802.11a PC Card
Quick Installation Guide

Wireless™ 802.11a PC Card

54 Mbps wireless network card

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Introduction

The Wireless™ 802.11a PC Card is a 54 Mbps wireless network
card that seamlessly integrates with existing Ethernet networks to support applications
such as mobile users or temporary conferences. This solution offers fast, reliable wireless
connectivity with considerable cost savings over wired LANs (which include long-term
maintenance overhead for cabling). Just plug wireless cards into your notebook PCs and
start networking.

Using this card in conjunction with a Wireless™ WA5001 802.11a Wireless Access Point,
you can create an instant network that allows users on the wireless LAN to access
resources on the wired LAN. Moreover, moving or expanding your network is as easy as
moving or installing additional access points – no wires!

Package Checklist

The Wireless™ PC Card package includes:

- 1 Wireless™ 802.11a PC Card (AP-2000 PC Card)
- 1 Driver and Utility CD-ROM
- This User Guide

Inform your dealer if there are any incorrect, missing, or damaged parts. If possible, retain
the carton, including the original packing materials. Use them again to repack the product
if there is a need to return it for repair.

System Requirements

Before you install the Wireless PC Card, check your system for the following
requirements:

- A computer with a CardBus slot
- Windows 98/Me/2000/XP (Have the Windows installation CD-ROM ready for use
  during installation)
- A minimum of 30 Mbytes of free disk space for installing the driver and utility program

Other IEEE 802.11a-compliant devices installed in your service area (such as the
Wireless 802.11a Access Point).

Applications

The Wireless products offer a fast, reliable, cost-effective solution for wireless client access to the network in applications such as:

- **Remote access to corporate network information**
  E-mail, file transfer, and terminal emulation.

- **Difficult-to-wire environments**
  Historical or old buildings, asbestos installations, and open areas where wiring is difficult to employ.

- **Frequently changing environments**
  Retailers, manufacturers, and banks which frequently rearrange the workplace or change location.

- **Temporary LANs for special projects or peak times**
  Trade shows, exhibitions, and construction sites which need temporary setup for a short time period. Retailers, airline and shipping companies which need additional workstations for a peak period. Auditors who require workgroups at customer sites.

- **Access to databases for mobile workers**
  Doctors, nurses, retailers, or white-collar workers who need access to databases while being mobile in a hospital, retail store, or an office campus.

- **SOHO users**
  SOHO (Small Office and Home Office) users who need easy and quick installation of a small computer network.

Hardware Description

The Wireless PC Card is fully compliant with 802.11a wireless networking as defined in IEEE 802.11a. It can be installed in any notebook with a CardBus slot. Support is provided for Windows 98/Me/2000/XP.

Hardware Installation

1. Turn your computer on and boot to your operating system.

2. With the CardBus adapter 68-pin connector facing the CardBus slot and the label facing up, slide the card completely into the CardBus slot as shown below.
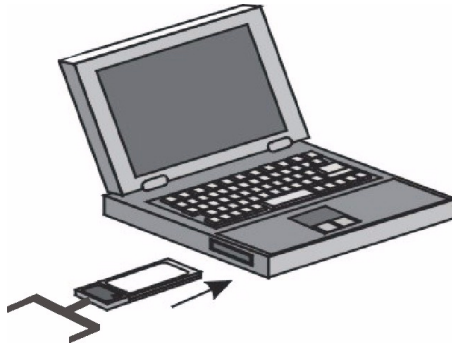
Note: You may insert or remove the CardBus adapter at any time. It is not necessary to power off your computer to do so.

Driver Installation and Configuration

The driver folder on the Driver/Utility CD-ROM contains the software drivers available for the Wireless™ 802.11a PC Card.

Windows 98/Me/2000/XP Driver Installation

You may find that these instructions do not exactly match your version of Windows. This is because these steps and screenshots were created from Windows 2000. Windows 98, Windows Millennium Edition, and Windows XP are similar, but not identical, to Windows 2000.

1. Once the card is inserted, Windows 98/Me/2000/XP will automatically detect the new hardware and prompt you to install the driver. Click "Next."

2. Insert the Driver/Utility CD-ROM and click "Next."
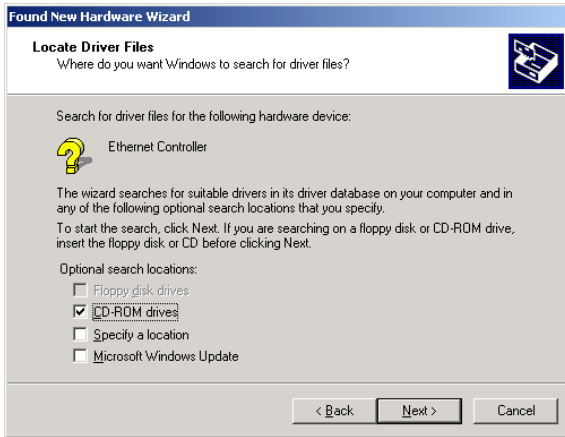
3. Click "Next" to copy files from the CD-ROM.

4.   Click "Finish" to end the installation.
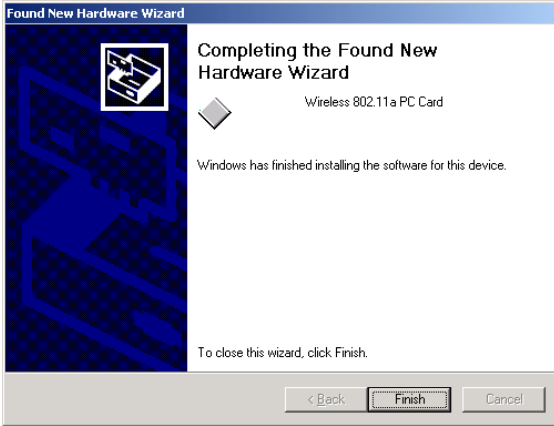
To communicate with the Wireless 802.11a wireless devices, you may need to configure the CardBus Adapter. For Windows 98, see "Windows 98 Configuration" on page 7. For Windows Me/2000/XP see "Windows Me/2000/XP Configuration" on page 8.

Windows 98 Configuration

1. From the "Start" menu, select "Settings" then click on "Control Panel."

2. Double-click on the "NIC Configuration" icon. A configuration dialog box similar to the one shown in step 5 on page 11 will appear. For the remaining configuration instructions, go to page 14 and continue from Step 5.

Windows Me/2000/XP Configuration

1. On your desktop, right click "My Computer," click "Properties" then click the "Hardware" tab in the "System Properties" dialog box.
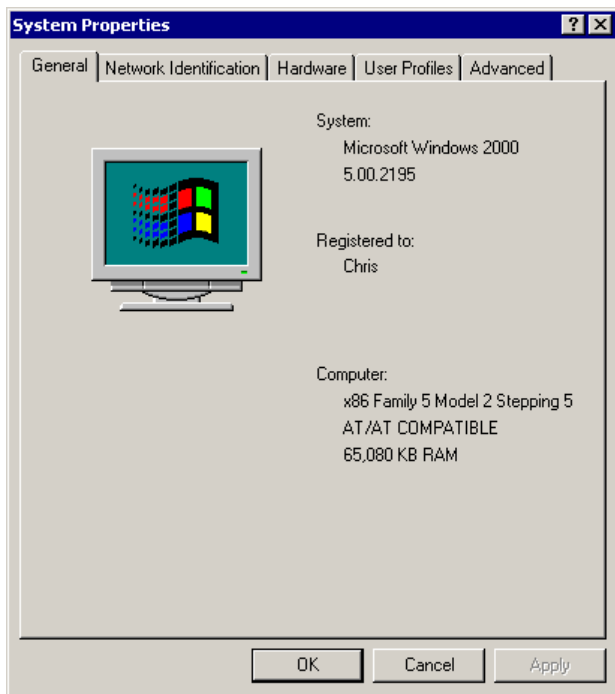
2. Click "Device Manager."
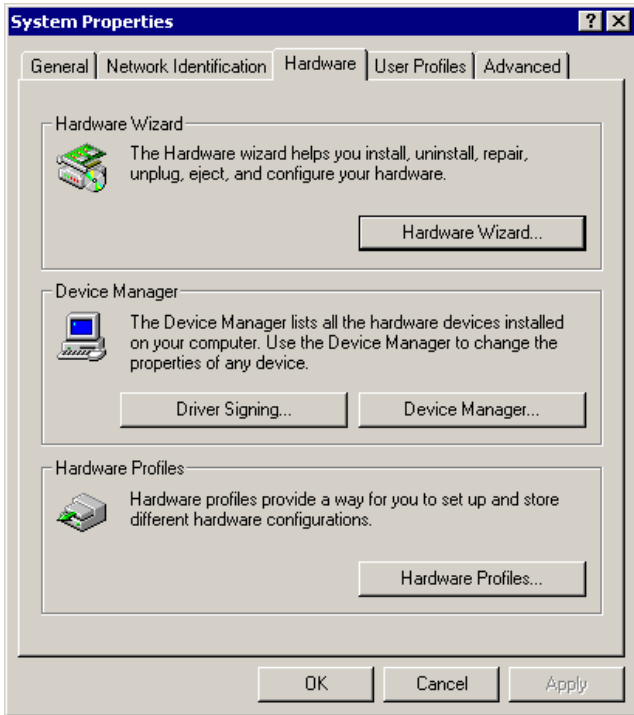
3. Click "Network adapters" then click "Wireless 802.11a PC Card."
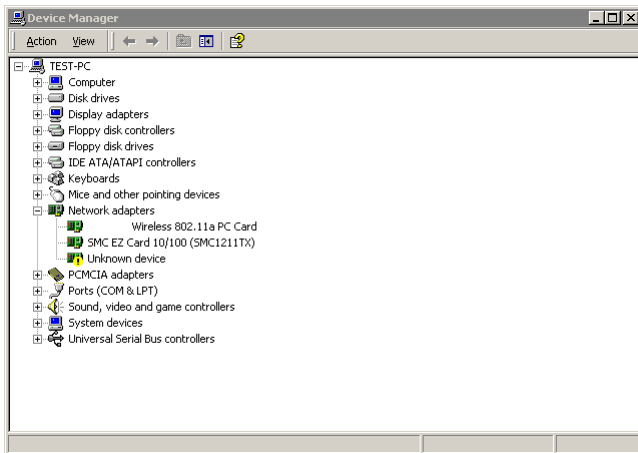
4. Click the "Settings" tab.

5. You may either modify the default settings or create a new configuration profile. To modify the default settings, click "Modify." To create a new configuration profile, click "New."
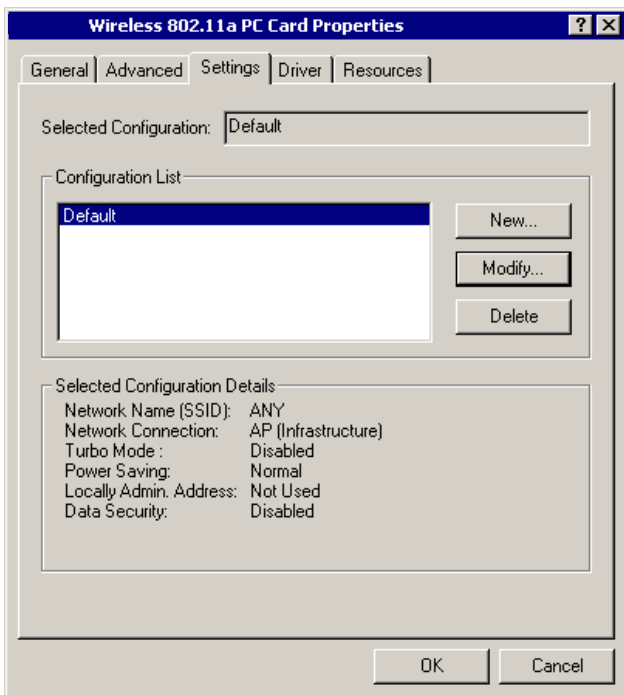
6.   The "Network Configuration Settings" dialog box will open.
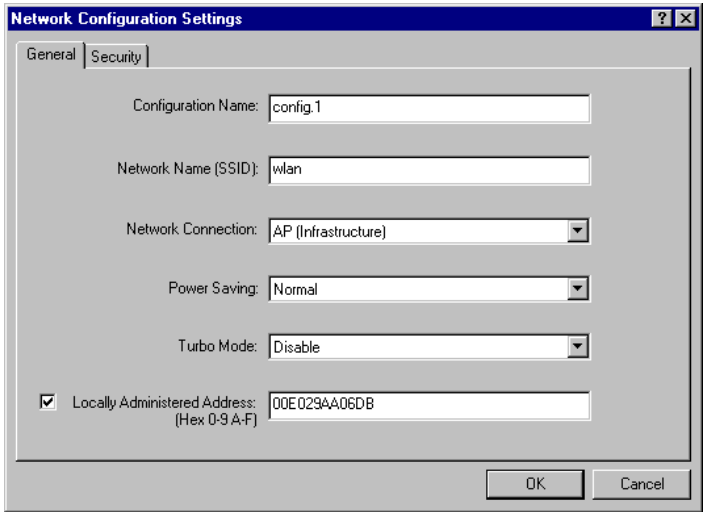
Configuration Name — Enter the configuration name.

Network Name (SSID) — Set the "SSID" (Service Set ID) to the same as that used by the ad hoc workgroup or access point you want to connect to (the Access Point default is "ANY").

Note: The SSID is case sensitive and can consist of up to 32 alphanumeric characters.

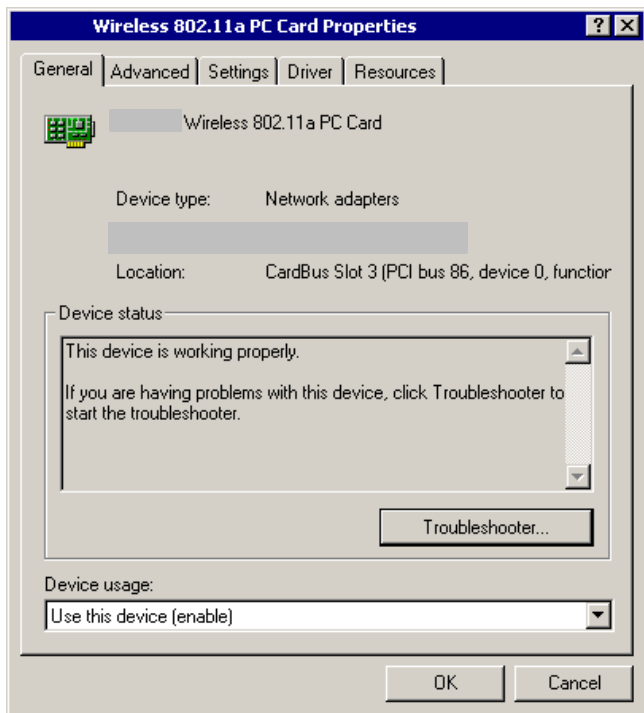**Network Connection** — Set "Network Connection" to "Ad Hoc" or "AP (Infrastructure)" depending on the type of network you want to connect to (see page 15).

Power Saving — Enable the "Power Saving" mode to reduce power loading (the default is "Normal").

Locally Administered Address — Check this box if you wish to set your own MAC address for the Cardbus Adapter. A MAC address consists of 6 hexadecimal numbers.

7.   Click "OK" when you have finished the configuration profile. This returns you to the card properties dialog box (see step 5 on page 11). The profile can be modified by selecting the profile name from the "Configuration List" and clicking on "Modify."

8. Wired Equivalent Privacy (WEP) is implemented in this device to prevent unauthorized access to your wireless network and provide more secure wireless data transmission. The CardBus supports "Shared Key" encryption with key lengths from standard 64-bit, industry standard 128-bit, to extended 152-bit. In addition to the standard WEP key, a per-station unique key is also supported. All wireless devices must have the same Key ID values to communicate.

   To enter security keys click the "Security" tab in the "Network Configuration Settings" dialog box and check "Enable Security." Select 64, 128, or 152-bit entry from the drop-down list then enter the required number of hexadecimal digits for the unique key and the first to fourth shared keys. Click "OK." This will return you to the card properties dialog box (see step 5 on page 11).
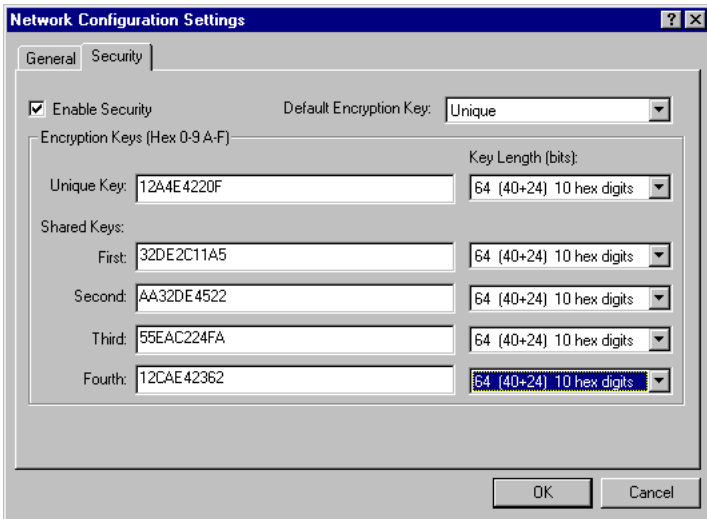
Key Length	Hex Digits per Key ID
64-Bit	10
128-Bit	26
152-Bit	32

9. Click "Modify" in the card properties dialog box (see step 5 on page 11), click the "Security" tab in the "Network Configuration Settings" dialog box, then select "Unique" or one of the shared keys from the drop-down list. Click "OK." This will return you to the card properties dialog box (see step 5 on page 11).
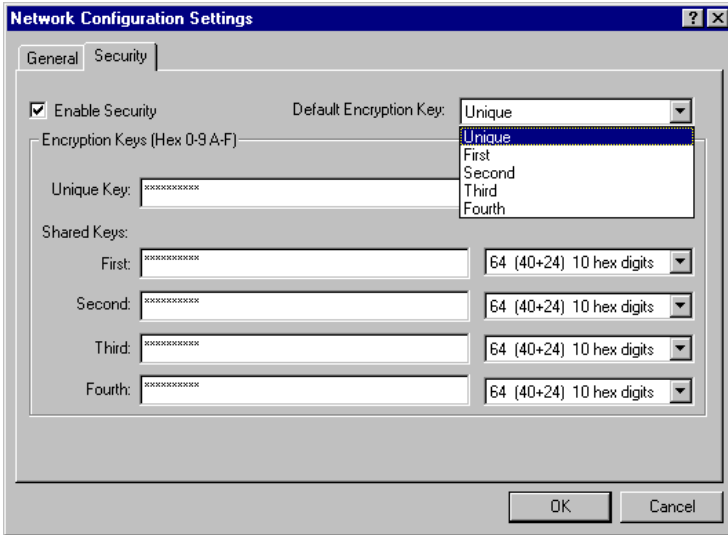
10. Click "OK" in the card properties dialog box (see step 5 on page 11).

11. Click "Yes" in the control panel dialog box to restart your computer and implement your new settings.

12. To add protocols after installation, go to "Control Panel" and double-click "Network."

13. Click "Add" to install the network protocols you want to use, such as IPX/SPX, NetBEUI or TCP/IP. If you install TCP/IP, be sure to set the appropriate Gateway, DNS Server, and Domain for your network. If you install an IPX/SPX-compatible protocol, then you also need to install the Client for NetWare Networks.

14. Click "File and Print Sharing" to share files or printers.

15. Click "Close" in the Network dialogue box and the system will restart your computer.

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Network Configuration and Planning

The wireless solution supports a stand-alone wireless network configuration, as well as an integrated wireless and 10/100 Mbps wired LAN configuration.

The AP-2000 PC Card can be configured as:

• Ad hoc – for small groups that only communicate with each other

• Infrastructure – for enterprise LANs

Network Topologies

Ad Hoc Wireless LAN

An ad hoc wireless LAN consists of a group of computers, each equipped with a wireless adapter, connected via radio signals as an independent wireless LAN. Computers in a specific ad hoc wireless LAN must be configured to the same radio channel.

An ad hoc wireless LAN can be used in a SOHO or temporary environment.

Ad Hoc Wireless LAN

Notebook with
Wireless USB Adapter

Notebook with
Wireless PC Card

PC with Wireless
PCI Adapter
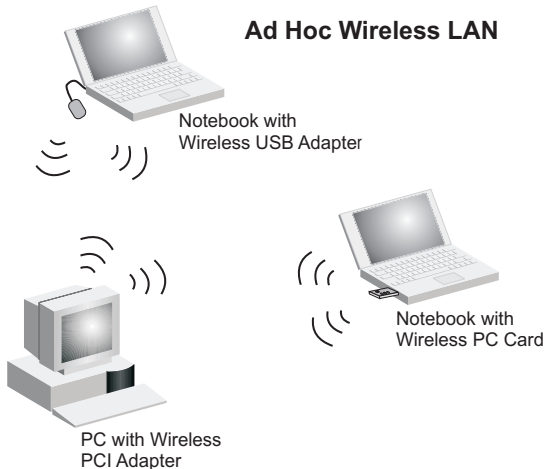
Infrastructure Wireless LAN

The AP-2000 PC Card can also provide access to a wired LAN for wireless clients. An integrated wired/wireless LAN is called an infrastructure configuration. A Basic Service Set (BSS) consists of a group of wireless PCs, and an access point that is directly connected to the wired LAN. Each wireless PC in this BSS can talk to any computer in its wireless group via a radio link, or access other computers or network resources in the wired LAN infrastructure via the access point.

The infrastructure configuration not only extends the accessibility of wireless PCs to the wired LAN, but also increases the effective wireless transmission range for wireless PCs by passing their signal through one or more access points.

A wireless infrastructure can be used for access to a central database, or for connecting mobile workers, as shown in the following figure.
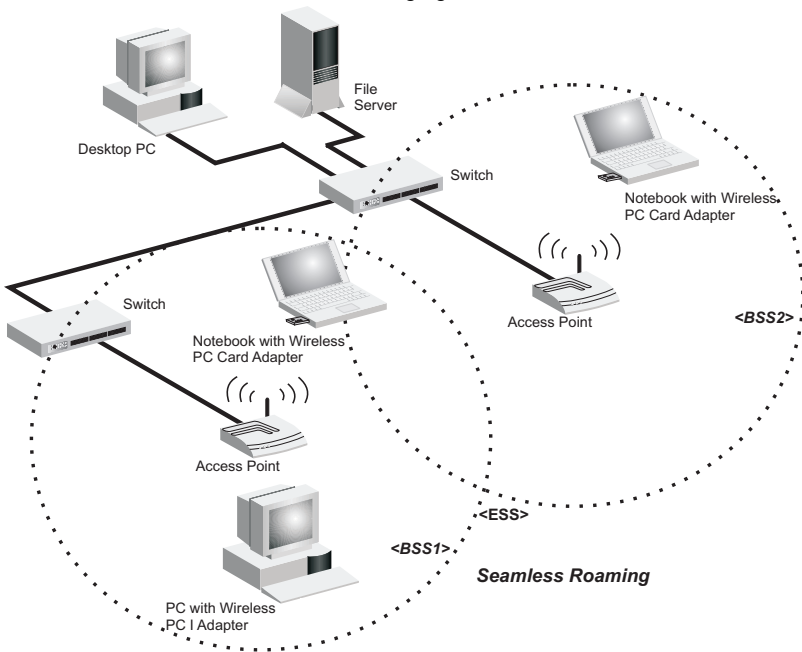
Infrastructure Wireless LAN for Roaming Wireless PCs

The Basic Service Set (BSS) is the communications domain for each Wireless Access Point. For wireless PCs that do not need to support roaming, set the domain identifier (SSID) for the wireless card to the SSID of the access point to which you want to connect. Check with your administrator for the SSID of the access point to which he wants you to connect.

A wireless infrastructure can also support roaming for mobile workers. More than one access point can be configured to create an Extended Service Set (ESS). By placing the access points so that a continuous coverage area is created, wireless users within this ESS can roam freely. All wireless network cards, adapters, and wireless access points within a specific ESS must be configured with the same SSID.

Wired LAN Extension to Wireless Adapters

Desktop PC

File Server

Switch

Notebook with Wireless PC Card Adapter

Access Point

PC with Wireless PCI Adapter
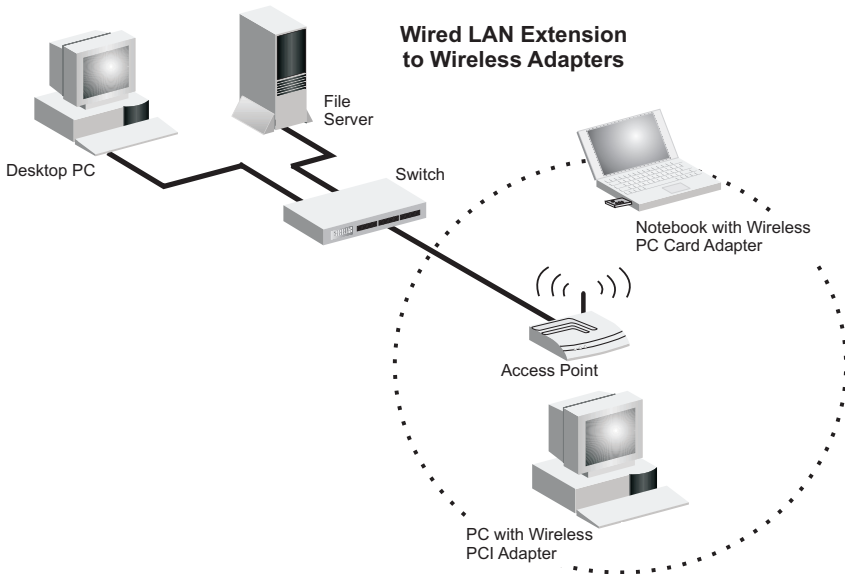
Troubleshooting

Adapter Installation Problems

If your computer cannot find the Wireless CardBus Adapter or the network driver does not install correctly, check the following:

- Make sure the adapter is securely seated in the CardBus slot. Check for any hardware problems, such as physical damage to the card's connector.
- Try the card in another CardBus slot. If this also fails, test your computer with another AP-2000 PC Card wireless card that is known to operate correctly.
- Make sure your computer is using the latest BIOS.
- If there are other network adapters in the computer, they may be causing conflict. Remove all other adapters from the computer and test the wireless adapter separately.
- Check for a defective computer or CardBus slot by trying the adapter in another computer that is known to operate correctly.

Network Connection Problems

If your wireless station cannot communicate with a computer in the Ethernet LAN when configured for infrastructure mode, check the following:

- Make sure the access point that the station is associated with is powered on.
- Make sure your wireless station is configured with the same operating radio channel as the access point.
- If you still cannot connect, change the access point and all the stations within the BSS to another radio channel.
- Make sure the CardBus adapter's SSID is the same as that of the access point.

The 802.11a Wireless Products Maximum Distance Table

Important Notice

Maximum distances posted below are actual tested distance thresholds. However, there are many variables such as barrier composition and construction, as well as local environmental interference, that may impact actual distances and cause you to experience distance thresholds far lower than those posted below.

802.11a Wireless Products Maximum Distance Table									
Speed and Distance Ranges									
Environmental Condition	72 Mbps	54 Mbps	48 Mbps	36 Mbps	24 Mbps	18 Mbps	12 Mbps	9 Mbps	6 Mbps
Outdoor Environment[1]	35 m (115 ft)	40 m (132 ft)	220 m (726 ft)	250 m (825 ft)	320 m (1056 ft)	350 m (1155 ft)	380 m (1254 ft)	450 m (1485 ft)	500 m (1650 ft)
Indoor Environment[2]	12 m (40 ft)	18 m (60 ft)	25 m (82 ft)	30 m (99 ft)	35 m (115 ft)	40 m (132 ft)	45 m (149 ft)	45 m (149 ft)	50 m (165 ft)

Notes: **1.** Outdoor Environment: A line-of-sight environment with no interference or obstruction between access point and users.

2. Indoor Environment: A typical office or home environment with floor to ceiling obstructions between access point and users.

Compliances

FCC Class B Certification

FCC ID: IMRWLPCE508A

This device complies with Part 15 of the FCC Rules Operation is subject to the following conditions:

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

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

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

Notice: The changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

FCC RF Radiation Exposure Statement

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

CSA Statement (Canada)

3857104650A
This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio interference Regulations of Industry Canada.

Le présent appareil numerique n'émet pas de bruits radio-électriques dépassant less limites applicables aux apparails numériques de la classe B prescrites dans le Réglement sur le brouillage radioélectrique édicté par l'Industrie.

Notice: Radio Frequency Interference Requirements: The device is restricted to indoor use only. FCC requires this product to be used indoor due to its operation in the frequency range 5.15 to 5.25GHz.

Specifications

Functional Criteria

Data Rate   Normal Mode: 6, 9, 12, 18, 24, 36, 48, 54 Mbps

Standards Conformance   IEEE 802.11a
Operating Range   Up to 500 m (1650 ft)

Radio Signal

Signal Type   Orthogonal Frequency Division Multiplexing (OFDM)
Operating Frequency   5.15 ~ 5.25 GHz (lower band) for US/Canada, Japan
                                          5.25 ~ 5.35 GHz (middle band) for US/Canada

Sensitivity

Modulation/Rates	Sensitivity (dBm)
BPSK (6 Mbps)	-85
BPSK (9 Mbps)	-84
QPSK (12 Mbps)	-83
QPSK (18 Mbps)	-81
16 QAM (24 Mbps)	-78
16 QAM (36 Mbps)	-74
64 QAM (48 Mbps)	-69
64QAM (54 Mbps)	-65

Modulation

Modulation	5.15-5.25 GHz (dBm)	5.25-5.35 GHz (dBm)
BPSK (6 Mbps)	14	16.5
BPSK (9 Mbps)	14	16.5
QPSK (12 Mbps)	14	16.5
QPSK (18 Mbps)	14	16.5
16 QAM (24 Mbps)	14	16.5

Specifications

Modulation	5.15-5.25 GHz (dBm)	5.25-5.35 GHz (dBm)
16 QAM (36 Mbps)	14	16.5
64 QAM (48 Mbps)	11	11
64 QAM (54 Mbps)	7	7

Physical Characteristics

Input Voltage   3.3 V
Power Consumption

     Idle/Listening 1478 mW, Power Save Mode 40 mW
     Base Mode: TX 1657 mW, RX 1247 mW,
     Idle/Listening 1238 mW, Power Save Mode 40 mW
Weight   50 g (4.8 oz)
Dimensions   11.5 x 5.3 cm (4.53 x 2.09 in)
Antenna   Built-in side-stem antenna
LED Indicators   Power, Network

Host Interface   68-pin connector to CardBus slot

Environmental

Temperature   0 to 50 °C / 32 to 140 °F (operating)
     0 to 70 °C / 32 to 158 °F (storage)
Humidity   5 to 80% (non-condensing)
Emissions   FCC Class B
Antenna   Built-in side-stem antenna
LED Indicators   Power, Network

Safety   CSA/NTRL (CSA 22.2 No. 950 & UL 1950)
     Vibration/Shock/Drop: IEC 68-2-34/IEC 68-2-32

Standards   802.11a

Software Drivers

NDIS Drivers   Windows 98
     Windows Me
     Windows 2000
     Windows XP

Terminology

The following is a list of terminology used in this document.

Access Point – An internetworking device that seamlessly connects wired and wireless networks.

Ad hoc – An ad hoc wireless LAN is a group of computers each with LAN adapters, connected as an independent wireless LAN.

Backbone – The core infrastructure of a network. The portion of the network that transports information from one central location to another central location where it is unloaded onto a local system.

Base Station – In mobile telecommunications, a base station is the central radio transmitter/receiver that maintains communications with the mobile radiotelephone sets within its range. In cellular and personal communications applications, each cell or micro-cell has its own base station; each base station in turn is interconnected with other cells' bases.

BSS – BSS stands for "Basic Service Set." It is an access point and all the LAN PCs that are associated with it.

CSMA/CA – Carrier Sense Multiple Access with Collision Avoidance.

ESS – ESS (ESS-ID, SSID) stands for "Extended Service Set." More than one BSS is configured to become an Extended Service Set. LAN mobile users can roam between different BSSs in an ESS (ESS-ID, SSID).

Ethernet – A popular local area data communications network, which accepts transmission from computers and terminals. Ethernet operates on a 10 Mbps baseband transmission rate, using a shielded coaxial cable, or shielded twisted pair telephone wire.

Infrastructure – An integrated wireless and wired LAN is called an infrastructure configuration.

Roaming – A wireless LAN mobile user moves around an ESS and maintains a continuous connection to the infrastructure network.

RTS Threshold – Transmitters contending for the medium may not be aware of each other. RTS/CTS mechanism can solve this "Hidden Node Problem." If the packet size is smaller than the preset RTS Threshold size, the RTS/CTS mechanism will NOT be enabled.

WEP – "Wired Equivalent Privacy" is based on the use of 64-bit, 128-bit, or 152-bit keys and the popular RC4 encryption algorithm. Wireless devices without a valid WEP key will be excluded from network traffic.