications

Table B.4 – Physical Characteristics

Item	Description
Size	3.37" L x 2.13" W x .20" H (8.56 cm L x 5.41 cm W x .51 cm H)
Enclosure	PC Card Type II
Weight	1.3 oz.
Operating Temperature	0° C to 70° C minimum (32° F to 158° F)
Storage Temperature	-40° C to +85° C (-40° F to 185° F)
Humidity, Shock, Drop, Vibration, Thermal Shock	per PC Card version 2.01, section 13.6.2 specifications
ESD	15kV (human body model)
Connectors	68-pin PC Card
Status Indicators	Green and Amber LEDs – link association/activity

Appendix C

Channels

The channel identifiers and the channel center frequencies of each 22 MHz wide channel are shown in the table below, as appropriate for the various areas or regulatory agencies.

| Channel Identifier	Center Frequency	Regulatory Domains				
		North America	ETSI	Spain	France	Japan
1	2412 MHz	X	X	-	-	X
2	2417 Mhz	X	X	-	-	X
3	2422 MHz	X	X	-	-	X
4	2427 Mhz	X	X	-	-	X
5	2432 Mhz	X	X	-	-	X
6	2437 Mhz	X	X	-	-	X
7	2442 MHz	X	X	-	-	X
8	2447 MHz	X	X	-	-	X
9	2452 MHz	X	X	-	-	X
10	2457 MHz	X	X	X	X	X
11	2462 MHz	X	X	X	X	X
12	2467 MHz	-	X	-	X	X
13	2472 MHz	-	X	-	X	X
14	2484 MHz	-	-	-	-	X

Appendix D

Declarations of Conformity

Manufacturers Federal Communication Commission Declaration of   Conformity Statement

Models: PC4800B, PC4810B, PC4820B, LM4800B, LM4810B, LM4820B

F C Tested To Comply
With FCC Standards

FOR HOME OR OFFICE USE
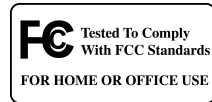
FCC Certification number: LOZ 102038 (PC4800B Series); LOZ 102035 (LM4800B Series)

> **Manufacturer:**
> **Aironet Wireless Communications, Inc.**
> **3875 Embassy Parkway**
> **Akron, OH 44333-8357**
> **330-664-7900**

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 into an outlet on a circuit different from which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician.

User Warning

The Part 15 radio device operates on a non-interference basis with other devices operating at this frequency.

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 numerique de la classe B respecte les exigences du Reglement sur le material broilleur du Canada.

This device complies with RSS-210 of Industry of 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.

The device is certified to the requirements of RSS-139-1 for 2.4 GHz spread spectrum devices. The use of this device 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.

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European Telecommunication Standards Institute

Statement of Compliance

Information to User

This equipment has been tested and found to comply with the European Telecommunications Standard ETS 300.328. This standard covers Wideband Data Transmission Systems referred in CEPT recommendation T/R 10.01.

This type accepted equipment is designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Declaration of Conformity

Aironet Model Number:
PC 4800B, PC4810B, PC4820B
LM4800B, LM4810B, LM4820B

Radio CE Type Certificate Number:

Radio Type Approval Examiniation Number: R0170 SRD 3a

Application of Council Directive: 89/336/EEC
Application of Council Directive: 72/23/EEC

Standards which Conformity is Declared:

EN 55022 (B)
EN 55011 (B)
ETS 300.826
EN 60950

Manufacturer: Aironet Wireless Communication
3875 Embassy Parkway
Akron, OH 44333

The undersigned hereby declares the above specified equipment conforms to the above Directives and standards.

Michael Smedley
Director, Manufacturing Engineering
Aironet Wireless Communications, Inc.

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Appendix E

Technical Support

Communications

Use the following information to contact the Aironet Technical Support group:

Telephone: (330) 664-7903
Fax: (330) 664-7990
e-mail: techsupp@aironet.com

Web Site

For additional product information and technical support, including the capability to download new firmware and drivers, use the Aironet web site at:

 http://www.aironet.com