IEEE 802.11b

WN3501AR

Wireless USB

Adapter

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WIRELESS USB ADAPTER WN3501AR

Wireless USB Adapter WN3501AR is an 11 Mbps wireless network adapter 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 desktop PCs and start networking.

Using this adapter in conjunction with Wireless Access Point, you can create an instant network that integrates seamlessly with 10 Mbps Ethernet LANs. Moreover, moving or expanding your network is as easy as moving or installing additional Access Points—no wires!

PACKAGE CHECKLIST

The Wireless USB Adapter WN3501AR package includes:

- 1 Wireless USB Adapter with dual dipole antenna (WN3501AR)

- 1 Driver/Utility diskette

- 1 USB cable

- This User Guide

HARDWARE DESCRIPTION

Wireless USB Adapter WN3501AR supports an 11 Mbps half-duplex connection to Ethernet networks. This adapter is fully compliant with 2.4 GHz DSSS CSMA/CA wireless networking as defined in IEEE 802.11b. It can be installed in any notebook or desktop with a USB port. Support is provided for Windows 98/Me/2000.

Applications

The Wireless USB Adapter WN3501AR offers 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**
  Historic or old buildings, asbestos installations, and open areas where wiring is difficult to employ

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

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

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

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

LED Indicators

The Wireless USB Adapter WN3501AR includes three
LED indicators, as described in the following figure
and table.

LED	Status	Description
Power	On Red	Indicates the power is being supplied
RX	Flashing Orange	Indicates that the card is receiving data via the wireless
TX	Flashing Green	Indicates that the card is transmitting data via the wireless

System Requirements

Before you install the Wireless USB Adapter
WN3501AR, check your system for the following
requirements:

- An available USB port in your computer.

- Windows 98/Me/2000 (Have the Windows
  installation CD-ROM ready for use during
  installation).

- A minimum of 1 MB of free disk space for
  installing the driver and utility program.

- Another IEEE 802.11b compliant device installed
  in your network, such as the WL11000 Wireless
  Access Point, or the Wireless USB Adapter
  WN3501AR.

INSTALLATION

WARNINGS:

- Backup your driver diskette and use the copy as the working diskette to protect the original from accidental damage.

1. Select an unused USB port and remove its protective bracket.

2. Carefully insert the USB cable and press until it is firmly seated in the USB port.

3. Install the appropriate network driver for your operating system. Drivers can be found on the driver diskette. See "Driver Installation" for more information.

4. Install the configuration program for your wireless USB adapter. The SETUP.EXE file can be found on the utility diskette. See "Configuration and Diagnostic Utility" for more information.

DRIVER INSTALLATION

The diskette labeled "Driver Diskette," that comes with the package contains all the software drivers available for the Wireless USB adapter WN3501AR. Select the driver you need for your system and refer to this guide for the installation and configuration procedure.

WINDOWS 98/ME INSTALLATION

1. Windows 98/Me will automatically detect the new hardware and prompt you to install the driver. Click "Next" to find the driver.


2. Insert the floppy disk labeled "Driver/Utility" diskette specify the location "A:\" and click "Next".


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3. Click "Next" to copy files from the floppy disk.

4. Set the "Channel" to the same radio channel as that used by the other wireless clients in your group. However, if you are connecting to a network via an access point, the adapter will automatically set the channel to be the same as that used by the Access Point.
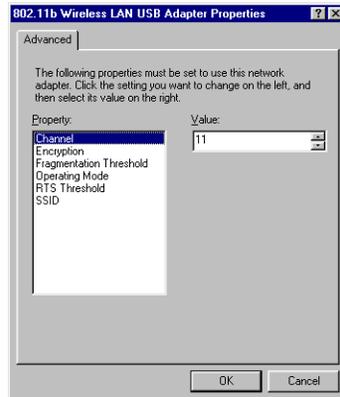
5. For more secure data transmission, set the "Encryption" to "128-bit" or "64-bit" to ensure wireless network security. The advance Wired Equivalent Privacy (WEP) is implemented in this card to prevent unauthorized access. The 128-bit setting gives a higher level of security but the setting must be the same for all clients in your wireless network. (Default: Disabled)
To completely configure WEP, you must use the Configuration Utility. Please see "Encryption Screen" under the "Configuration and Diagnostic Utility" section.
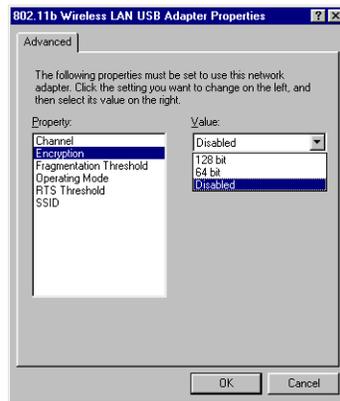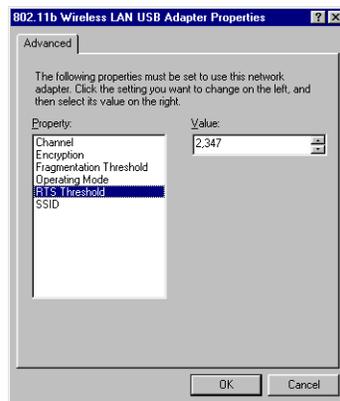

6. Set the "Fragmentation Threshold". (The Default is 2346 which means "Disabled")
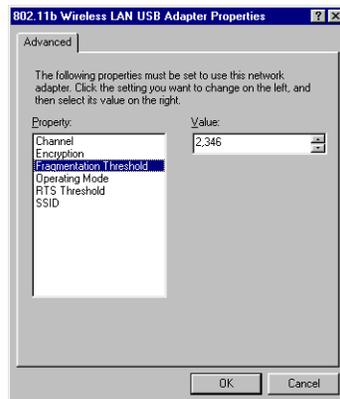
7. Set the "Operating Mode" to "802.11 Ad-Hoc" or "Infrastructure" depending on the type of network you want to connect to.
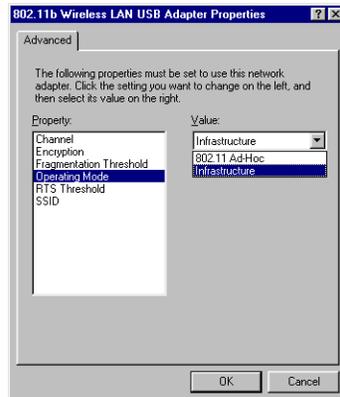
8. Set the "RTS Threshold" to the same as that used by other devices in your network. (The default is 2347 which means "Disabled")

9. Set the "SSID" identifier to the same as that used by the ad hoc work group or access point you want to connect to. If you will be roaming among multiple Access Points with different BSSIDs, a value of "ANY" will allow connection to any SSID.
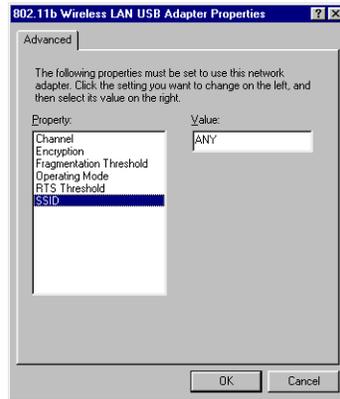
10. Insert Windows98/Me CD-ROM and click "OK". Windows will copy source file to your system.
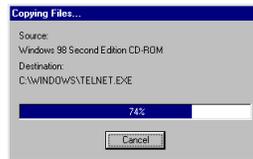
11. If you want to add more protocols after installation, go to control panel and double-click "Network".

12. Select the "Configuration" tab and 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.
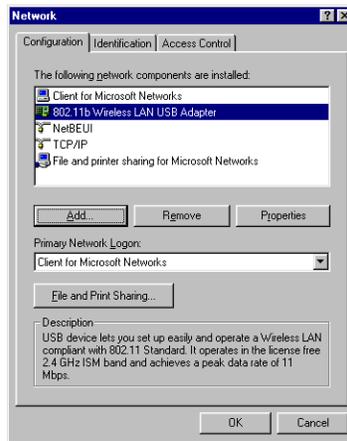
13. Click "File and Print Sharing…" to share files or printers.

14. Click on the "Identification" tab on the Network dialog box, and specify your computer name and network workgroup.

15. Click "OK" in the Network dialog box and the system will restart your computer.

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WINDOWS 2000 INSTALLATION

1. Windows 2000 will automatically detect the new hardware and prompt you to install the driver Click "Next" to find the driver.

2. Insert the floppy disk labeled "Driver/Utility" diskette choose "Floppy disk drives"and click "Next".

3. Click "Next" to copy files from the floppy disk.

4. Finish the driver installation.

5. If you want to add more protocols after installation, go to control panel and double click on "Network and Dial-up Connections" and double click "Local Area Connection X", click "Properties".

6. Select the "General" tab and click "install" to install the network protocols you want to use, such as IPX/SPX, NetBEUI or TCP/IP.

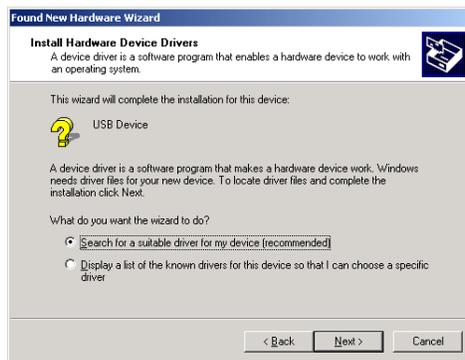   If you install TCP/IP, be sure to set the appropriate Gateway, DNS Server, and Domain for your network.

   If you install an IPX/SPX compatible protocol, then you also need to install the Client for NetWare Networks.

CONFIGURATION AND DIAGNOSTIC UTILITY

Wireless USB Adapter WN3501AR provides free optional management software for quick network configuration and easy diagnostics. The "Driver/ Utility" diskette that comes with the package contains a user-friendly interface for configuring the Wireless USB Adapter WN3501AR.

Utility Installation

To install the utility software:

1. Insert the "Driver/Utility" diskette in your PC's floppy drive (A:).

2. Select "run..." from Windows "Start" menu bar.

3. Enter "A:\Utility\Setup.exe" and click "OK".

4. Follow the on-screen instructions to finish installation.

Using the Wireless LAN Utility

Once the installation is completed, the configuration utility can be accessed by selecting the "USB Utility" icon from the "IEEE 802.11b Wireless LAN" folder.
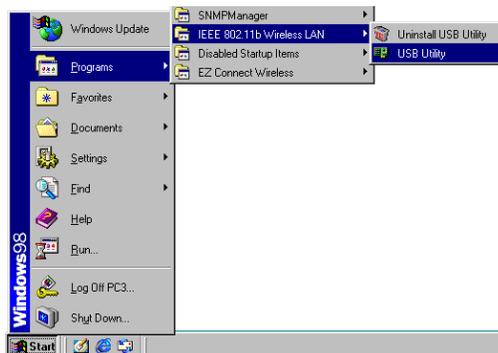
Quick-Launch Icon

After the utility program is running, it will have a "Quick Launch" icon in the lower right hand corner of the task bar.

Double clicking the icon in the Quick Launch bar will open the USB Utility program, providing quick access to all settings of the adapter.

This configuration software includes the following functions:

Monitor - Allow you to monitor network status and configure parameters for the wireless adapter.

Statistics - Show the statistics of the wireless adapter.

Site Survey - Scan/Show all the APs in range.

Encryption - Provides WEP security control.

Advanced - Allow you to configure the advanced settings.
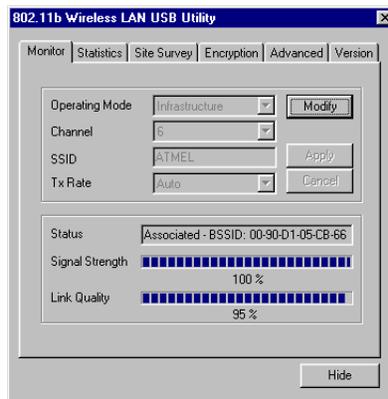
Version - Show the version information.

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Monitor Screen

When you start the wireless USB utility, the information window for the WN3501AR is shown as the figure below. Click on the "Monitor" tab to monitor the network status of the wireless adapter, including the BSS ID, current channel, link quality, and signal strength.

Click "Modify" to configure "Operating Mode", "Channel", "SSID" and "Tx Rate". After configuration, just click "Apply" to save the changes.

Operating Mode - Set the station operation mode to "802.11 AdHoc" for network configurations that do not have any Access Points, or to "Infrastructure" for configurations with Access Points. ("Infrastructure" is the default setting)

Channel - If you are setting up an ad hoc wireless LAN (see page 23), set the channel number to the same radio channel as that used by the other wireless clients in your group. However, if you are connecting to a network via an Access Point, then the channel is automatically set to the channel of the Access Point that the adapter connects to.

SSID - Input an SSID string that you want to connect to ("ANY" is the default setting). If you will be roaming among multiple Access Points with different BSSIDs, a value of "ANY" will allow connecttion to any SSID.

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Tx Rate - Indicates the communication rates. Select appropriate transmission speed to match your wireless LAN settings. (Default: Fully Automatic)
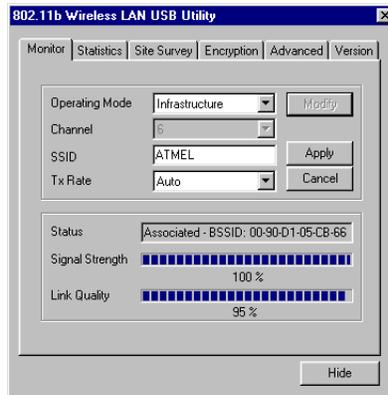
Note : The "Channel" can only be set when the "Operating Mode" is "802.11 Ad-Hoc".

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Statistics Screen

The Statistics screen displays "Data Frames" and "Management Frames". (Please see "Terminology" section for "Data Frames" and "Management Frames" definitions)
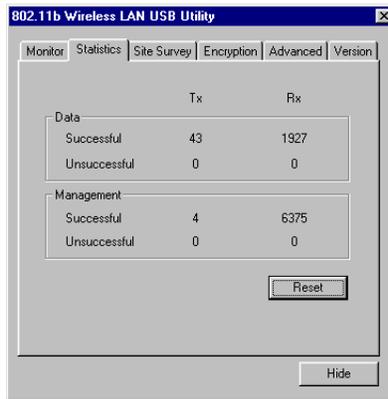
Site Survey Screen

The Site Survey screen displays all APs in wireless LAN, and you can choose one of them to connect to by double clicking.
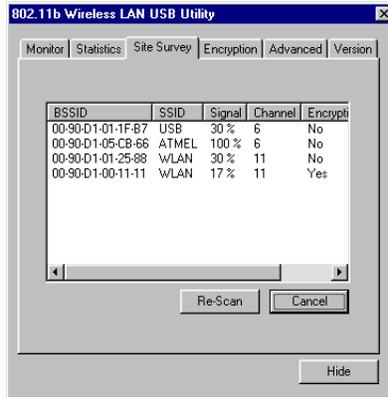
Encryption Screen

Encryption - For more secure data transmission, set the "**Encryption**" to "128-bit" or "64-bit" to ensure wireless network security. Wired Equivalent Privacy (WEP) is implemented in this adapter to prevent unauthorized access to your wireless network. The 128-bit setting gives a higher level of security, but the setting must be the same as other clients in your wireless network. (Default: Disabled)

The WEP (Wired Equivalent Privacy) implemented in Wireless USB adapter WN3501AR is based on an RC4 encryption algorithm. The security keys provided to ensure data confidentiality are four 10 digit keys for the 64-bit WEP setting (first screen below) and one 26-digit key for the 128-bit WEP setting (second screen below). This WEP security protects your wireless LAN against eavesdropping and unauthorized access by hackers or unexpected intruders.

Create with Passphrase - Security keys for WEP encryption are generated from your Passphrase string, so you must use the same passphrase on all the other stations in your network.

Manual Entry - "Manual Entry" allows the user to manually enter key elements. (2 Hexadecimal digits in each block)

Default Key ID - Choose the Key ID that has the encryption string you prefer. If you are using a key generated from Passphrase, you must use the same Passphrase and key on each station.

To use the WEP function, take the following steps:

1. Select "128-bit" or "64-bit" for the "**Encryption**" field.

2. Then choose **Create with Passphrase**, type a string in the **Passphrase** field and click "Generate", then select the key, and click "Apply"**.**
    Note: Passphrase string can consist of up to 32 alphanumeric character.
    Or choose **Manual Entry** and enter key elements in one of the keys 1-4, and click "Apply".
    Note: Each bit key must be hexadecimal.
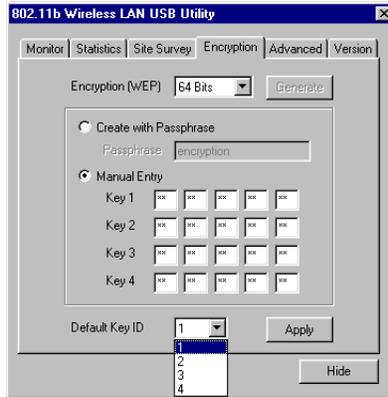
Advanced Screen

Here you can set values of "Fragmentation Threshold"(Default: 2346, which means Disabled) and "RTS/CTS Threshold"(Default: 2347, which means Disabled).
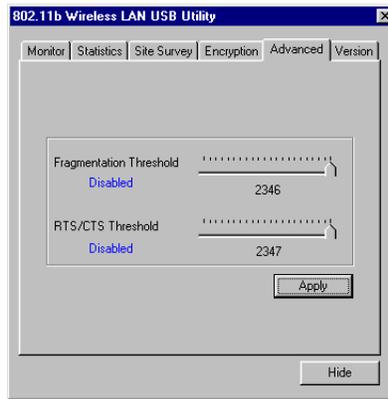
NETWORK CONFIGURATION AND PLANNING

WN3501AR Wireless Solution supports a stand-alone wireless network configuration, as well as an integrated configuration with 10 Mbps Ethernet LANs.

The WN3501AR USB adapter can be configured as:

- Ad hoc for departmental or SOHO LANs

- 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 therefore be configured to the same radio channel.

An ad hoc wireless LAN can be used for a branch office or SOHO operation.

Ad Hoc Wireless LAN

Notebook with
Wireless USB Adapter

Notebook with
Wireless PC Card

PC with Wireless
PCI Adapter

Infrastructure Wireless LAN

The WN3501AR can also provide access to a wired
LAN for wireless workstations. An integrated wired
and wireless LAN is called an Infrastructure
configuration. A Basic Service Set (BSS) consists of a
group of wireless PC users, 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 doubles 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 connection between mobile
workers, as shown in the following figure.
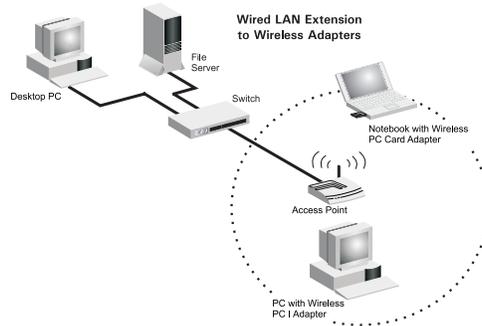
Setting the Communication Domain

Stationary Wireless PCs

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

Roaming Wireless PCs

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 adapters and Wireless Access Points within a specific ESS must be configured with the same SS ID.
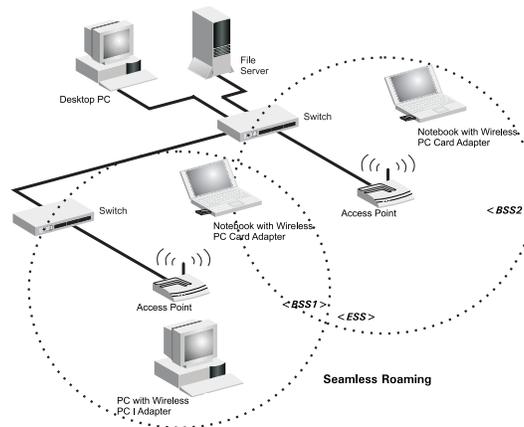
Before setting up an ESS for roaming, you need to choose a clear radio channel and ideal location for the Access Points to maximize performance. (Refer to "Using the Wireless LAN Utility" on page 15 for detailed information on installation and usage.)

TROUBLESHOOTING

Check the following troubleshooting items before contacting Technical Support.

USB adapter Installation Problems

If your computer can't find the Wireless USB adapter WN3501AR or the network driver doesn't install correctly, check the following:

- Make sure the adapter is connected to the USB port.Check for any hardware problems, such as physical damage to the adapter's connector.

- Try the adapter in another USB port. If this also fails, try using another WN3501AR wireless adapter 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 cause conflicts. Disable or remove all other adapters from the computer and test the wireless adapter separately.

- Check for a defective computer or USB port by trying the adapter in another computer that is known to operate correctly.

- If there are still difficulties, remove the wireless adapter. Delete the file "Vnetusba.sys" from c: \windows\system(For Windows98/Me), c: \winnt\system32\drivers(For Windows2000). Then go to "Control Panel" and delete the adapter from your network configuration menu. Restart your PC and reinstall the adapter.

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NETWORK CONNECTION PROBLEMS

If the LEDs on the USB adapter are not lit, or if you can't access any network resources from the computer. Check the following:

- Make sure the correct software driver is installed. Try reinstalling the driver.

- Make sure the computer and other network devices are receiving power.

- The access point you want to connect to may not be functioning correctly. Try using another Access Point.

- If you cannot access a Windows or NetWare service on the network, check that you have enabled and configured the service correctly. If you cannot connect to a particular server, be sure that you have access rights and a valid ID and password.

- If you cannot access the Internet, be sure you have configured your system for TCP/IP.

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

- Make sure the Access Point which the station associated with is powered on.

- Check to make sure your wireless settings (i.e. WEP, SSID, Channel) match the AP or other stations you are connecting to.

- If you still can't connect, change the Access Point and all the stations within the BSS to another radio channel.

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COMPLIANCES

FCC Class B Certification

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 communications.

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.
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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.

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CSA Statement (Canada)

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 numérique n'émet pas de bruits radio-électriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dens le Règlement sur le brouillage radioélectrique édicté par l'Industrie.

CE Mark Declaration of Conformance

This is to certify that this product complies with ISO/IEC Guide 22 and EN45014. It conforms to the following specifications:

EMC: EN55022(1988)/CISPR-22(1985)   Class B
      IEC 61000-4-2(2000)   4kVCD/8kVAD
      IEC 61000-4-3(2000)   3V/m
      IEC 61000-4-4(2000)   1kV- (power line)
      IEC 61000-4-6(2000)   3Vrms
      IEC 61000-4-11(2000)   3Vrms

This product complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC, and carries the CE Mark accordingly.

SPECIFICATIONS

Functional Criteria

Data Rate	1, 2, 5.5, 11 Mbps
Transmission Mode	Half duplex
Network Connection	IEEE 802.11b wireless
Operating Range	Max distance of 11Mbps: 180m (590ft)
	Max distance of 5.5Mbps: 300m (984ft)
	Max distance of 2Mbps: 450m (1476ft)
	Max distance of 1Mbps: 550m (1800ft)

Radio Signal

Signal Type	Direct Sequence Spread-Spectrum (DSSS)
Operating Frequency	USA, Canada and ETSI: 2.4~2.4835GHz
	Japan: 2.4~2.497GHz
Sensitivity	1, 2, 5.5 Mbps: -80 dBm,
	11 Mbps: -78 dBm (minimum)
Modulation	CCK, BPSK, QPSK
Output Power	>+15 dBm (minimum)

Physical Characteristics

Current Consumption	TX 450 mA Max
	RX 320 mA Max
	Typical 350 mA Max
Dimensions	133 x 108 x 30 mm (5.23 x 4.25 x 1.18 in)
Weight	181 g (6.38 oz)
Antenna	Dual dipole antenna
LED Indicator	Power, RX, TX
Host Interface	USB specification reversion 1.1

Standards Conformance	IEEE 802.11b
Certification	
	FCC Part 15
	ETSI 300.328
	ARIB STD 33 & 66

Software

NDIS Driver/Utility	Windows 98
	Windows Me
	Windows 2000

TERMINOLOGY

The following is a list of terminology that is 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.

Data Frame – The packets transmit/receive from the device.

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 base band transmission rate, using a shielded coaxial cable or over twisted pair telephone wire.

Fragmentation Threshold – In the 802.11 Standard, the MAC Layer may fragment and reassamble directed MSDUs or MMPDUs. The fragmentation and defragmentation mechanisms allow for fragment re-transmission.

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

Management Frame – Control frame for establishing the link between Access Point and client station. It should include the Beacon, Probe, Authentication, and Association frame.

MSDUs – MAC Service Data Units.

MMPDUs – MAC Management Protocol Data Units.

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.

USB - The Universal Serial Bus allows complete Plug and Play connection of peripheral devices to a computer.

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