E1165

ASUS

SpaceLink B&W PCI Card

ASUS SpaceLink B&W

Bluetooth & Wireless LAN PCI Card

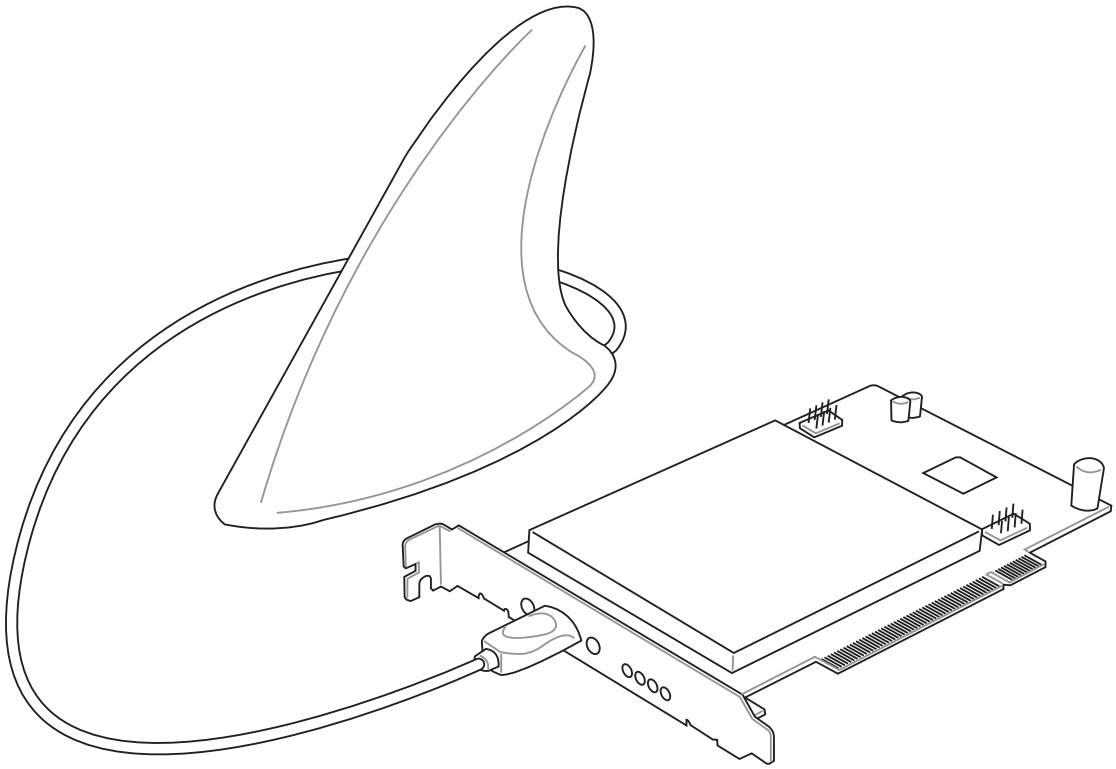
User's Manual

E1165

SpaceLink™ B&W PCI Card

WL-230

User's Manual



Copyright Information

Product Name:	SpaceLink B&W PCI Card (WL-230)
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Table of Contents

1. Introduction

Overview

Thank you for purchasing the ASUS SpaceLink B&W PCI Card. The ASUS SpaceLink B&W PCI Card is a PCI compliant "wireless" network interface card (NIC) for any computer equipped with a PCI slot.

ASUS SpaceLink B&W PCI Card is designed to be fully compliant with both the IEEE 802.11b and IEEE 802.11a wireless local area network (Wireless LAN) standards as well as Bluetooth for interconnecting personal devices. The ASUS SpaceLink B&W PCI Card product provides high-speed, standards-based Wireless LAN solutions. The ASUS SpaceLink B&W PCI Card can auto-switch between 802.11b and 802.11a networks, while maintaining Bluetooth connectivity.

Bluetooth

Bluetooth can communicate with a wide range of Bluetooth-enabled devices from mobile phones, headsets, PDAs, printers, and other computers. Bluetooth can create virtual connections for serial communication, network access, file transfer, and device sharing.

802.11b

The ASUS SpaceLink B&W PCI Card supports data rates up to 11 Mbps (or up to 108 Mbps in ASUS turbo mode), with automatic fallback to 5.5, 2, and 1 Mbps in 802.11b networks. It operates in the unlicensed 2.4 GHz frequencies called the Instrumentation, Science, and Medical (ISM) band. Unlicensed means free of charge to users.

802.11a

The ASUS SpaceLink B&W PCI Card also supports data rates up to 54 Mbps in 802.11a networks using 5 GHz frequencies and Orthogonal Frequency Division Multiplexing (OFDM) technology.

Wireless LAN Software

The ASUS SpaceLink B&W PCI Card configuration utility is a user-friendly application that helps you quickly setup multiple roaming nodes. You can even export the configuration settings to a file and import them to other computers for fast multiple installations. Wireless LANs are complementary extensions to existing wired LANs, offering complete mobility while maintaining continuous network connectivity to both corporate and home Intranets.

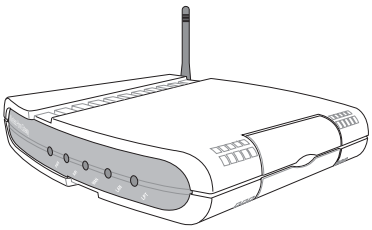
Bluetooth Software

Integrated Widcomm software provides easy Bluetooth connections user-friendly interface and complete with user profiles for quick saving and loading of settings.

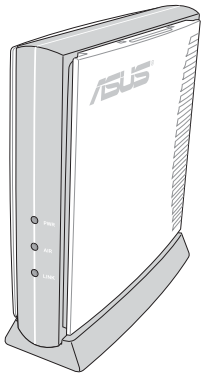
ASUS SpaceLink products keep you connected anytime, anywhere!

The SpaceLink™ Family

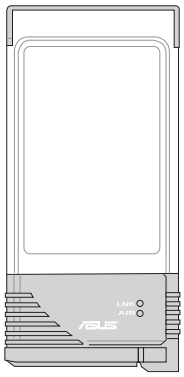
The SpaceLink™ Wireless PCI Card is a member of a product family that provides a complete wireless networking solution.



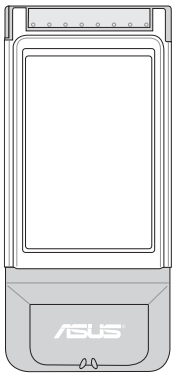
The **SpaceLink™ Home Gateway (WL-500)** creates a wireless network using the IEEE 802.11b wireless standard and allows sharing a single Internet connection.



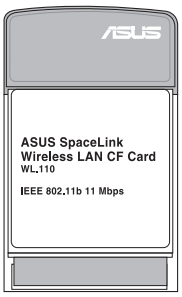
The **SpaceLink™ Access Point (WL-300)** creates a wireless network using the IEEE 802.11b wireless standard.



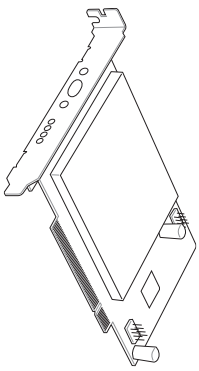
The **SpaceLink™ PC Card (WL-100)** is a IEEE 802.11b wireless LAN adapter that fits into a PCMCIA Type II slot in a Notebook PC.



The **SpaceLink™ Cardbus Card (WL-200)** is a dual band (IEEE 802.11a/b) wireless LAN adapter that fits into a Notebook PC's PCMCIA Type II slot with Cardbus support.

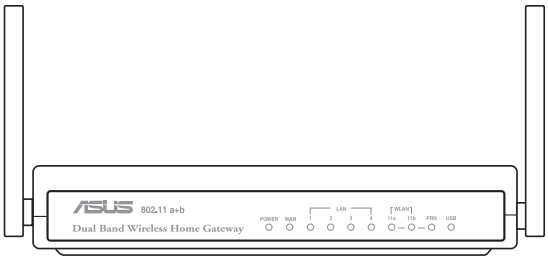


The **SpaceLink™ CF Card (WL-110)** is a IEEE 802.11b wireless LAN adapter that fits into a Compact Flash Type II slot in a Portable Digital Assistant (PDA).

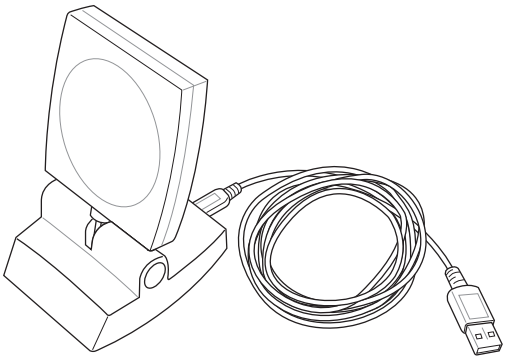


The **SpaceLink™ B&W PCI Card (WL-230)** is a dual band (IEEE 802.11a/b) wireless PCI card that supports IEEE 802.11a, 802.11b, and Bluetooth.

The above illustrations are not to scale.



The **SpaceLink™ Dual-Band Home Gateway (WL-600)** creates a wireless network using the IEEE 802.11b and 802.11a wireless standards and allows sharing a single Internet connection.



The **USB SpaceLink™ Client (WL-140)** is an IEEE 802.11b wireless USB LAN adapter that connects to any computer's USB port with the benefit of being able to place the antenna anywhere in order to maximize signal strength.

System Requirements

To begin using the SpaceLink™ Wireless B&W PCI Card, you must have the following minimum requirements:

- Motherboard with an available PCI slot
- USB 2.0 header (10-1 pins) on motherboard or USB 2.0 PCI card
- Windows XP/2000/ME/98SE
- 32MB system memory or larger
- 300MHz processor or higher

The Product Package

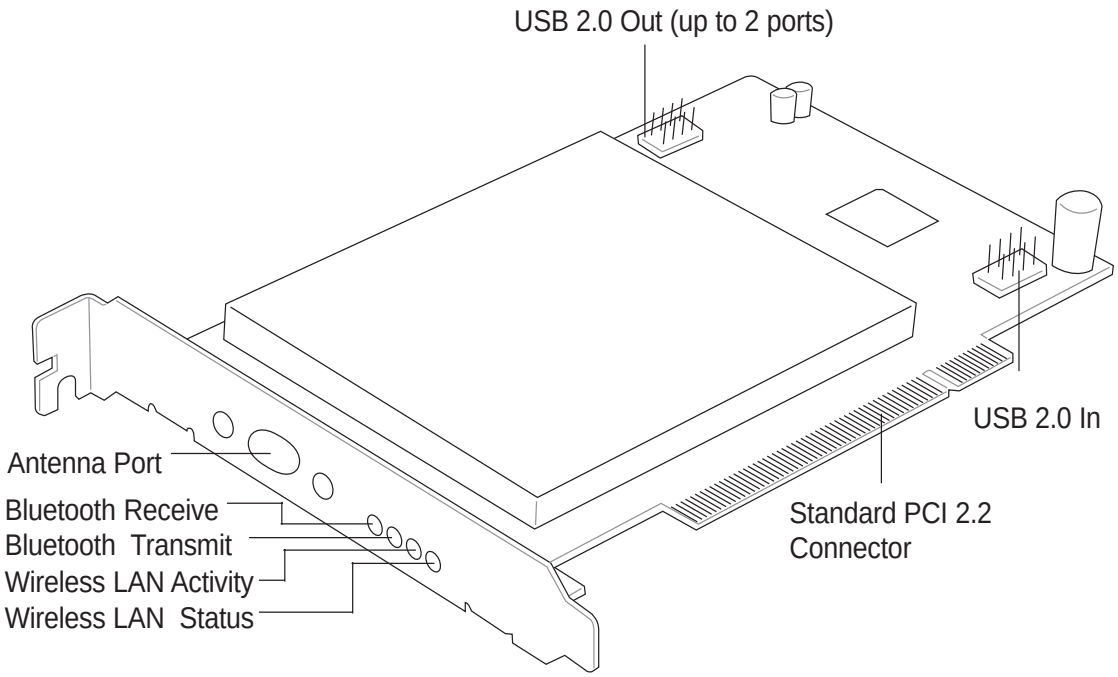
When you receive the Wireless LAN package, it should contain the following items:

- One SpaceLink™ Wireless B&W PCI Card with Antenna
- One SpaceLink™ Wireless B&W PCI Card User's Manual
- One Support CD (tools and documentation)
- One short USB 2.0 cable (for card to motherboard use only)
- One 2-port USB bracket with cable (for individual package)

  The SpaceLink Wireless B&W PCI Card comes in two packages – bundled with an ASUS motherboard and individual package for separate sale.

If any of the above items are not included or damaged, contact your local dealer for instructions.

ASUS SpaceLink B&W PCI Card Layout



LED Definitions

Bluetooth

Bluetooth Receive LED:

Blink - Receiving data packets
OFF - No data packets received

Bluetooth Transmit LED:

Blink - Transmitting data packets
OFF - No data packets transmitted

Wireless LAN (802.11a/b)

Activity LED	Status LED	Meaning
Fast Blink	Fast Blink	Associated or joined with network
Slow Blink	Slow Blink	Associated or joined with network, no activity
Alternating	Alternating	Searching for network connection
OFF	Slow Blink	Power save mode (Power-Up or Reset)
OFF	OFF	No power received

ASUS SpaceLink B&W Specifications

Industry Standards:	Bluetooth, IEEE802.11a, IEEE802.11b
Host Interface:	**WLAN:** PCI 2.2 compliant slot, **Bluetooth:** USB 2.0
Antenna:	Integrated Bluetooth and dual-band wireless LAN

Bluetooth

Operating Freq:	2.4GHz to 2.5GHz
Data Rate:	1 Mbps
Range:	Up to 10 meters
Architecture:	Piconet, scatter net

IEEE802.11a

Operating Freq:	5.15GHz to 5.35GHz, 5.725GHz to 5.85GHz
Data Rate:	54, 48, 36, 24, 12, 9, 6Mbps, turbo mode up to 108Mbps (turbo mode available only when connecting with other ASUS 802.11a devices)
Range:	Indoor: 12 meters @ 11Mbps, 50 meters @ 6Mbps Outdoor: 30 meters @ 54Mbps, 150 meters @ 6Mbps
Architecture:	Infrastructure and Ad-Hoc

IEEE802.11b

Operating Freq:	2.4GHz to 2.5GHz
Data Rate:	11, 5.5, 2, 1Mbps
Range:	Indoor: 30 meters @ 11Mbps, 90 meters @ 2Mbps Outdoor: 150 meters @ 11Mbps, 300 meters @ 2Mbps
Architecture:	Infrastructure and Ad-Hoc

2. Installation

This chapter explains how to install the ASUS SpaceLink B&W PCI Card hardware, drivers, and utilities. This product is designed to operate in Windows 98SE, Windows Me, 2000, and XP. Examples in this manual will be that of Windows XP.

Complete the following steps to install the ASUS SpaceLink B&W PCI Card.

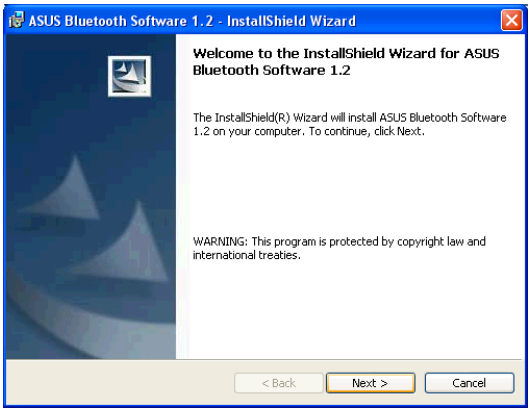
1. Install the ASUS SpaceLink Bluetooth Software.
2. Install the ASUS SpaceLink B&W PCI Card.
3. Install the ASUS SpaceLink B&W PCI Card WLAN Driver.
4. Install the ASUS SpaceLink B&W PCI Card WLAN Utilities.

Note: Install the ASUS Bluetooth Software first before inserting the SpaceLink B&W PCI Card.

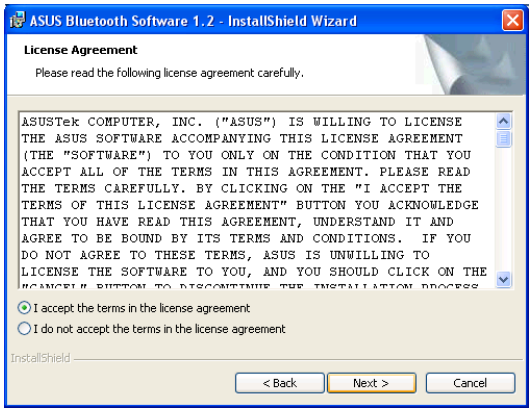
2.1 Installing the ASUS Bluetooth Software

The SpaceLink Bluetooth function requires the installation of the ASUS Bluetooth Software. Insert the ASUS SpaceLink B&W PCI Card support CD and the autorun screen should appear. On the autorun menu, click **Install Bluetooth Software**. If your autorun is disabled, double-click SETUP.EXE in the root directory of the support CD.

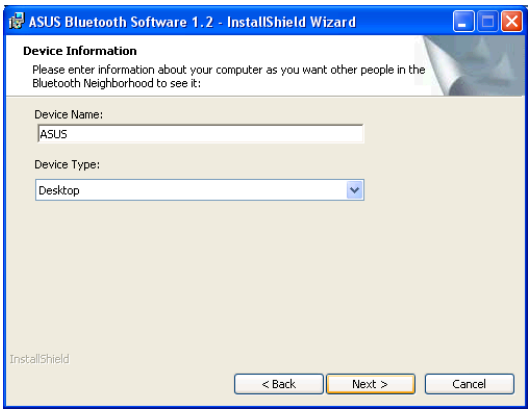
Note: Install the ASUS Bluetooth Software first before inserting the SpaceLink B&W PCI Card.



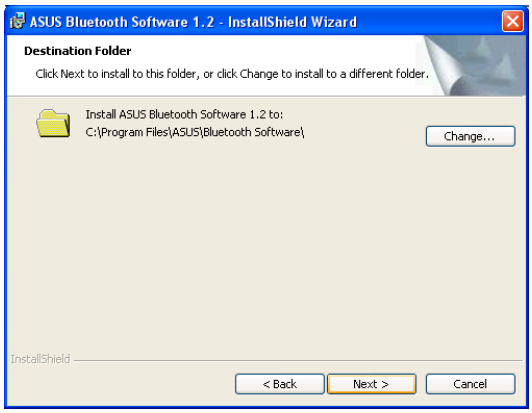
1. Click **Next** to begin.



2. Click **Next** after reading the License Agreement and selecting "I accept...".

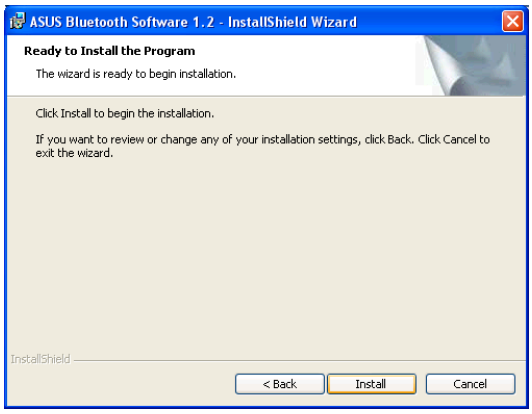


3. Select your computer type: **Desktop**

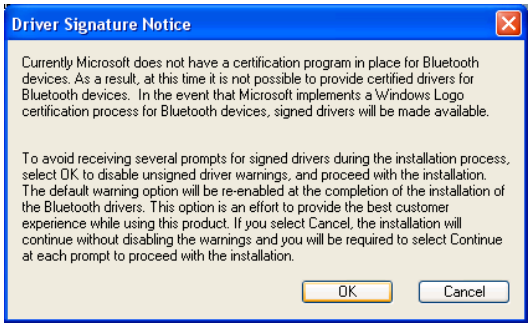


4. Click **Next** to accept the destination folder or click "Change" to specify another folder.

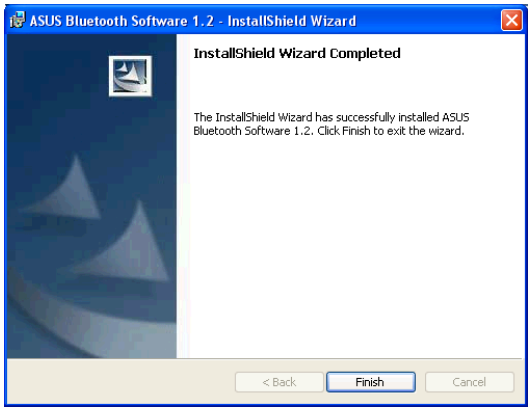
2.1 Installing the ASUS Bluetooth Software (Cont.)



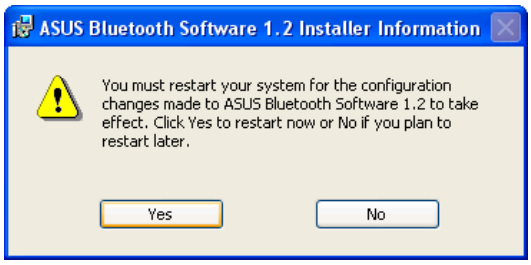
5. Click **Install** when ready to install the software.



6. Click **OK** after reading the driver notice.



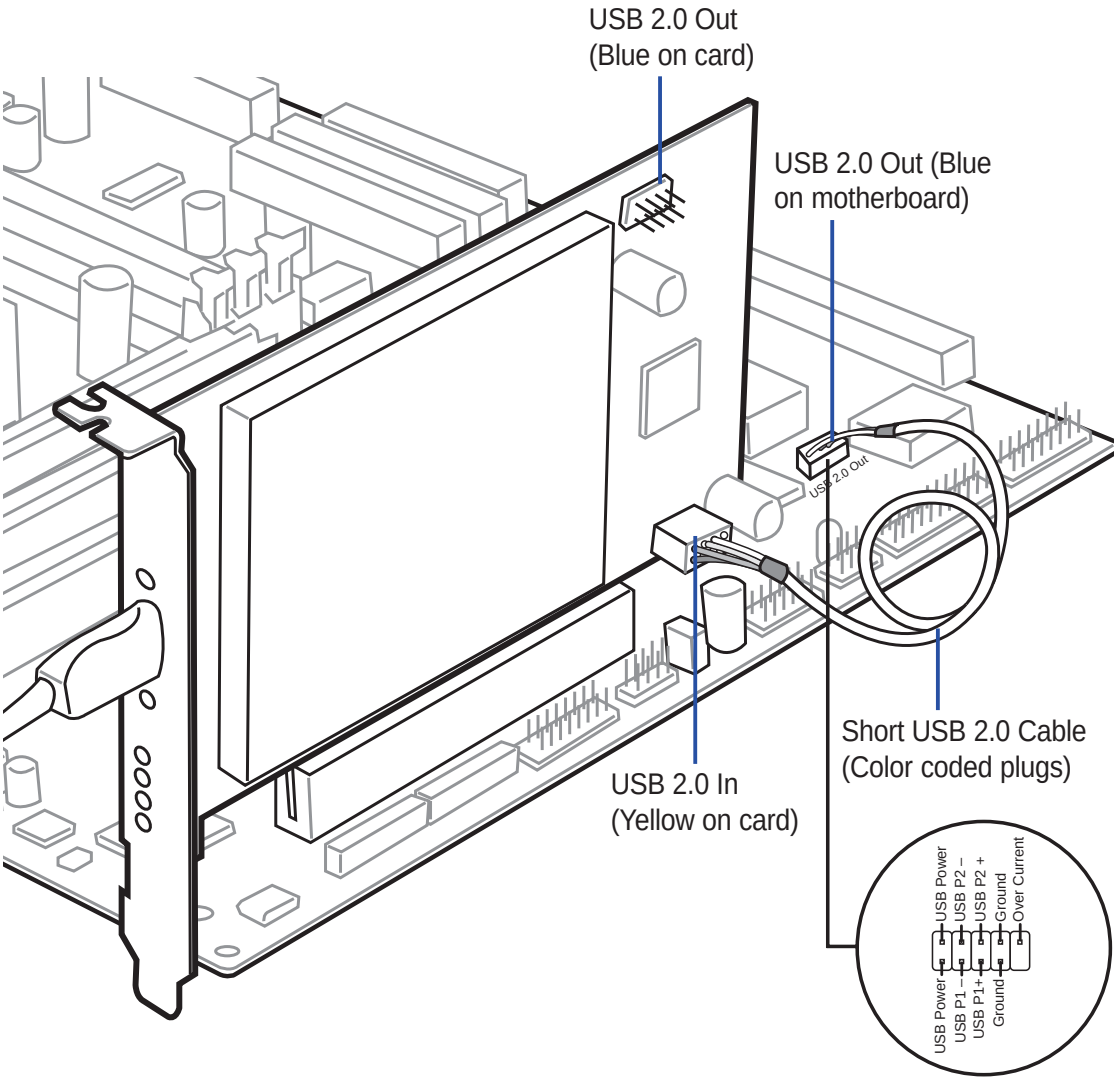
7. Click **Finish** when installation is complete.



8. Click **Yes** to restart your computer.

2.2 Installing the ASUS SpaceLink B&W PCI Card

1. Turn OFF your computer and open your computer chassis.
2. Insert the ASUS SpaceLink B&W PCI Card into a PCI slot.
3. Connect the provided short USB 2.0 cable from the ASUS SpaceLink B&W PCI Card (USB 2.0 IN) to the USB 2.0 OUT header on the motherboard or USB 2.0 PCI expansion card. You can use the USB 2.0 port by connecting your motherboard's USB bracket (not included) to the USB 2.0 OUT on the ASUS SpaceLink B&W PCI Card.
4. Attach the antenna to the ASUS SpaceLink B&W PCI Card as shown.



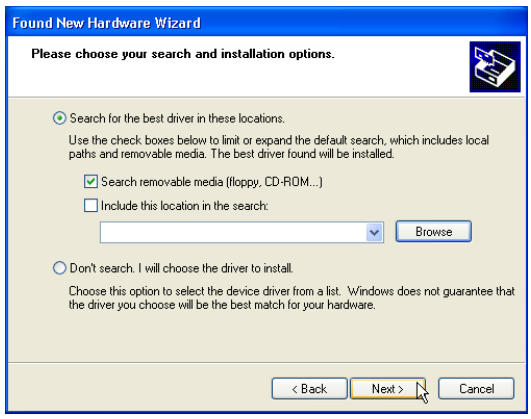
Color Coded Plugs

USB 2.0 connectors and cable are color coded. Connect the same color plug to the same color connectors.

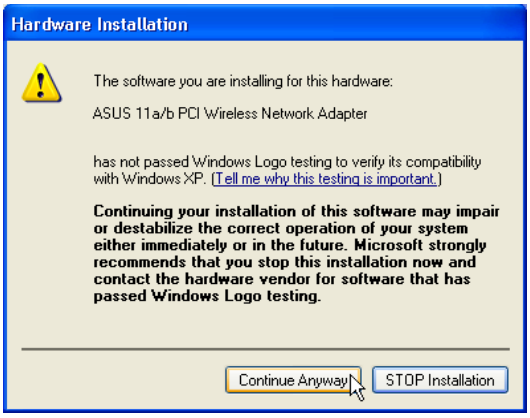
2.3 Installing SpaceLink B&W PCI Card WLAN Drivers

With the SpaceLink B&W PCI Card installed, turn ON your computer and enter Windows.

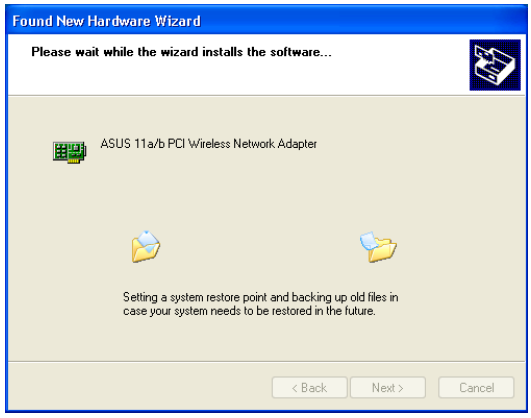
1. Windows will automatically detect the ASUS SpaceLink B&W PCI Card once you enter Windows with the card properly installed. Once the “Add New Hardware Wizard” dialog appears, click **Next**.



2. Insert the support CD that came with your ASUS SpaceLink B&W PCI Card .
3. Select “Search for the best driver in”... “Search removable media...” Click **Next**.

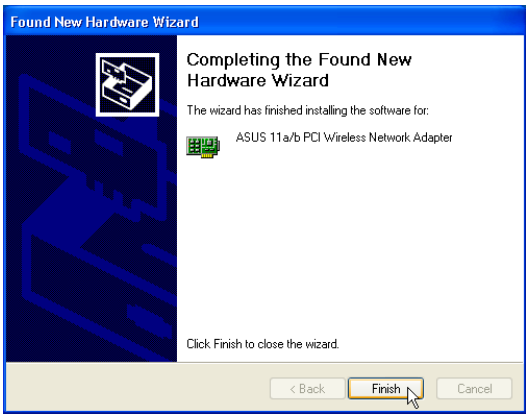


4. When asked about driver compatibility with Windows XP. Click **Continue Anyway** since ASUS has always tests its drivers before product shipment.



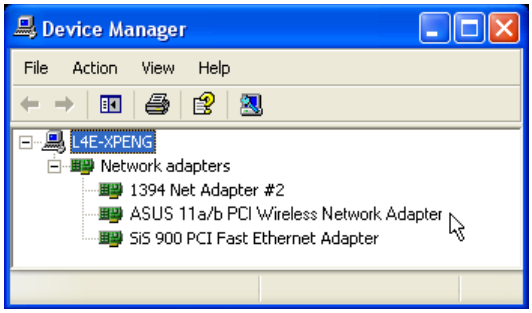
5. Wait while Windows XP creates a restore point for you system files in case you need to restore your current system.

2.3 Installing SpaceLink B&W PCI Card WLAN Drivers (Cont.)



6. Click **Finish** when installation has complete. Restart your computer if prompted.

2.4 Verifying Drivers



You can verify the driver in Device Manager. (Access Device Manager from Start | Control Panel | System | Hardware). A question mark means that no driver has been installed. An exclamation mark over a card means that the driver is incorrect. Verify that you are using the correct product and driver CD. Try repeating the installation and contact customer support if necessary.

WLAN

If it is installed successfully, the "ASUS 11a/b PCI Wireless Network Adapter" will appear under "Network adapaters".

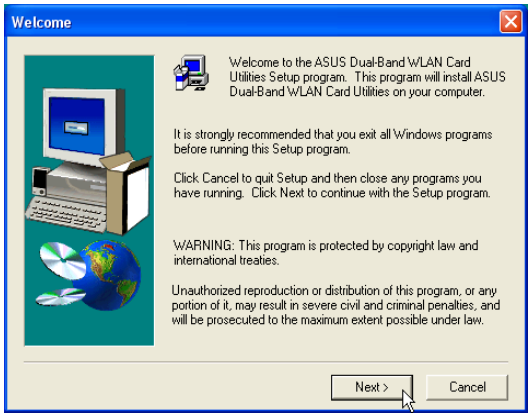
Bluetooth

If it is installed successfully, "ASUS Bluetooth Device" will appear under "Universal Serial Bus controllers".

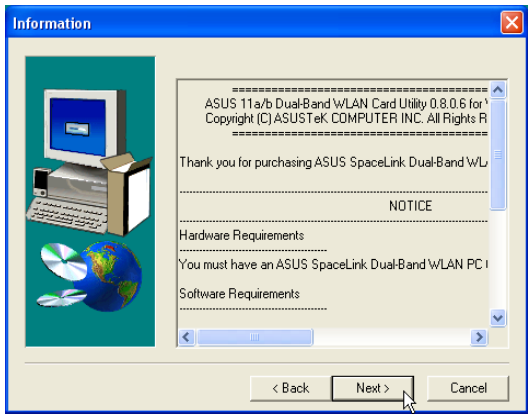
2.5 Installing SpaceLink Wireless Utilities

After you have installed the ASUS SpaceLink B&W PCI Card driver, you can install the SpaceLink wireless utilities. The SpaceLink wireless utilities can be used for all SpaceLink products so you only need to have one copy installed in your system.

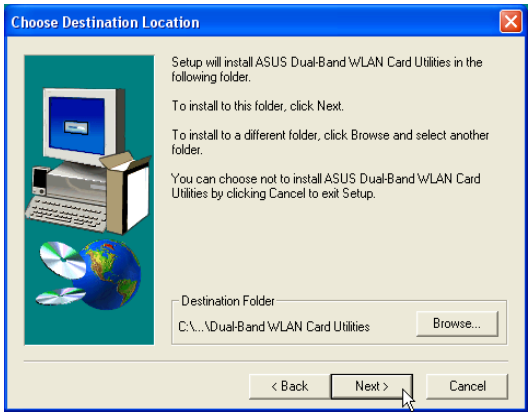
1. Insert the ASUS SpaceLink B&W PCI Card support CD and an autorun menu will appear. If your autorun is disabled, double click **SETUP.EXE** in the root directory of the support CD.
2. On the bottom of the autorun menu, select a language from the pull-down menu. Click **Install ASUS Dual-Band WLAN Card Utilities**.



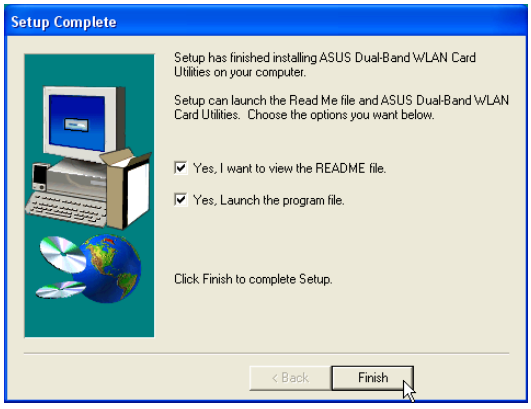
1. Click **Next** on the Welcome screen.



2. Click **Next** after reading the Information.



3. Click **Next** to use the default Destination Folder or click Browse to select another folder.

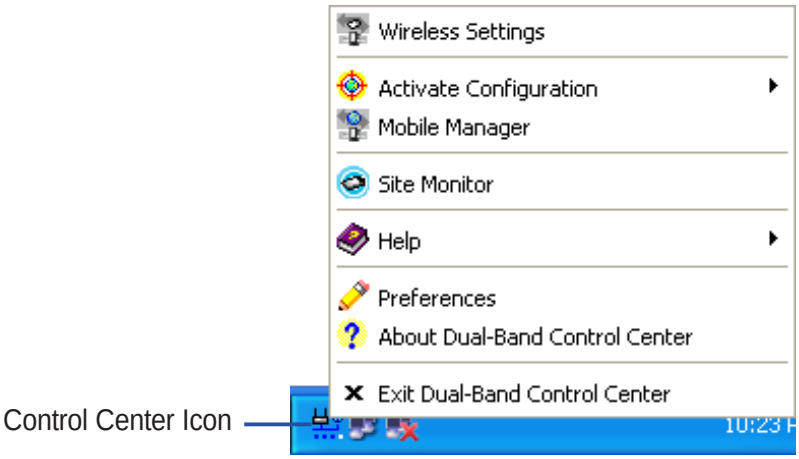


4. Click **Finish** after setup is complete.

3. Wireless LAN Reference

Chapter Overview

The ASUS SpaceLink B&W PCI Card software includes utilities that can be launched from the Start Menu or taskbar icon. Normally control center is launched on Windows startup and right clicking the taskbar icon will bring up a quick access menu.



Right-Click Taskbar Menu

This chapter will describe the following utilities in this order:

1. **Control Center** – This is the main software (launched on Windows startup by default) which makes it easy to launch applications and activate network location settings.
2. **Wireless Settings** – This is the main configuration interface which allows users to control the ASUS SpaceLink B&W PCI Card.
3. **Activate Configuration** – This allows you to set roaming and profile options to conveniently change wireless settings for different locations.
4. **Mobile Manager** – This is a convenient tool to setup and manage network location settings.
5. **Site Monitor** – This measures the received signal strength indicator (RSSI) values of all wireless networks. This tool is used for determining the best placement of Access Points to provide the most efficient coverage in a wireless network.

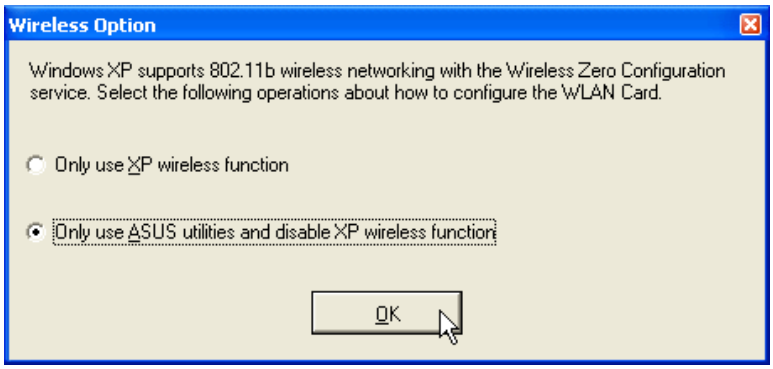
Preliminary Information

Windows XP Wireless Options

The first time the Control Center utility is launched in Windows XP, it will automatically show the wireless options shown below. Select one of the radio buttons to decide which interface to use with your SpaceLink B&W PCI Card.

Only use XP wireless function – Only use "Windows XP" wireless network settings to configure the ASUS SpaceLink B&W PCI Card.

Only use ASUS utilities and disable XP wireless function – Only use "ASUS SpaceLink B&W PCI Card utilities" to configure the ASUS SpaceLink B&W PCI Card.



It is recommended that you choose "ASUS utilities..." because there are added features provided by the ASUS SpaceLink Software. This User's Manual will discuss the ASUS utilities. You can return to the Wireless Option setting at any time by left clicking the control center icon and choosing "Wireless Option".

Taskbar Left-Click Menu

3.1 Control Center (Utility)

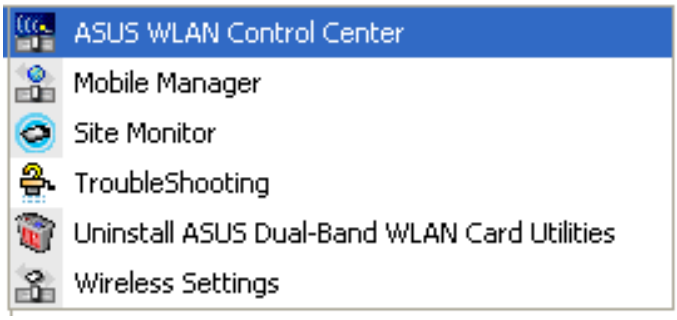
Control Center is an application that makes it easy to launch applications and activate network location settings. Control Center starts automatically when the system boots. Whenever Control Center is running, you will see a Control Center icon displayed on the Windows taskbar.

Starting the Control Center manually

- Click the Windows **Start** button, select **Programs**, select **ASUS Utility**, select **Dual Band WLAN Card**, and then click **ASUS WLAN Control Center**.

or

- Double click the **Control Center icon** on the desktop.

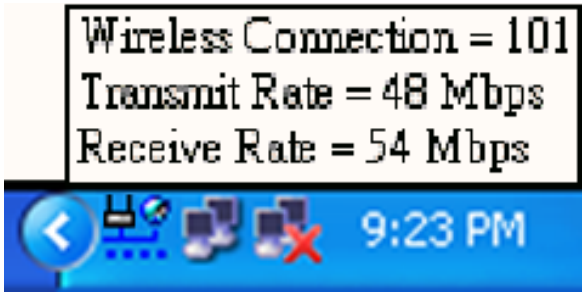


Windows Start Menu - Programs

Using the Control Center Taskbar

The Control Center Taskbar menu display the following information:

- The link quality of the ASUS SpaceLink B&W PCI Card (Excellent, Good, Fair, Poor, Not Linked)
- Whether the ASUS SpaceLink B&W PCI Card is connected to the Internet (Blue: Connected, Gray: Not Connected)



Taskbar Icon and Status

Wireless Status Icons (on the taskbar)

 **Excellent** link quality and **connected to Internet** (Infrastructure)

 **Good** link quality and **connected to Internet** (Infrastructure)

 **Fair** link quality and **connected to Internet** (Infrastructure)

 **Poor** link quality and **connected to Internet** (Infrastructure)

 **Not linked** but **connected to Internet** (Infrastructure)

 **Excellent** link quality but **not connected to Internet** (Infrastructure)

 **Good** link quality but **not connected to Internet** (Infrastructure)

 **Fair** link quality but **not connected to Internet** (Infrastructure)

 **Poor** link quality but **not connected to Internet** (Infrastructure)

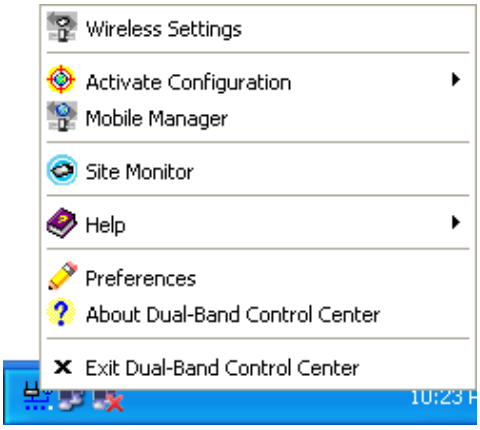
 **Not linked** and **not connected to Internet** (Infrastructure)

 Linked (Ad Hoc)

 Not Linked (Ad Hoc)

 Connected to Internet

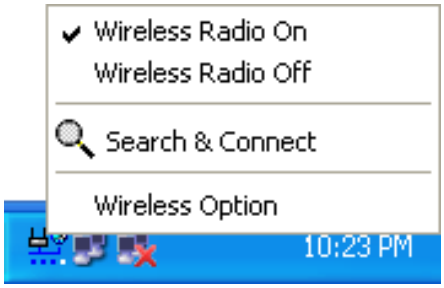
3.1.1 Taskbar Right-Click Menu



Right-clicking the taskbar icon shows the following menu items:

- **Wireless Settings** – Launches Wireless Settings application.
- **Activate Configuration** – Allows you to set which profile to use.
- **Mobile Manager** – Launches Mobile Manager application.
- **Preferences** – Customizes the way the Control Center program behaves. You can create a Control Center shortcut on the desktop. You can also set whether Control Center starts up with Windows.
- **Exit** – Closes the Control Center program.

3.1.2 Taskbar Left-Click Menu



Left-clicking the taskbar icon shows the following menu:

- **Wireless Radio On** – Turns the wireless radio ON.
- **Wireless Radio Off** – Turns the wireless radio OFF.
- **Search & Connect** – View the properties of available Access Points within range.
- **Wireless Option** (Windows XP only) – Sets your Windows XP wireless networking environment.

Double-clicking the taskbar icon:

- Launches the Wireless Settings application. 

3.2 Wireless Settings (Utility)

Wireless Settings is an application that allows you to control your ASUS SpaceLink B&W PCI Card. Use Wireless Settings to View or Modify the configuration settings and monitor the operational status of your PC Card. Once Wireless Settings is launched, you can see the tabbed property sheet. This property sheet is composed of tabbed “pages”, each with its own group of feature-specific settings.

Starting Wireless Settings

- Open the Windows **Control Panel**, and then double-click the icon **ASUS DualBand WLAN Card Setting** icon.

or

- Click the Windows **Start** button, select **Programs**, select **ASUS Utility**, select **DualBand WLAN Card**, and then click **Wireless Settings**.

or

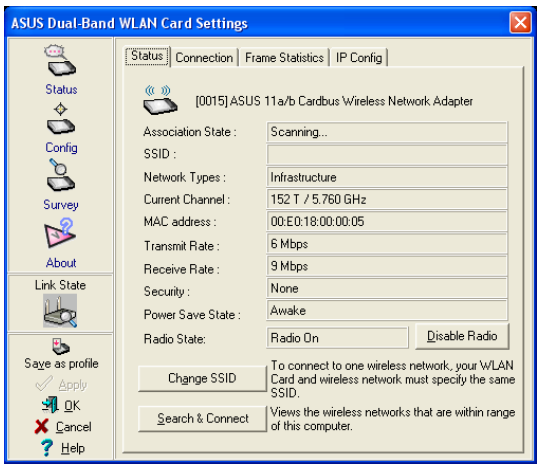
- Click the **Control Center icon** on the Windows taskbar, a popup menu appears, and then click **Wireless Settings**.

More than one ASUS SpaceLink Device

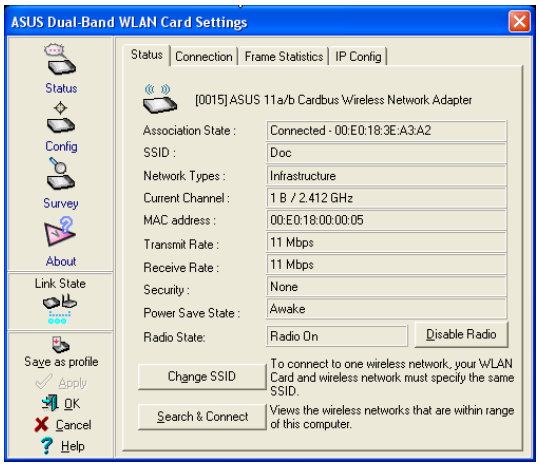
If you have more than one ASUS SpaceLink device. You will be given a device selection window when you launch the “Wireless Settings” utility.

3.2.1 Status - Status Tab

You can view the information about the ASUS SpaceLink B&W PCI Card from the general menu. These fields are blank if the ASUS SpaceLink B&W PCI Card does not exist.



Scanning



Connected

Association State

Displays the connection status as follows:

Connected - The station is now associated with one wireless LAN device. When operating in Infrastructure mode, this field shows the MAC address of the Access Point with which you are communicating. When operating in Ad Hoc mode, this field shows the virtual MAC address used by computers participating in the Ad Hoc network.

Scanning... - The station is now attempting to authenticate and associate with the desired Access Point or Ad Hoc node.

Disconnected - The link is connected, but no beacon received.

SSID

Displays the Service Set Identifier (SSID) that the card is either associated or intending to join.

Network Type

Displays the type of the network that the card is in use. The value is either "Infrastructure" or "Ad Hoc".

Current Channel

Displays the radio channel that the card is currently tuned. This number changes as the radio scans the available channels.

MAC address

Indicates the hardware address of the card. MAC address is a unique identifier for networking devices (typically written as twelve hexadecimal digits 0 through 9 and A through F, six hexadecimal numbers separated by colons, i.e. 00:E0:18:F0:05:C0).

Transmit Rate

Displays the current transmit data rate in megabits per second (Mbps).

Receive Rate

Displays the current receive data rate in megabits per second (Mbps).

Security

Indicates whether or not Wired Equivalent Privacy (WEP) is enabled for the station.

Power Save State

Shows the following indicating the power saving state of the station "Awake", "Sleep Pending", "Sleep", "Fake Sleep Pending", "Faking Sleep", and "Unknown".

Radio State

Shows the wireless radio on or off.

Radio On - When the wireless radio is turned off, the following icon appears in the upper left of the Settings property page.

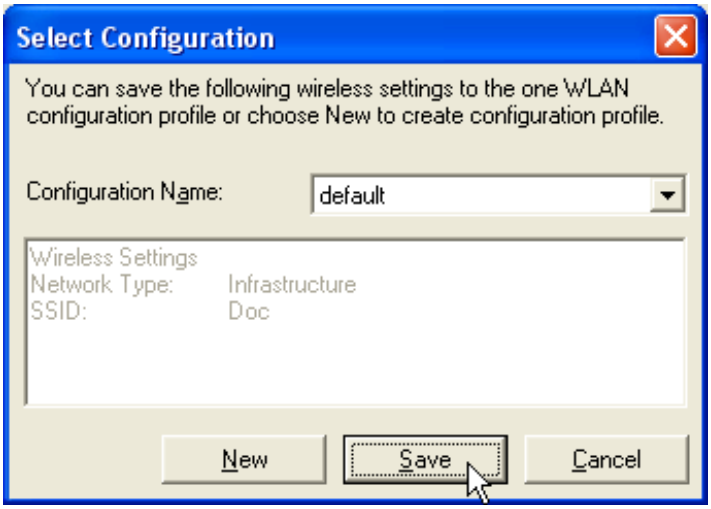
Radio Off - When the wireless radio is turned on, the following icon appears in the upper left of the Settings property page.

Change SSID – Click on this to set the SSID.

Search & Connect – Click on this to connect to an available network.

3.2.2 Save as Profile

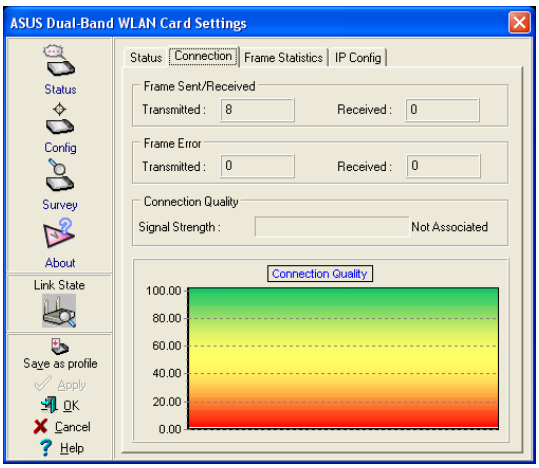
Later, when you make individual settings, you may want to use profiles to save your settings. Profiles will help you combine all your settings for work, home, roaming, and other locations so that you do not have to repeat individual settings.



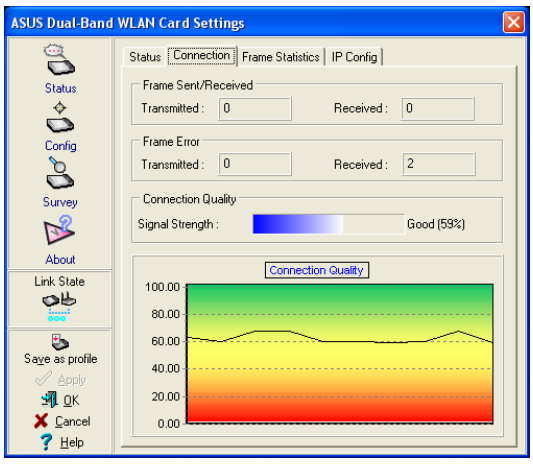
Select "Activate Configuration" from the menu to load a profile.

3.2.3 Status - Connection Tab

You can view the current link statistics about the ASUS SpaceLink B&W PCI Card. These statistics are updated once per second and are valid only if the ASUS SpaceLink B&W PCI Card exists.



Scanning



Connected

Frame Sent/Received

Transmitted - The number of frames that were transmitted.

Received - The number of frames that were received.

Frame Error

Transmitted - The number of frames that were not successfully transmitted.

Received - The number of frames that were not successfully received.

Connection Quality

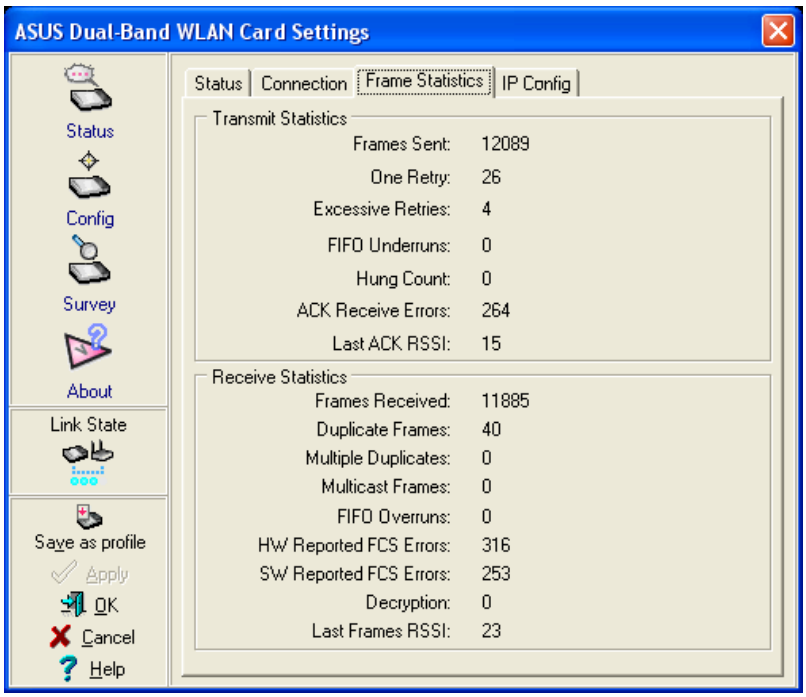
Signal Strength - Reflects the signal level related to the Access Point or Ad Hoc node the station is currently connected to. Ratings are: Excellent, Good, Fair, and Poor.

Overall Connection Quality

It is derived from the current "Signal Strength". A graph displays a connection quality range between 0 and 100 percent.

3.2.4 Frame Statistics

Frame statistics give information on data transferred though the wireless LAN. You can monitor performance or trouble shoot signal quality within different location of your wireless network.

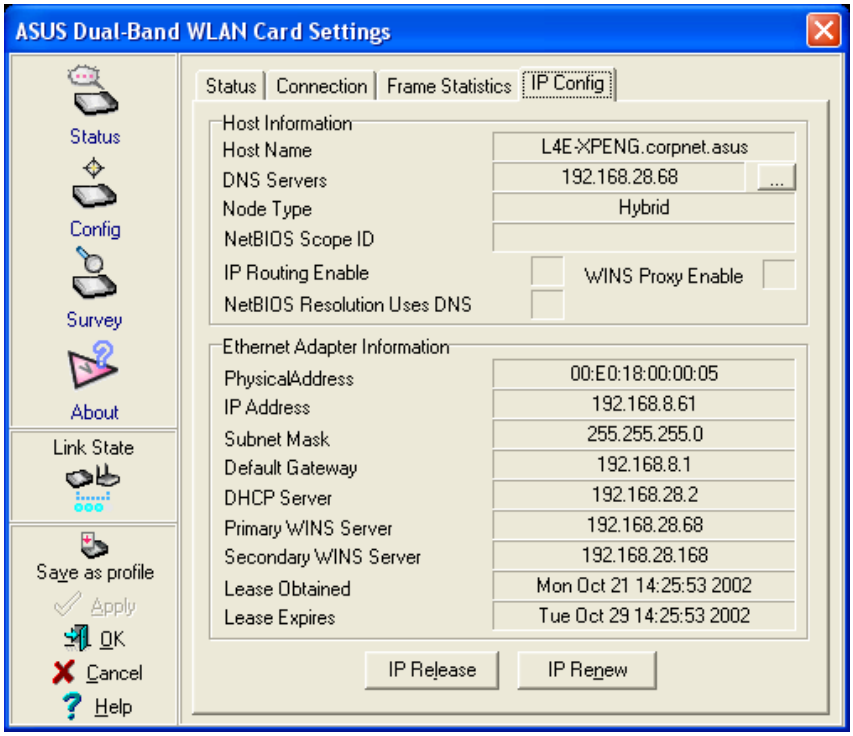


Connected

3.2.5 Status - IP Config Tab

IP Config tab shows all the current network configuration information for the ASUS SpaceLink B&W PCI Card. Use it to verify your network settings.

IP CONFIG will display all the current TCP/IP configuration values including the IP address, subnet mask, default gateway and Windows Internet Naming Service (WINS) and DNS configuration.



Connected

Button

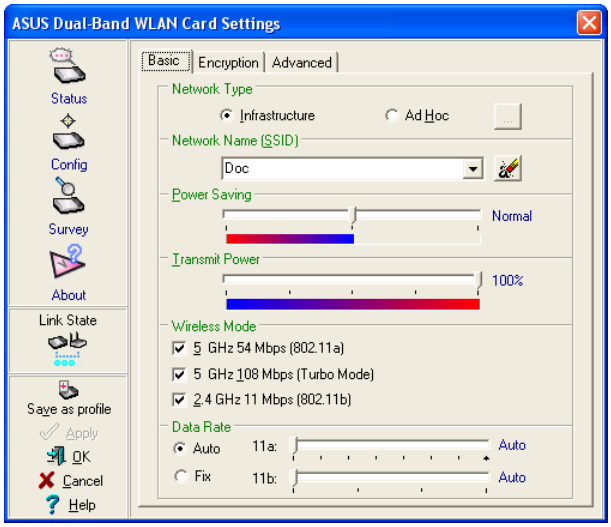
IP Release - Releases the DHCP IP address for the ASUS SpaceLink B&W PCI Card.

IP Renew - Renews the DHCP IP address for the ASUS SpaceLink B&W PCI Card.

NOTE: The IP Release and IP Renew buttons can only be used on the ASUS SpaceLink B&W PCI Card that is configured with DHCP.

3.2.6 Config - Basic Tab

Lets you can change the ASUS SpaceLink B&W PCI Card configurations without rebooting your computer.



SSID Set to "Doc"

Network Type

Infrastructure – Select the Infrastructure mode to establish a connection with an Access Point. Your computer is able to access wireless LAN and wired LAN (Ethernet), via an associated access point. The Channel field turns to "Auto" when "Infrastructure" is selected.

Ad Hoc – Select the "Ad Hoc" mode to communicate directly with each other without using an Access Point. An "Ad Hoc" network is typically formed quickly and easily without pre-planning. For example, share meeting notes between networked computers in a meeting room.

SSID

Use the SSID filed to configure the SSID for the ASUS SpaceLink B&W PCI Card. You can enter a new SSID or select one from the drop-down list box. SSID stands for "Service Set Identifier", which is a string used to identify a wireless LAN. You will only be able to connect Access Points which has the same SSID as the one you set. Use different SSIDs to segment the wireless LAN and increase security. SSIDs must all be printable characters and having a maximum of 32 case sensitive characters, such as " Wireless LAN".

Set the SSID to a null string, if you wish to allow your station to connect to any Access Point it can find. But you cannot use null string in Ad Hoc mode.

Power Saving

This field allows the configuration of power management options to conserve battery life. These options are "Off", "Normal, and "Maximum". Power Management is disabled when "Ad Hoc" mode is selected in the Network Type field.

When the Power Saving setting is Off, it allows a full powered state that yields the best performance. This mode is recommended for devices running on AC power.

Power Saving setting is Normal or Maximum will enable power savings function, the adapter will wake up periodically to see if there is any data being sent. This mode is recommended for devices running on battery power. The difference is when the Power Saving setting is Normal, the driver turns off power to the adapter for brief periods over briefly-spaced time intervals; when the Power Saving setting is Maximum, the driver turns off power to the adapter for long periods over widely-spaced time intervals.

Transmit Power

This field allows the configuration of transmit power options. The options are "100%", "50%", "25%", "12.5", and "Lowest".

Wireless Mode

Choose which wireless mode the wireless card will use. You can enable more than one wireless mode to allow system auto switch among them.

5GHz 54Mbps (802.11a): Use this checkbox to allow the wireless card to use the 5 GHz and 54 Mbps wireless mode.

5GHz 108Mbps (Turbo Mode): Use this checkbox to allow the wireless card to use the 5 GHz and 108 Mbps wireless mode. A high speed operating mode for 802.11a radio space. Support data transfer speeds up to 108 Mbps, twice the speed of standard 802.11a devices. Turbo mode is only supported between ASUS SpaceLink 802.11a devices.

2.4GHz 11Mbps (802.11b): Use this checkbox to allow the wireless card to use the 2.4 GHz and 11 Mbps wireless mode.

Click Apply to save and activate the new configurations.

Data Rate

Select the transmit data rate (fix or auto). The data rates supported for the ASUS SpaceLink WLAN Cards are:

Auto - The adapter will adjust to the most suitable transmission rate.

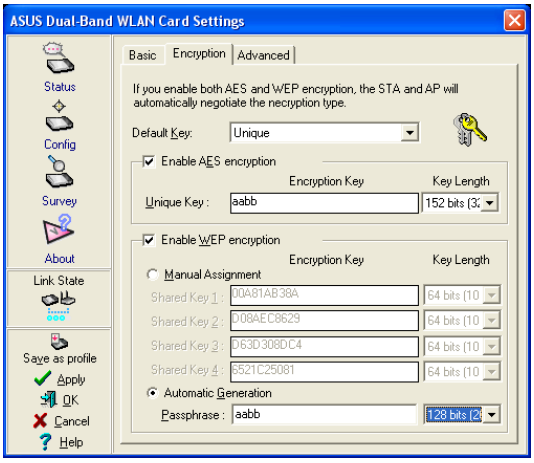
Fix - 11a: Fix data rate to 6, 9, 12, 18, 24, 36, 48, or 54 megabits per second.

11b: Fix data rate to 1, 2, 5, or 11 megabits per second.

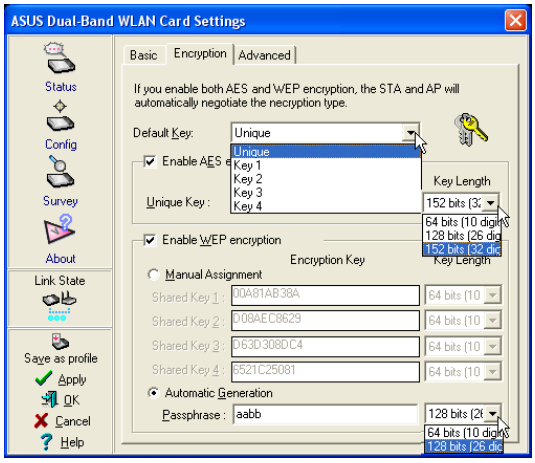
Click Apply to save and activate the new configurations.

3.2.7 Config - Encryption Tab

Lets you configure the ASUS SpaceLink encryption settings. We support three security options:



WEP Enabled



Pull Down Menus

Default Key

The Default Key field lets you specify which of the encryption key (Unique, First, Second, Third, or Fourth) you use to transmit data on your wireless LAN. You can change the default key by clicking on the down arrow at the right of this field, selecting the number of the key you want to use and then clicking the Apply button. As long as the Access Point or station with which you are communicating has the same key in the same position, you can use any of the keys as the default.

AES Encryption

If you specify both AES and WEP keys, the STA and AP will automatically negotiate the encryption type. Because AES is a stronger encryption than WEP, it is used wherever possible. If the STA or AP does not support AES, WEP is used.

Please note that you will only be able to communicate with wireless devices that have use the same encryption settings.

NOTE: AES is not supported in Ad Hoc mode, since Ad Hoc mode does not support unique key.

Use Static Keys

We provide both the IEEE 802.11 standard wired equivalent privacy (WEP) and advanced encryption security (AES) encryption. While WEP is universally supported and commonly used, AES provides a much higher level of security. Frames encrypted with AES are more difficult to decipher without known the key.

Unique Key

This option is enable only if you enable AES Encryption. Defines the unique encryption key for security for the current network configuration. In Ad Hoc mode, this encryption key type is not used.

Key Length

Defines the length for each encryption key. As the Key Length is changed, the number of available characters in the filed is changed automatically. For 64 bits encryption, each Key contains exactly 10 hexadecimal digits. For 128 bits encryption, each Key contains exactly 26 hexadecimal digits. For 152 bits encryption, each Key contains exactly 32 hexadecimal digits.

Shared Key

This option is enable only if you enable WEP Encryption. The WEP Key is a 64 bits (5 byte), 128 bits (13 byte) or 152 bits (16 byte) Hexadecimal digits that is used to encrypt transmit data packets and decrypt received data packets.

NOTE: Click the Apply or OK button to save the encryption settings. The keys you entered will be masked by asterisks.

Two ways to assign Shared Keys

Manual Assignment - When you click this button, the cursor appears in the field for Key 1. To enable WEP encryption, you are required to enter at least one shared key. For 64-bit encryption, each Key contains exactly 10 hex digits (0~9, a~f, and A~F). For 128-bit encryption, each Key contains exactly 26 hex digits (0~9, a~f, and A~F). For 152-bit encryption, each Key contains exactly 32 hex digits (0~9, a~f, and A~F).

Automatic Generation - Type a combination of up to 64 letters, numbers, or symbols in the Passphrase column, then the Wireless Settings Utility uses an algorithm to generate four shared Keys for encryption.

NOTE: This function ease users from having to remember their passwords and is compatible to some existing WLAN utilities, but it is not very secure. "Manual Assignment" is more secure.

64/128bits versus 40/104bits

You may be confused about configuring WEP encryption, especially when using multiple wireless LAN products from different vendors. There are two levels of WEP Encryption: 64 bits and 128 bits.

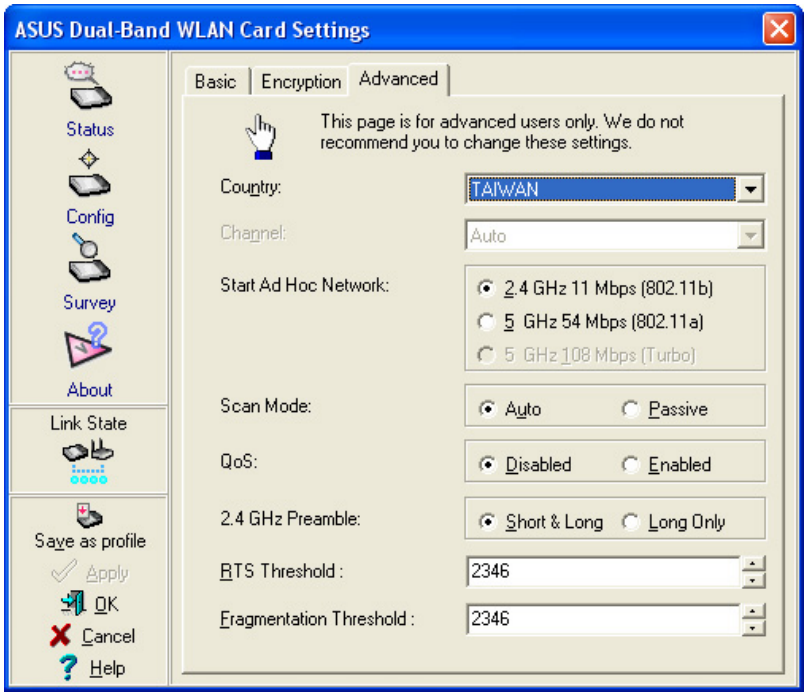
First, 64 bit WEP and 40 bit WEP are the same encryption method and can interoperate in the wireless network. This lower level of WEP encryption uses a 40 bit (10 Hex character) as a “secret key” (set by user), and a 24 bit “Initialization Vector” (not under user control). This together makes 64 bits (40 + 24). Some vendors refer to this level of WEP as 40 bits and others refer to this as 64 bits. ASUS SpaceLink products use the term 64 bits when referring to this *lower* level of encryption.

Second, 104 bit WEP and 128 bit WEP are the same encryption method and can interoperate in the wireless network. This higher level of WEP encryption uses a 104 bit (26 Hex character) as a “secret key” (set by user), and a 24 bit “Initialization Vector” (not under user control). This together makes 128 bits (104 + 24). Some vendors refer to this level of WEP as 104 bits and others refer to this as 128 bits. ASUS SpaceLink products use the term 128 bits when referring to this *higher* level of encryption.

Click Apply to save and activate the new configurations.

3.2.8 Config - Advanced Tab

Advanced tab provides some additional settings for the ASUS SpaceLink B&W PCI Card.



Country

Allows users to select the country where ASUS wireless network adapters will be operated. The country code specifies the corresponding regulatory domain and constructs a channel list for channel scanning.

Channel

Using the Channel field to select the radio channel for card. In an "infrastructure" network, the card will automatically select the correct frequency channel required to communicate with an Access Point, this parameter will be fixed in "Auto" and cannot be changed. In an "Ad Hoc" network, you can decide channel number for the card. The radio channels you may use depend on the regulations in your country.

Start Ad Hoc Network

Choose which wireless mode will start an Ad Hoc network if no matching SSID is found after scanning all available modes. The default value is 5 GHz 54 Mbps (802.11a).

Scan Mode

Allows selection of the wireless card scanning method used to locate access points or ad hoc networks. The default value is Auto.

Passive: Click on this radio button to specify passive scanning. Passive scanning indicates that the wireless card is in listen-only mode.

Auto: Click on this radio button to specify automatic scanning. The driver uses the country code to determine which type of scanning to use, either active or passive.

QoS

Specifies disable or enable the station to cooperate in a network using Quality of Service (QoS).

2.4 GHz Preamble

Specifies Short & Long or Long-Only preamble mode for a 2.4 GHz/11 Mb network. Long-Only is used for backward-compatibility with older 2.4 GHz devices. The default value is Short & Long.

RTS Threshold

Define the size packet that the station used for RTS/CTS handshake boundary. Be aware that setting the minimum size packet too small causes RTS packets to be sent more often, adding excessive overhead to the network, therefore decreasing network utilization. However, the more often RTS packets are sent, the more transmission collisions can avoid. That's trade-off. RTS Threshold ranged from 0 to 2346 steps 64. The default value is 2346.

Fragmentation Threshold

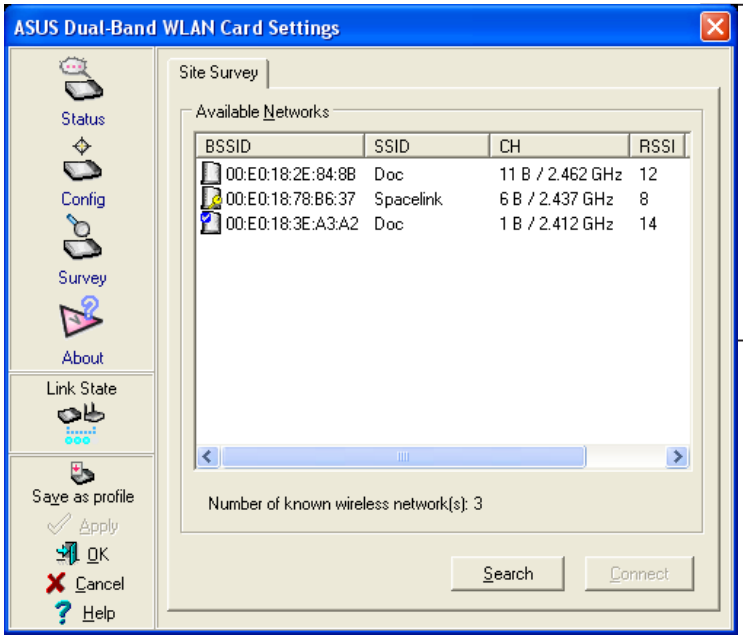
Define the number of bytes used for fragmentation boundary. If the length of the data unit exceeds this parameter, it will be divided into smaller fragments for transmission. Each of the fragments is sent independently. If there is a significant interference present, set the fragment size smaller. Otherwise, set the fragment size larger. Because send multiple frames lead to overhead on the network. Fragmentation Threshold ranged from 256 to 2346 steps 128. The default value is 2346.

Click Apply to save and activate the new configurations.

3.2.9 Survey - Site Survey Tab

Use the Site Survey tab to view statistics on the wireless networks available to the ASUS SpaceLink B&W PCI Card. The Site Survey tab is read-only with no user configurable data fields. Use the Site Survey tab to view the following network parameters.

- **BSSID** – View the IEEE MAC addresses of the available networks.
- **SSID** – View the SSID (service set identification) within available networks.
- **CH** – View the direct-sequence channel used by each network.
- **RSSI** – Views the Received Signal Strength Indication (RSSI) in dB.
- **Type** – View wireless network status information, the value is either AP (infrastructure) or STA (Ad Hoc).
- **WEP** – View wireless network WEP encryption information, the value is either OFF (disable encryption) or ON (enable encryption).



Some Access Points can disable broadcasting SSID to hide themselves from "Site Survey" or "Site Monitor" for added security but still allow you to join if you know their SSID.

Buttons

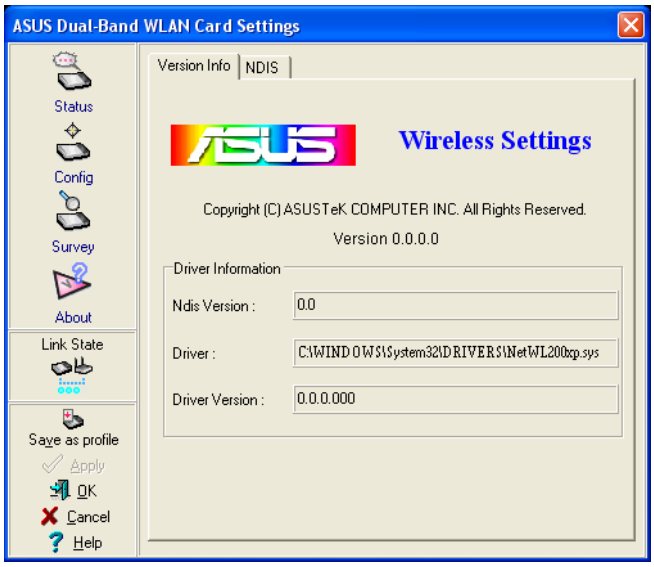
Search – Scan all available wireless networks and show the scan result in the "Available Network List".

Connect – To associate a network, select it from the "Available Network List" and click this button.

3.2.10 About

Version Info Tab

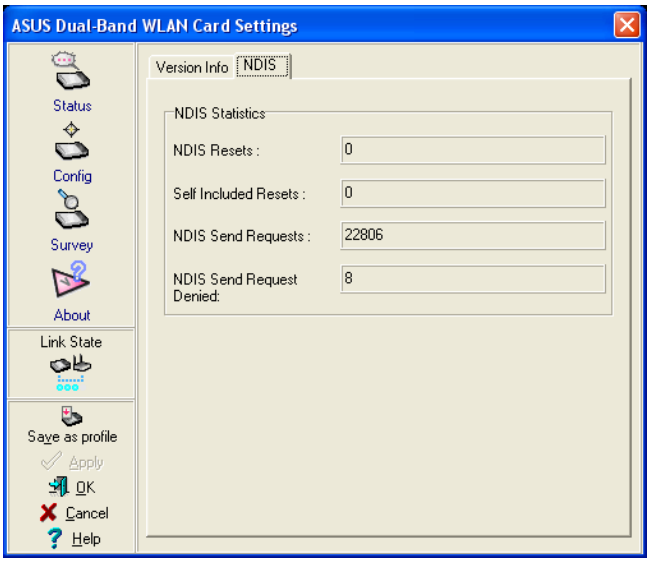
Uses the Version Info tab to view program and ASUS SpaceLink WLAN Card version information. The program version information field includes the Copyright and utility version. The version information includes the NDIS version, driver name, and driver version.



This screen is an example only. Normally, you will see non-zero version numbers.

NDIS Tab

The NDIS page gives statistics for troubleshooting.



Network Driver Interface Specification

3.2.11 Link Status

ASUS SpaceLink B&W PCI Card connection quality icon appears on the left of the ASUS WLAN Card Settings. Use the icon to view the current signal quality of the adapter.

 Excellent Link Quality (Infrastructure)

 Good Link Quality (Infrastructure)

 Fair Link Quality (Infrastructure)

 Poor Link Quality (Infrastructure)

 Not linked (Infrastructure)

 Linked (Ad Hoc)

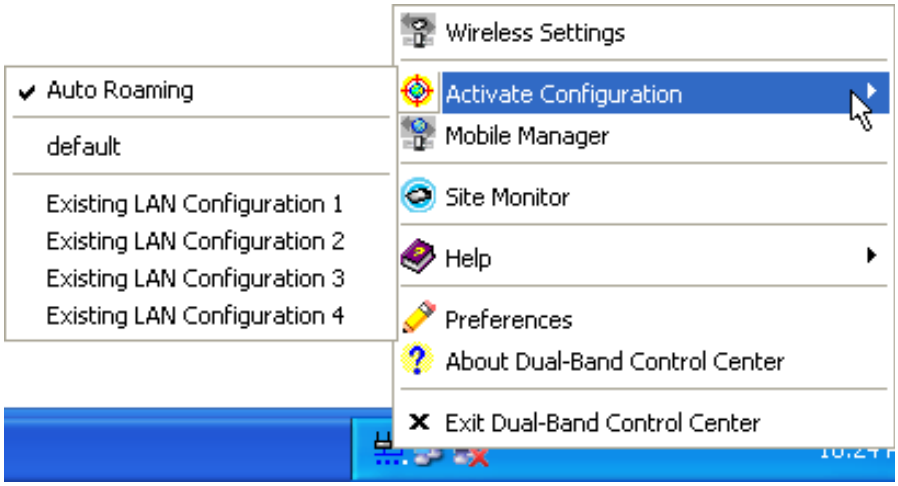
 Not Linked (Ad Hoc)

3.2.12 Exit Wireless Settings

To exit Wireless Settings, you can click **OK** or **Cancel**. This utility may be closed at any time and from any tab. If you did not save the configuration settings, you will be prompted to do so.

3.3 Activate Configuration

Auto roaming is enabled by default and will automatically switch to stronger access points. You can uncheck it if you have many access points and do not want to constantly switch to different networks. If you want to use a particular profile. You can also check it here.



Auto Roaming

Select or deselect to allow auto roaming. Auto roaming will contstantly change the access point's SSID to keep you connected when you cross into regions covered by access points with differenct SSID's.

Default / (Other Profiles)

Select default settings or one of the saved profiles listed below. Both the default settings and the profile settings can be customized.

3.4 Mobile Manager (Utility)

Mobile Manager is a convenient tool to setup and manage network location settings. Mobile Manager lets users configure multiple alternative configurations for different locations. You only need to set this once, and then easily switch configurations when you change your location.

Starting Mobile Manager

- Click the Windows **Start** button, select **Programs**, select ASUS Utility, select **Dual-Band WLAN Card**, and then click **Mobile Manager**.

or

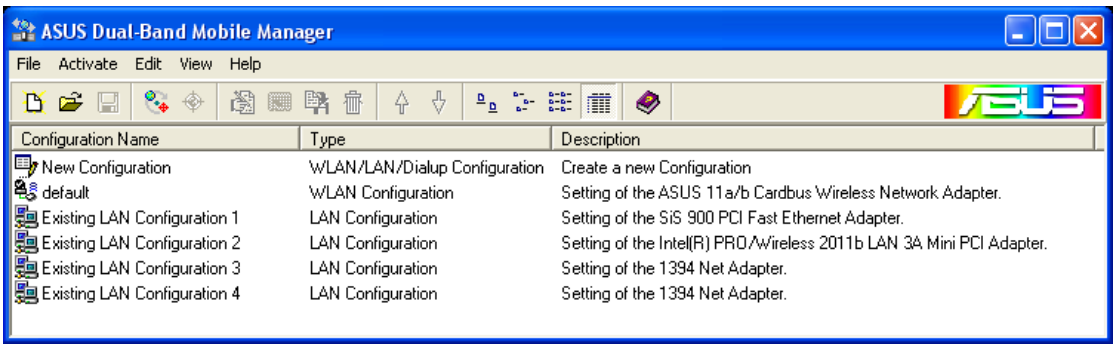
- Right-click the **Control Center** icon on the Windows taskbar and then click **Mobile Manager**.

Using Mobile Manager - Quick Guide

1. The first time you launch the Mobile Manager utility, it will automatically generate configurations that stores the current settings of all installed network devices in your system.
2. Change the name of the configuration to a descriptive name like “Work-Meeting Room” or “Home-ADSL”.
3. On the **File** menu, click **New Configuration**, the New Configuration Wizard dialog appears. Follow the on-screen instructions to create your own location configurations.
4. After you have created your configurations, you can see them in the main window.
5. Select the configuration you want to use and then click **Activate Configuration** from the **Activate** pull-down menu. Your system will then switch to the network settings configured to your chosen selection.

3.4.1 Main Window

You can use the Mobile Manager utility main window to create a new configuration, edit a configuration or activate a configuration. The main window includes a menu bar, tool bar, and a list view for showing existing configurations.



Using the pull-down menu and toolbar

The following topics show the commands available from the Mobile Manager pull-down menu and toolbar. If no configuration is selected, some commands will be grayed out and inaccessible. The toolbar contains buttons for many of the most commonly used commands in Mobile Manager. It allows quick access to some of the most useful features of Mobile Manager. The commands provided by the toolbar buttons are also available from the pull-down menu.

File

New Configuration - Select New Configuration in the File menu to open a New Configuration Wizard dialog. Use the New Configuration Wizard dialog to create a new configuration. See Using New Configuration Wizard for details on this command.

Import Configuration - Load a configuration from an INI File.

Export Configuration - Save the selected configuration (containing Wireless Settings, TCP/IP Settings, Network Settings, ...) to an INI File. The INI file can be placed on a floppy diskette and then imported by other computers using Mobile Manager. This can also be used as a backup feature for yourself.

Exit - Close the Mobile Manager utility.

Activate

Auto Roaming – If an association changes, it will automatically switch into a network configuration that you have made. If no associations have been made, it will automatically connect to a wireless network based on configurations that you specify.

Activate Configuration – Applies the configuration that you have selected from the list. You may be prompted to restart Windows depending on the required changes. Follow the instructions on the screen. Windows 2000 and XP usually do not require restarting your computer, but Windows 98 and ME usually will require a restart.

Edit

All these commands are also available from the context menu that appears when you right-click with a configuration in the Mobile Manager window.

Network Order Move Up - Raises the portion of the selected wireless network configuration in the Preferred network lists.

Network Order Move Down - Lowers the position of the selected wireless network configuration in the Preferred networks list.

Edit Configuration - Select Edit Configuration in the Edit menu to open an Edit Configuration dialog to edit selected configuration items. See “Using Edit Configuration” for details on this command.

Rename - Change the name of the selected configuration.

Copy - Duplicate the selected configuration.

Delete - Discard the selected configuration.

3.4.2 View Menu

Large Icons - Displays large icons for each configuration.

Small Icons - Displays small icons for each configuration.

List - Shows the configuration names in a list.

Details - The Detailed view expands this list to include information about the configurations. The information includes configuration name, type, and description.

3.4.3 Help Menu

Contents - Displays the WinHelp contents window (the one you are reading now) for online Help.

About Mobile Manager - Displays the version number and copyright information for Mobile Manager. Click on the logo to connect to ASUS' website.

3.4.3 Using New Configuration Wizard

Create a new configuration

Create a new configuration if you are in a specific location that does not have an existing configuration defined. Use the New Configuration Wizard to create a configuration in a few easy steps.

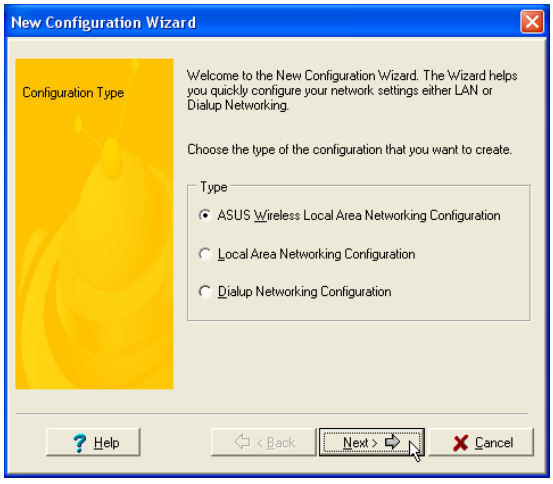
Do one of the following:

- On the **File menu**, click **New Configuration**.

or

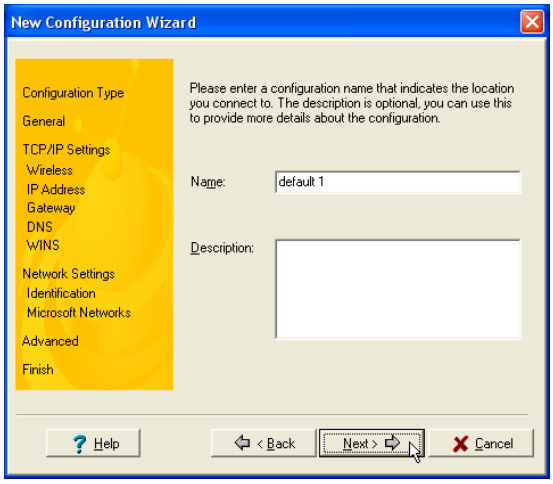
- Double-click **New Configuration** on the Main window.

Then the New Configuration Wizard dialog starts.



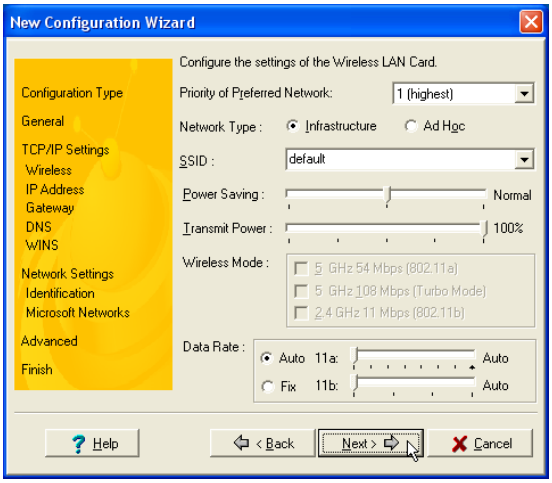
Choose the type of configuration that you want to create and click **Next**.

- **Wireless Local Area Network Configuration:** You must have an ASUS SpaceLink B&W PCI Card installed in your PC.
- **Wired Local Area Network Configuration:** You must have a NIC (LAN card) (other than ASUS SpaceLink B&W PCI Card) installed in your PC.
- **Dialup Networking Configuration:** You must have a modem installed in your PC.



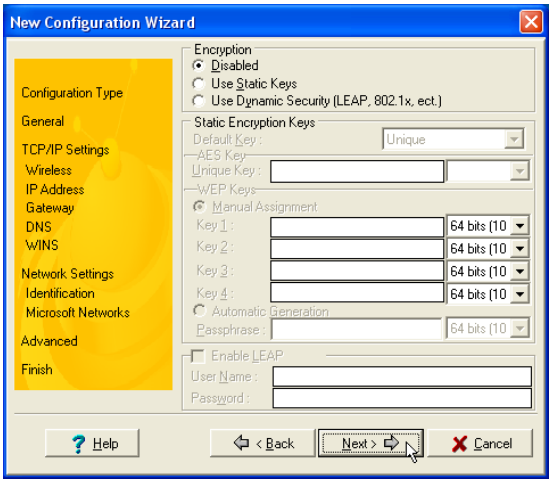
Enter the name and description you want to use for this configuration in the Name and description field. Click **Next** to continue.

Using New Configuration Wizard (Cont.)



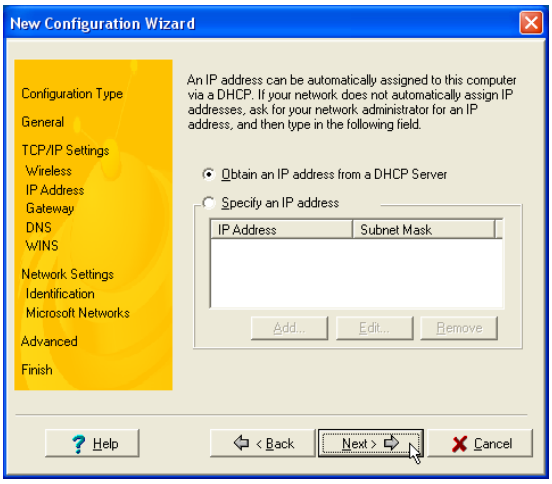
Enter the appropriate information in the wizard. After specifying the appropriate information, click **Next** to continue.

See "Using Edit Configuration" for detailed information on each.



Enter the appropriate information in the wizard. After specifying the appropriate information, click **Next** to continue.

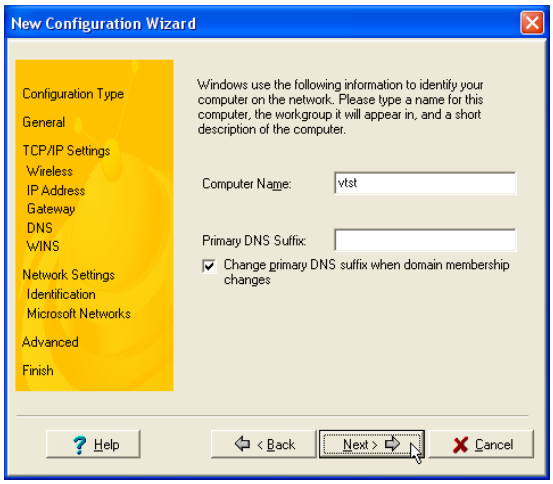
See "Using Edit Configuration" for detailed information on each.



Select to obtain an IP address automatically from a DHCP server or assign one manually. Click **Next** to continue.

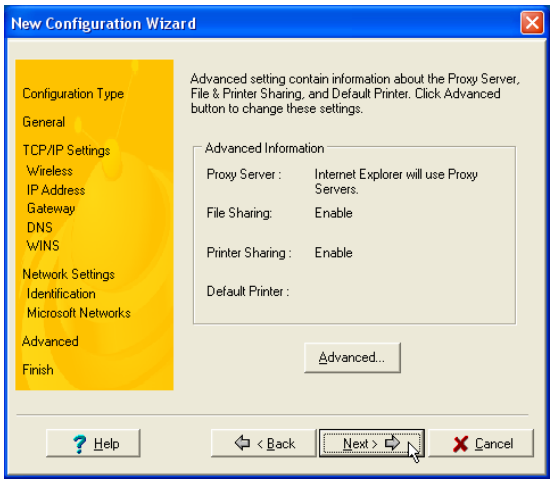
See "Using Edit Configuration" for detailed information on each.

Using New Configuration Wizard (Cont.)



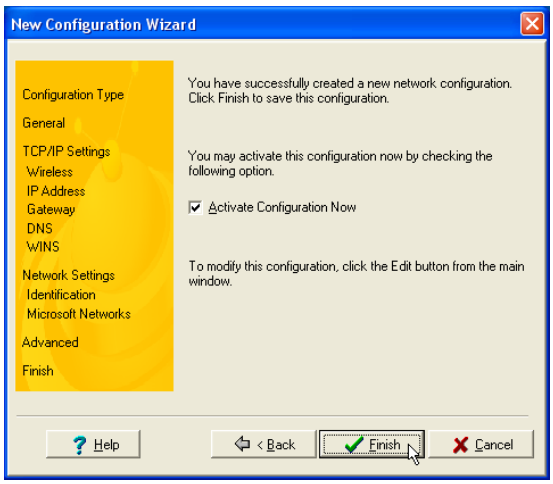
Enter the computer name and DNS suffix. Click **Next** to continue.

Read Microsoft Windows documentation for information on these items.



Click **Next** to accept these settings or click **Advanced** to change them.

Read Microsoft Windows documentation for information on these items.



On the final window of the New Configuration Wizard, you will see a **Finish** button.

If you do not want to use this new configuration now, click **Finish** to save the new configuration. It will be shown in the Mobile Manager main window.

If you want to use this new configuration now, check “Activate Configuration Now**”**.

3.4.4 Using Edit Configuration

Edit an existing configuration

Edit a configuration if you want to view or change dialup or LAN settings.

- On the **Edit menu**, click **Edit Configuration**.

or

- Double-click one existing configuration on the Main window.

Then the Edit Configuration dialog starts.

The Edit Configuration dialog contains various settings, which you select by clicking the buttons at the left of the window. Each setting is described below.

General settings

Name – This field is mandatory, and used for indicating the location from which you are dialing or connecting to the network. For example, if this is used for a meeting room at work, you can use a name like "Work-Meeting Room". If it is used for home on your ADSL, you can name like "Home-ADSL".

Description – This field is optional, you can use it to provide more details about this configuration.

Network settings

Network settings include: "Identification" and "Microsoft Networking".

Identification

Computer name – Give your computer a unique name of up to 15 characters. Thecomputer name is the name that others on your network will see your computer as. For complete compatibility, do not use spaces or symbols. It's generally the same as the DNS hostname, for example, "JohnDoe".

Workgroup – Type an existing workgroup name or create a new workgroup by typing a new name that contains up to 15 characters. Use it to identify your computer group that you belong to.

Computer Description – This information is displayed as a comment next to the computer name when the computer is seen in "Details" view (select from the Windows pull-down menu). Use it to describe your computer, for example, your name, or location.

Microsoft Networking

Logon validation – Specify how Windows 9x clients connect to a Windows NT Server Domain at this location.Check *Log on to Windows NT domain* box if you are using a Windows NT Server in domain controller mode. And then enter the Window NT server domain name in *Window NT domain* field.

Network logon options – Specify how Windows 9x clients try to logon. Select *Quick logon* to wait until the shared network drives is actually used to attempt the login. Select *Logon and restore network connections* to logon to all shared network drives when the user logs into Windows.

Wireless settings

Wireless settings include: "Wireless" and "Encryption".

Network Type

Infrastructure – Select the Infrastructure mode to establish a connection with an Access Point.

Ad Hoc – Select the Ad Hoc mode to communicate directly with each other without using an Access Point.

SSID

Using the SSID filed to configure the SSID setting for the ASUS SpaceLink B&W PCI Card. SSID stands for Service Set Identifier, which is a string used to identify a wireless LAN. You will only be able to connect with an Access Point, which has the same SSID. Use different SSIDs to segment the wireless LAN and add security.

Note that the SSID must be all printable character string (case sensitivity) and up to 32 characters long, such as " WIRELESS LAN". Set the SSID to a null string, if you wish to allow your station to connect to any Access Point it can find. But you cannot use null string in Ad Hoc mode.

Power Saving

This field allows the configuration of power management options to conserve battery life. These options are "Off", "Normal, and "Maximum". Power Management is disabled when "Ad Hoc" mode is selected in the Network Type field.

When the Power Saving setting is Off, it allows a full powered state that yields the best performance. This mode is recommended for devices running on AC power.

Power Saving setting is Normal or Maximum will enable power savings function, the adapter will wake up periodically to see if there is any data being sent. This mode is recommended for devices running on battery power. The difference is when the Power Saving setting is Normal, the driver turns off power to the adapter for brief periods over briefly-spaced time intervals; when the Power Saving setting is Maximum, the driver turns off power to the adapter for long periods over widely-spaced time intervals.

Transmit Power

This field allows the configuration of transmit power options. The options are "100%", "50%", "25%", "12.5", and "Lowest".

Wireless Mode

Choose which wireless mode the wireless card will use. You can enable more than one wireless mode to allow system auto switch among them.

5 GHz 54 Mbps (802.11a): Use this checkbox to allow the wireless card to use the 5 GHz and 54 Mbps wireless mode.

5 GHz 108 Mbps (Turbo Mode): Use this checkbox to allow the wireless card to use the 5 GHz and 108 Mbps wireless mode. A high speed operating mode for 802.11a radio space. Support data transfer speeds up to 108 Mbps, twice the speed of standard 802.11a devices.

2.4 GHz 11 Mbps (802.11b): Use this checkbox to allow the wireless card to use the 2.4 GHz and 11 Mbps wireless mode.

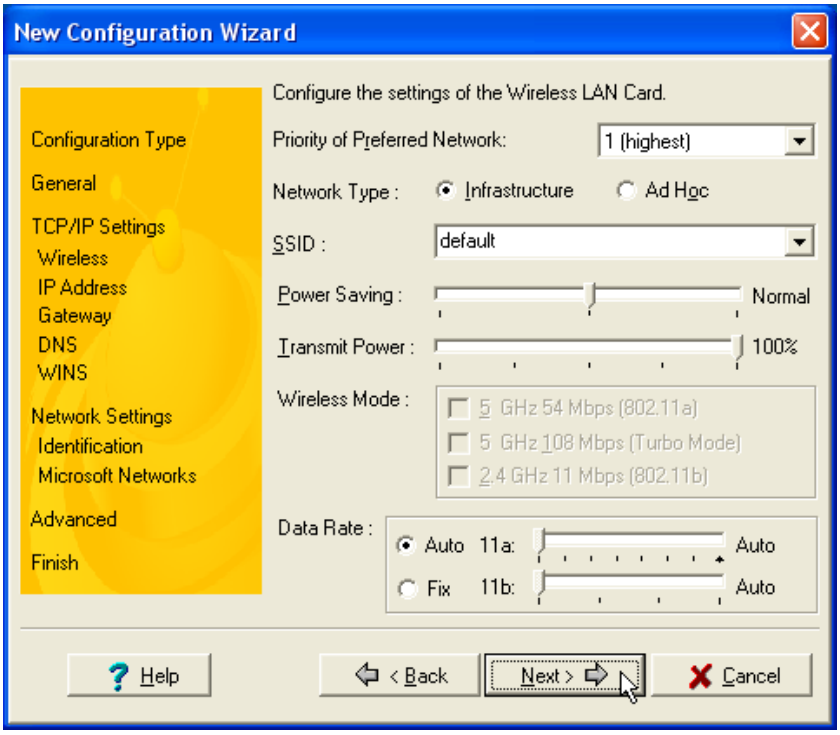
Data Rate

Select the transmit data rate (fix or auto). The data rates supported for the ASUS SpaceLink WLAN Cards are:

Auto - The adapter will adjust to the most suitable transmission rate.

Fix - 11a: Fix data rate to 6, 9, 12, 18, 24, 36, 48, or 54 megabits per second.

11b: Fix data rate to 1, 2, 5, or 11 megabits per second.



Gateway

Specify the gateways. There can be more than one specified.Set up the primary gateway first.

Add a gateway - Type the IP address of the gateway in the **New Gateway** field and then click **Add**. The gateway you specified appears in the **Installed Gateways** list. Repeat to specify another gateways. The value in each field must be a number between 0 and 255. You can have up to eight IP addresses for gateways.

Remove a gateway - Select the gateway from the **Installed Gateways** list and click **Remove**.

DNS

Select Enable or Disable DNS. If you enable DNS, fill the following parameters.

Host – Enter the name of your computer. That is used to identifier the computer on the Internet. The hostname is generally the same as the Microsoft networking computer name, for example, “S82000W”.

Domain – Enter the TCP/IP domain name for your network.The full domain name consists of one or more names that are separated by dots, for example, “asus.com”.

DNS Server Search Order – Specify the DNS Servers in the desired order to search for DNS information.

Domain Suffix Search Order – Add any domain suffixes that may be valid attached to the end of Internet domain name.

WINS

Specify the WINS server. There can be more than one specified.Set up the primary WINS server first.

Disable WINS Resolution – Do not use WINS resolution.

Enable WINS Resolution – Use WINS resolution. Specify the IP addresses of the WINS servers in the desired search order. *Scope ID* is used when NetBIOS over TCP/IP is enabling on the workstations. If this protocol has been enabled, then every workstation group must have the same Scope ID for those computers to communicate within the group. The Scope ID is usually left blank.

Use DHCP for WINS Resolution – If a DHCP server is available that is configured to provide information on available WINS servers.

Dialing settings

Specify how the call will be dialed. This is useful if you want to change the call to a calling card, use your computer from different locations, or add a dial prefix, country code, or area code automatically.

Dialup Networking settings

Dialup Networking settings include four tabs: Device, Phone Number, Server Type, and TCP/IP.

Device

Choose the modem you want to use by Dial-Up Networking to connect to another computer for this connection.

Phone Number

Specify area code, telephone number, and country code for this connection. Clear the **Use area code and Dialing Properties** checkbox, if you want to ignore area code and dialing settings.

Server Type

Type of Dial-Up Server – Select the server type for this connection.

Advanced options

Select **Log on to network** checkbox to specify that Dial-Up Networking will attempt to log on to the network you are connecting to, using the user name and password you typed when you logged on to Windows.

Select **Enable software compression** checkbox to specify whether incoming or outgoing information is compressed before it is sent. This is useful to speed up the transfer of information. Compression occurs only if both computers are using compatible compression.

Select **Require encrypted password** checkbox to specify that only encrypted passwords can be sent to or accepted by your computer. This is useful if you need additional security for this connection. When type your password while dialing out, this setting will encrypt your password but the target computer must support encrypted passwords for your password to be understood.

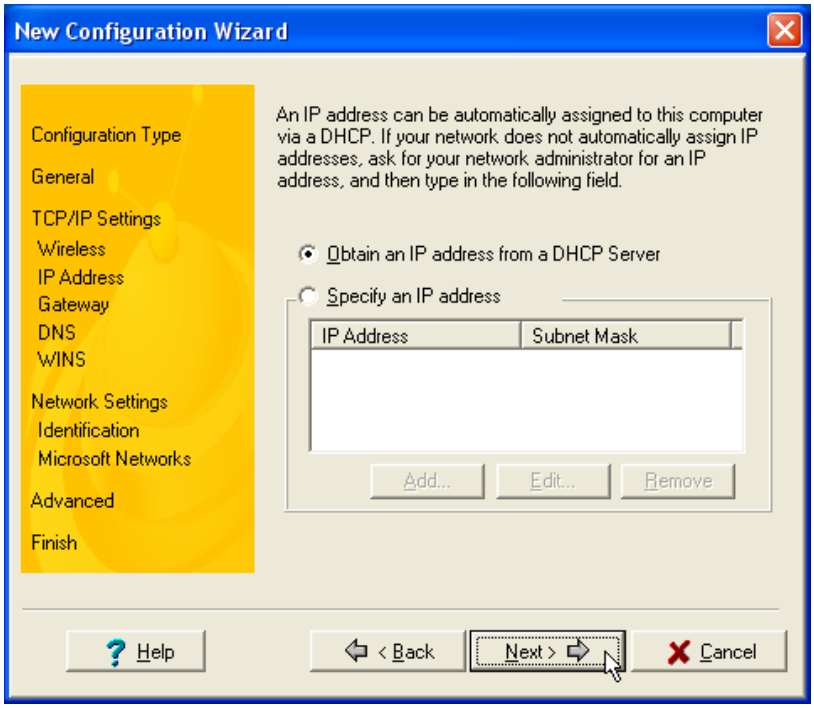
Allowed network protocols – Specifies the network protocols that your computer can use.

Select **NetBEUI** protocol to connect to Windows NT, Windows for Workgroups, or LAN Manager servers.

Select **IPX/SPX Compatible** protocol to connect to Netware and Windows NT servers and Windows 98 computers.

Select **TCP/IP** protocol to connect to Internet and wide-area networks.

TCP/IP



Server assigned IP address – Specifies whether Dialup Networking accepts an IP address from a ppp server. If the ppp server does not offer an IP address, the IP address specified for TCP/IP Dial-Up Adapter in the Network dialog box is used.

Specify an IP address – Provides a space for you to type the preferred IP address for this connection. Dial-Up Networking tries to use this address first.

Server assigned name server addresses – Specifies whether Dial-Up Networking accepts a DNS and WINS server addresses from a ppp server. If the ppp server does not offer DNS and WINS addresses, DNS and WINS server addresses specified for TCP/IP Dial-Up Adapter in the Network dialog box are used.

Specify name server addresses – Provides a space for you to type one or two DNS and WINS server addresses for this connection only. Dial-Up Networking tries to use these addresses first.

Use IP header compression – Specifies whether Dial-Up Networking uses IP header compression for this connection. IP header compression optimizes data transfer between computers.

Use default gateway on remote network – Specifies whether IP traffic is routed to the WAN connection by default.

Internet settings

A proxy server acts as a security barrier between your internal network (Intranet) and the Internet, keeping other people on the Internet from gaining access to confidential information on your internal network or your computer.

Disable Proxy Server – Do not use proxy server.

Enable Proxy Server – Use the Proxy server to gain access to the Internet.

Use the same proxy server for all protocols – Specifies whether you want to use the same proxy server to gain access to the Internet using all protocols.

Servers – Provides spaces for you to type the address and port number of the proxy server you want to use to gain access to the Internet over HTTP, Secure, FTP, Gopher, and Socks protocol.

Exceptions

Do not use proxy server for address beginning with – Provides a space for you to type the Web addresses that do not need to be accessed through the proxy server. If you want to connect to a computer on your Intranet, make sure you type its address in this box. You can use wild cards to match domain and host names or addresses, for example, "*.company.com", "192.72.111.*".

Bypass proxy server for local addresses – Specifies whether you want to use the proxy server for all local (Intranet) addresses. You might be able to gain access to local addresses easier and faster if you do not use the proxy server.

Sharing settings

I want to be able to give others access to my files – Turn file sharing ON or OFF. File sharing enables people using other computers to read or modify files you share on your computer.

I want to be able to allow others to print to my printer(s) – Turn printer sharing ON or OFF. Printer sharing enables people using other computers to printer their files on your printers.

Click **Save** button to save all the changes you have made without closing the Edit Configuration dialog box.

Click **Cancel** button to close the Edit Configuration dialog box without saving any changes you have made.

Click **Close** button to close the Edit Configuration dialog box and save any changes that you have made.

3.5 Site Monitor

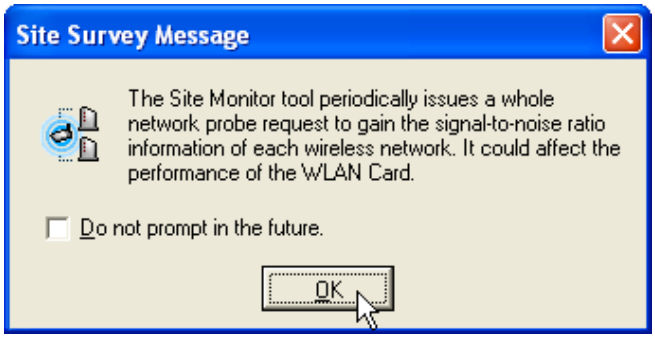
Site Monitor measures the received signal strength indicator (RSSI) values of all available wireless networks. This tool is used for determining the best placement of Access Points to provide the best coverage for a wireless network.

3.5.1 Starting Site Monitor

- Click the Windows **Start** button, select **Programs**, select ASUS Utility, select **Dual-Band WLAN Card Utilities**, and then click **Site Monitor**.

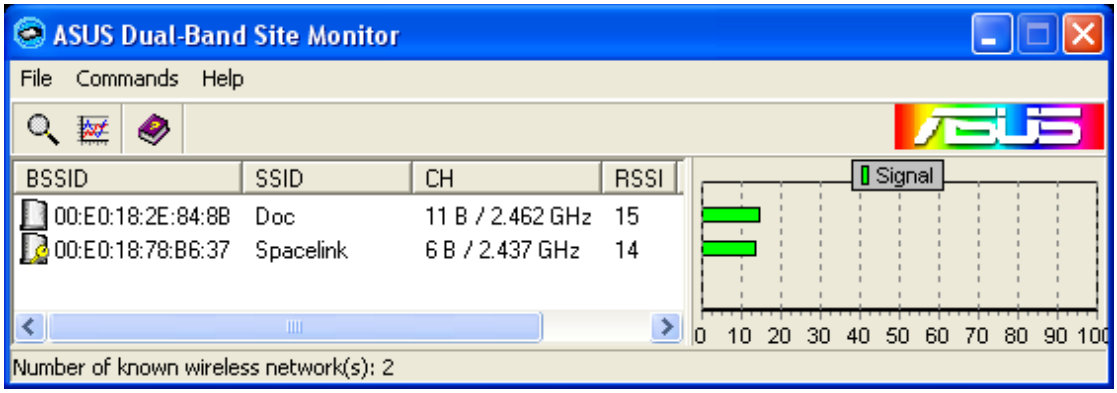
or

- Right-click the **Control Center** icon on the Windows taskbar and then click **Site Monitor**.



3.5.2 Main Screen

Site Monitor measures the received signal strength indicator (RSSI) values of all available wireless networks.



Some Access Points can disable broadcasting SSID to hide themselves from "Site Survey" or "Site Monitor" for added security but still allow you to join if you know their SSID.

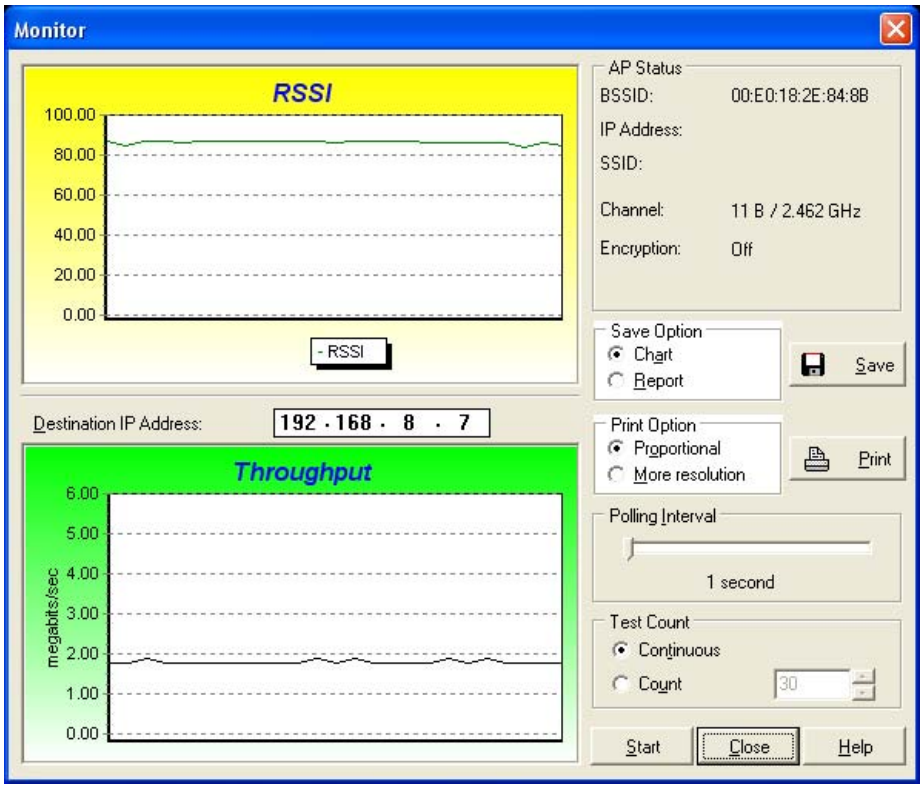
3.5.3 Monitor

Directed link state test with one particular wireless network, including:

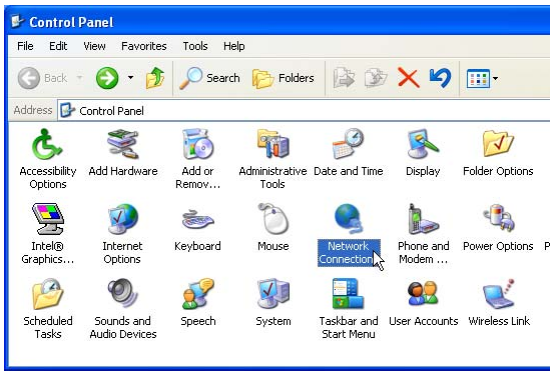
RSSI: This indicates the value of received signal strength of the last received frame. In principle, the higher the RSSI, the better your communications quality.

Throughput: This sends a specified number of data packets to the remote host and calculates the average megabytes per second.

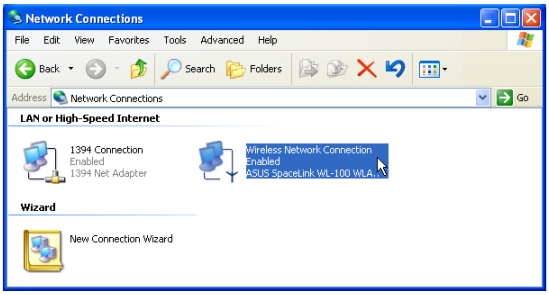
During the test, the Start button toggles to Stop. You can click Start button to begin the link test and click Stop button at any time to terminate the test.



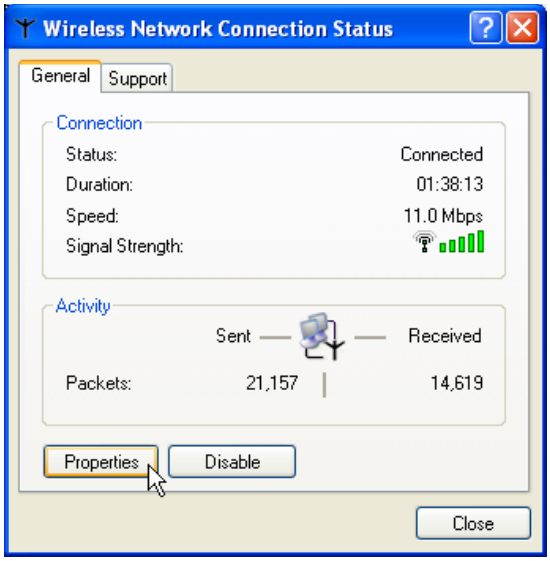
3.6 Windows XP Wireless Properties



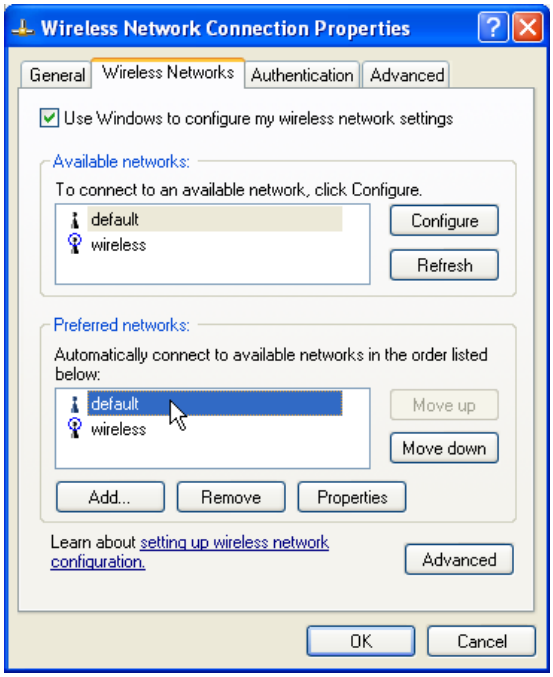
1. Double-click **System** icon in the Control Panel.



2. Double-click **ASUS SpaceLink WL230...**

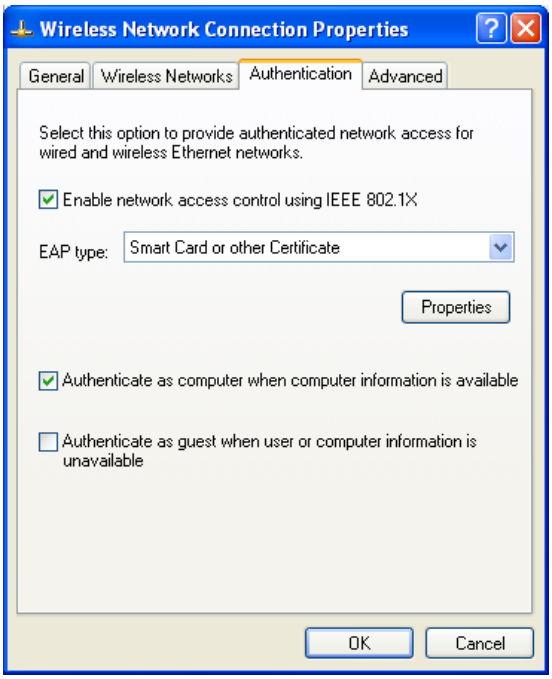


3. The "General" page will show status, duration, speed, and signal strength. Signal strength is represented by green bars with 5 bars meaning excellent signal and 1 bar meaning poor signal.

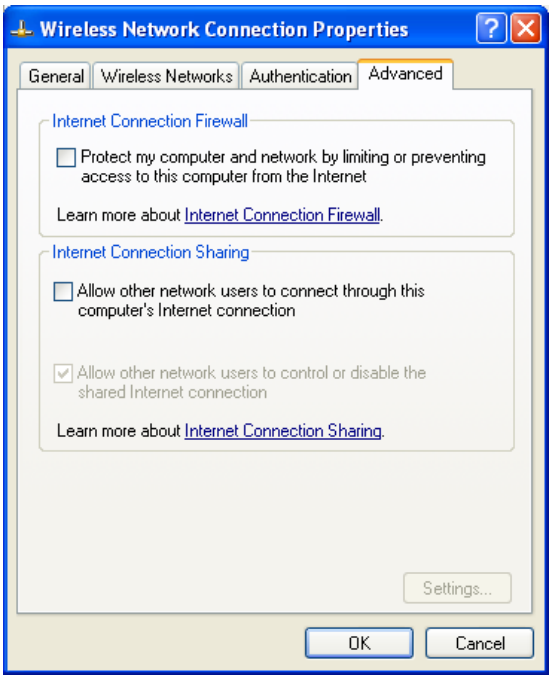


4. The "Wireless Networks" page will show Available networks and Preferred networks. Use the **Add** button to add the "SSID" of available networks and set the connection preference order with the **Move up** and **Move down** buttons. The radio tower with a signal icon identifies the currently connected access point.

Windows XP Wireless Properties (Cont.)



5. The “Authentication” page allows you to add security settings. Read Windows help for more information.



6. The “Advanced” page allows you to set firewall and sharing. Read Windows help for more information.

4. Bluetooth Reference

4.1 Introduction to Bluetooth

The term "Bluetooth" refers to a worldwide standard for the wireless exchange of data between two devices.

In order to exchange data, two Bluetooth devices must establish a connection. Before a connection is established, one device must request a connection with another. The second device accepts (or rejects) the connection. The originator of the request is known as the client. The device that accepts (or rejects) the request is known as the server. Many Bluetooth devices can act as both client and server.

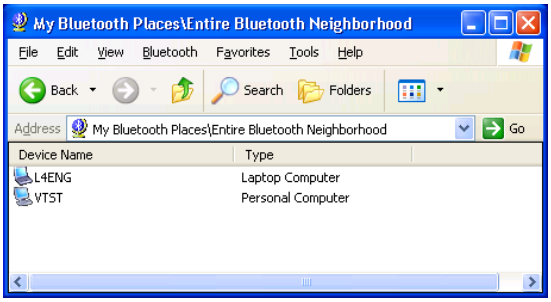
A client Bluetooth device runs a software program that requests a connection to another device as part of its normal operation. For example, the program may request a connection to a remote computer, a printer, PDA, or a Cellular Phone. Becoming a Bluetooth client normally requires an action by the device operator, such as an attempt to browse a remote computer, print a file, or dial out on a Cellular Phone.

Every Bluetooth device that provides a service must be prepared to respond to a connection request. Bluetooth software is always running in the background on the server, ready to respond to connection requests.

4.2 Using the Bluetooth Software

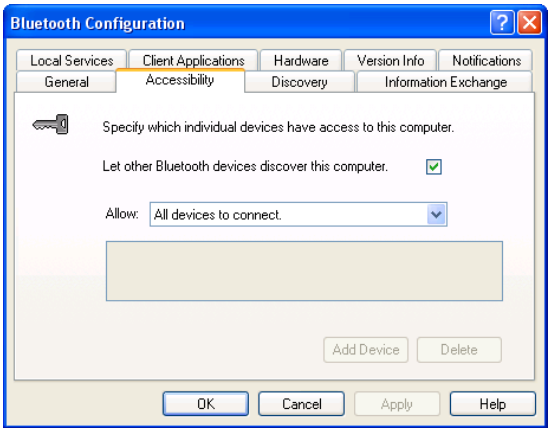
This icon will appear on your desktop. Double-click **My Bluetooth Places** to launch the Bluetooth utility.

Click **Entire Bluetooth Neighborhood** to search for Bluetooth devices in range.



Devices within range will be shown in “Entire Bluetooth Neighborhood”

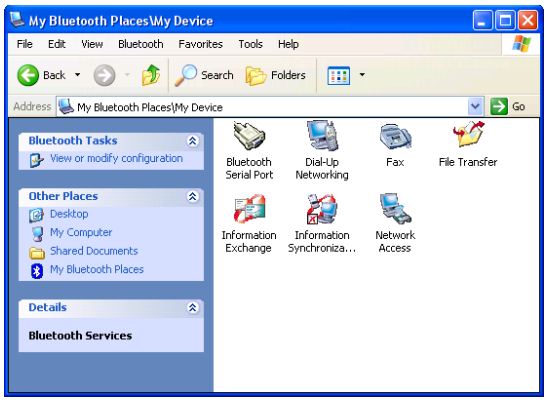
If you cannot see any devices within “Entire Bluetooth Neighborhood”, make sure that your devices are properly working and set to allow discovering.



Enable Discovering

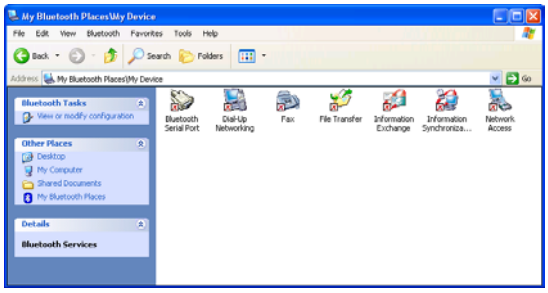
By default, Bluetooth devices will have their discovery option enabled. If you want to know where this is set, right-click the Bluetooth icon on the taskbar and choose **Setup | Configuration** in order to bring up the configuration window. Use the “Accessibility” page to “Let other Bluetooth devices discover this computer”.

Using the Bluetooth Software (Cont.)



Different Views

Depending on your Windows folder options, you will may see different sized icons. The above has “Show common tasks in folders” enabled and view “Tiles”.

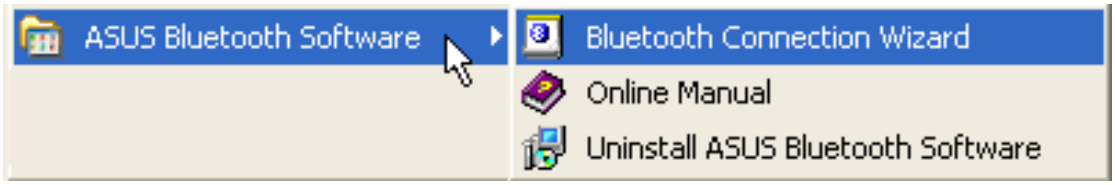


Bluetooth Not Available

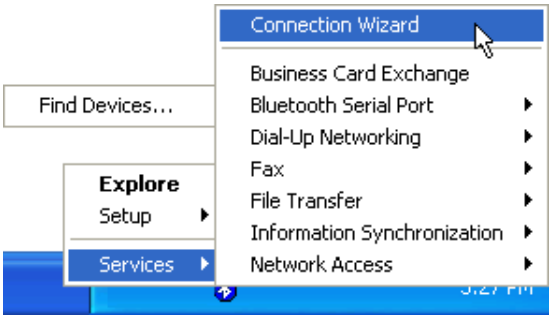
If your local Bluetooth device is not present or working, you will get red x’s on each Bluetooth service icon.

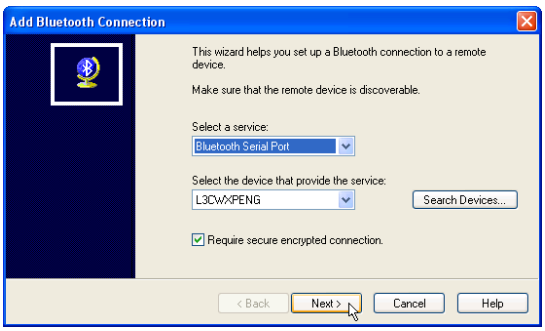
4.2.1 Bluetooth Connection Wizard

Using “My Bluetooth Places” and browsing to the individual service within a target device is actually easier to use than using the “Bluetooth Connection Wizard”. See “Services” a few pages later.



Launch the “Bluetooth Connection Wizard” from the Start menu or right click the Bluetooth icon on the taskbar. You can read about “Bluetooth Connection” in the Online Manual.



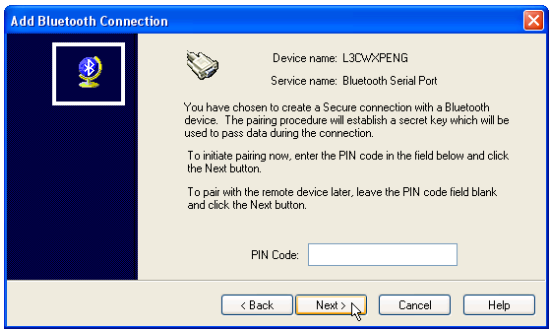


Select a service and target device. (To update the list of devices displayed, click the **Search Devices...** button.)

Optional: select the “Require secure encrypted connection” option to enable Authentication and Encryption for this connection.

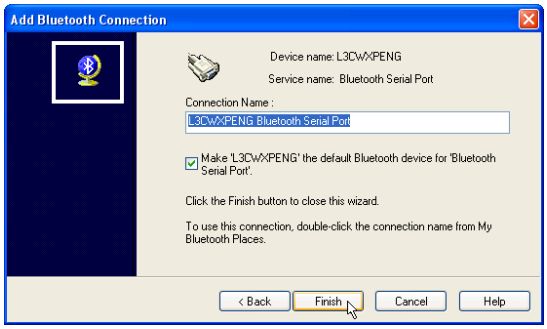
Click the Next button:

- If more than one service is available for the selected device, for example, multiple Bluetooth Serial Ports, then the Select Bluetooth Service dialog box appears. Select the specific service to be used, and then click the **OK** button to close the Select Bluetooth Service dialog box.
- If only one service is available for the selected device, the next Connection Wizard screen appears.



If "Require secure encrypted connection" was selected earlier, a security screen may appear:

- To establish a paired relationship with the remote device while using this wizard, enter your Personal Identification Number in the PIN Code field of the security screen, and then click the **Next** button.
- To establish the paired relationship with the remote device the first time this connection is used, leave the PIN Code field blank in the security screen, and click the **Next** button. The Security screen WILL NOT appear if the devices have been paired.

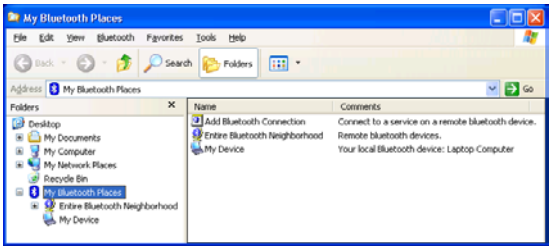


The top of the screen provides basic information about the new connection – the name of the device that will provide the service and the name of the service that will be provided. If this information is NOT correct, click the **Back** button to return to the previous screen, and from that screen select the correct service and device.

In the "Connection Name:" field, enter a descriptive name for the connection, for example, "Serial Connection to ASUS Desktop".

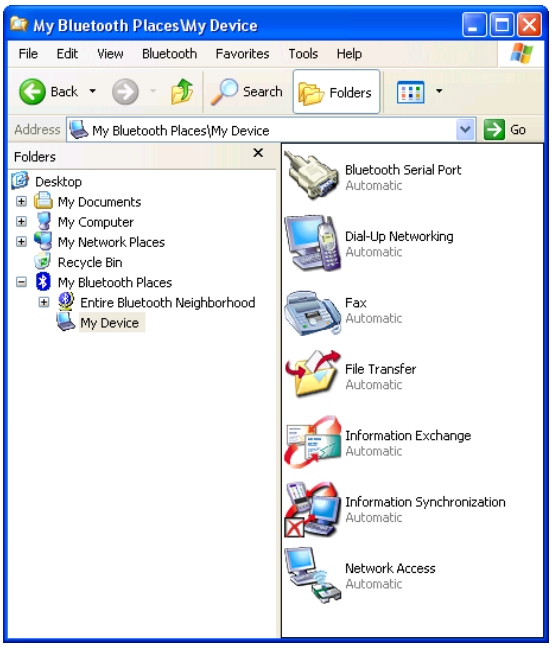
4.2.2 Explore

Besides double-clicking the Bluetooth icon on your desktop, you can right click and select **Explore** to view Bluetooth devices along with your entire computer in one window.



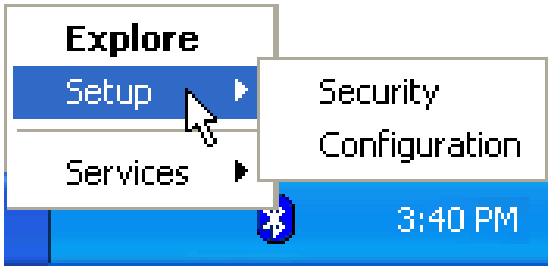
This is Windows "Explorer" utility with "My Bluetooth Places" selected.

This is Windows "Explorer" utility with "Entire Bluetooth Neighborhood" selected.

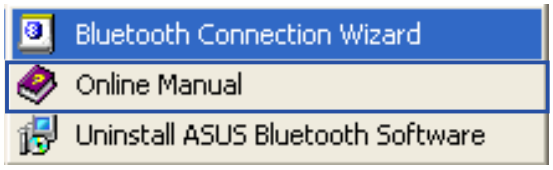


This is Windows "Explorer" utility with "My Device" selected.

4.2.3 Setup

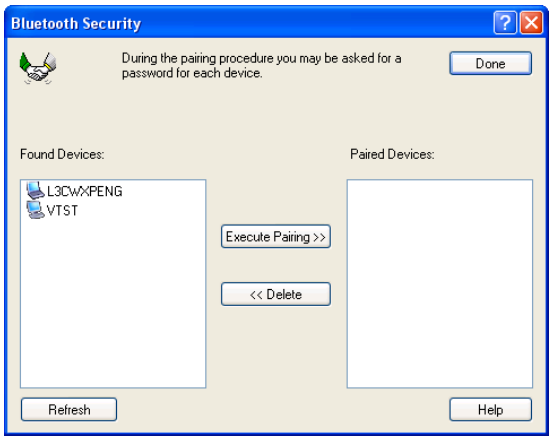


Right click and select **Setup** to view Bluetooth configuration options.



You can read about the Security and Configuration settings in the Online Manual.

4.2.4 Security



Pairing Devices

Pairing allows you to avoid entering access information each time a connection is attempted. Paired devices share a unique Link Key, which they exchange when connecting.

The mate of a pair will always appear in My Bluetooth Places, even if the mate is not turned on or is out of connection range.

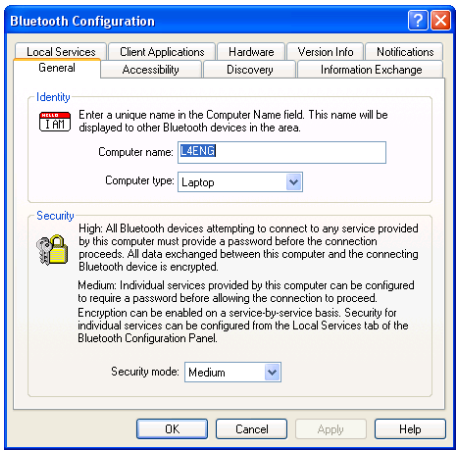
Paired devices remain paired even when: One of the devices is not powered up; a service connection is interrupted or the service stopped; or one or both devices are rebooted.

When Authentication is enabled devices are paired the first time they attempt to connect, after a successful passkey exchange.

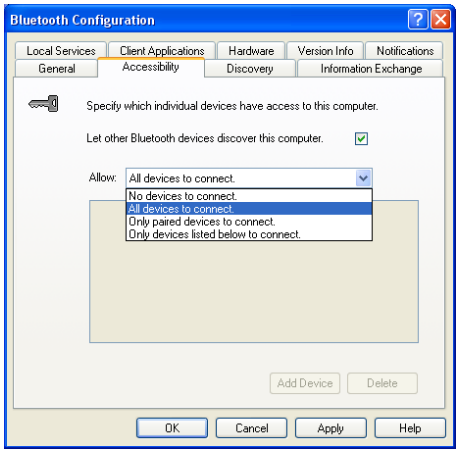
4.2.5 Configuration

View the online manual for information on configuration settings.

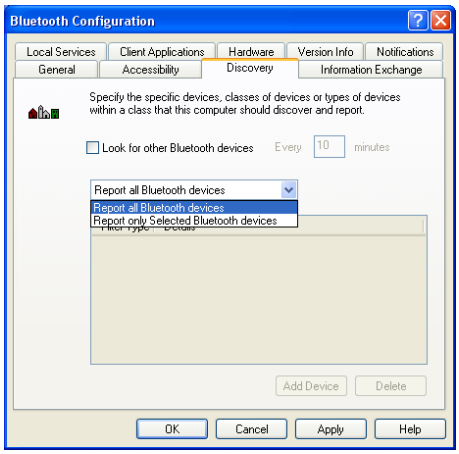
General



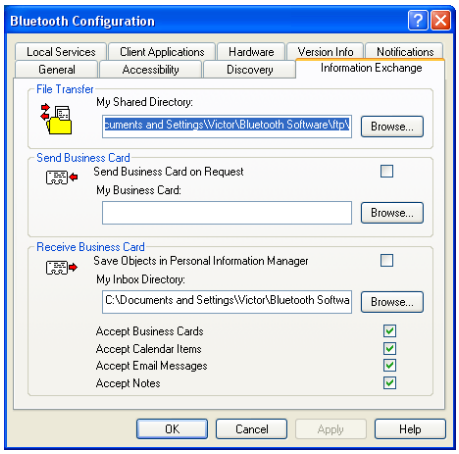
Accessibility



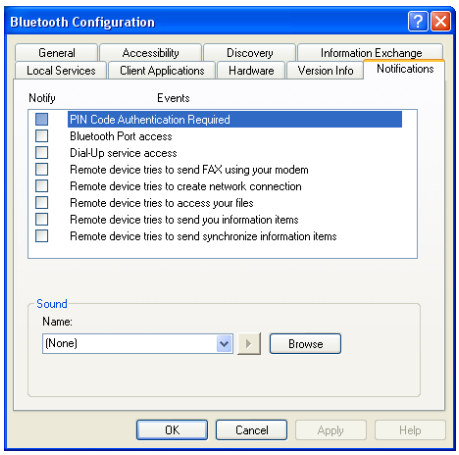
Discovery



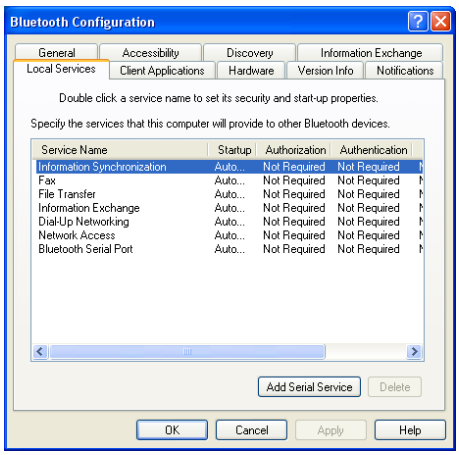
Information Exchange



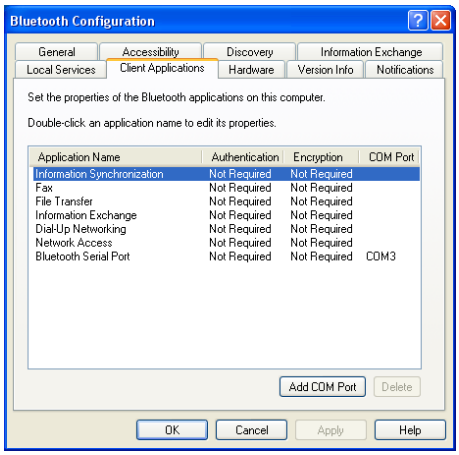
Discovery



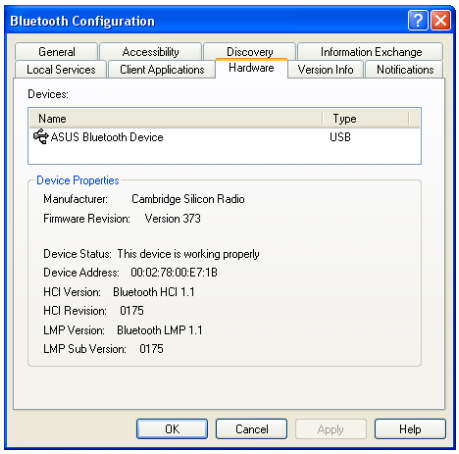
Local Services



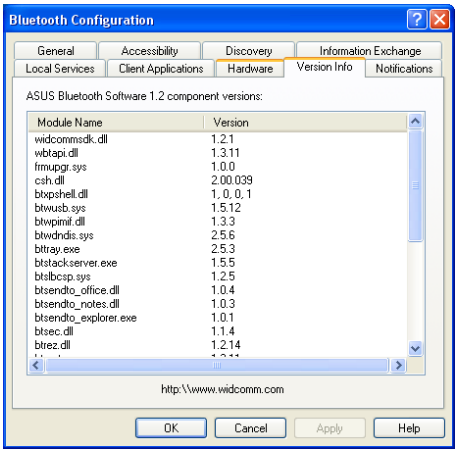
Client Applications



Hardware

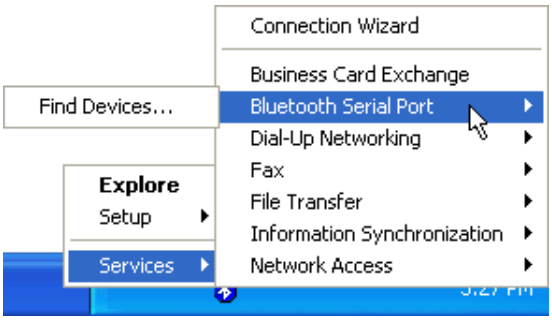


Version Info



4.2.6 Services

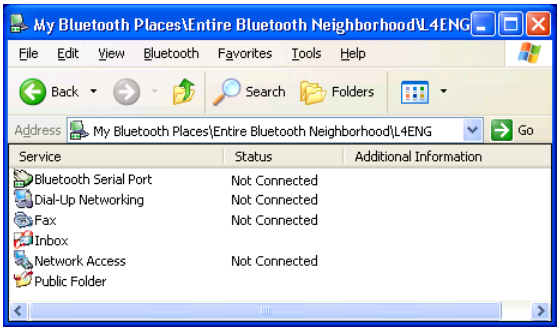
Using services on a target device are just as they would be on your own computer but you will be borrowing the target device's resources. For more information on those services, refer to your source or target's user's manual. Services are provided by the server and used by the client. All Bluetooth servers do not necessarily provide all of these services.



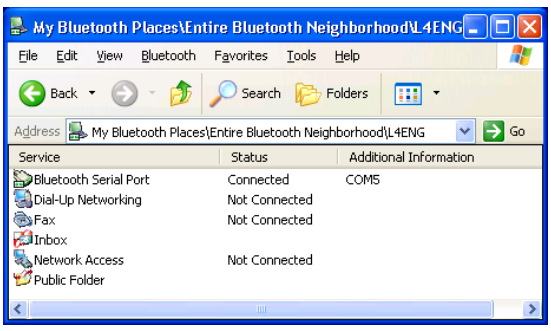
You can also use services from the Bluetooth taskbar icon. Right-click the icon to bring up the "Services" menu.

Determine the services provided by a Bluetooth device

- On the client, in the Folders pane of My Bluetooth Places, select Entire Bluetooth Neighborhood.
- In the right pane of Entire Bluetooth Neighborhood, right-click anywhere except on a device name and select Refresh from the pop-up menu.
- In the Folders pane of My Bluetooth Places, right-click a device and select Discover Available Services from the pop-up menu to update the available services list. The available services will be displayed in the right pane of My Bluetooth Places.



There are several other services available when you open the target device.



When you double-click a service, the "Status" will show "Connected". Because resources are limited, when you start a service, other services may be disconnected.

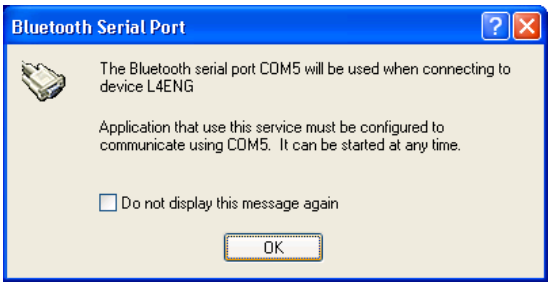
Device Icons

Name	Normal	Connected	Paired
Desktop			
Laptop			
Modem			
Network Access Point			
Personal Digital Assistant			
Printer			
Telephone			
Unknown Device			

Service Icons

Name	Normal	Connected	Not Available
Dial-up Networking			
Fax			
File Transfer			
Information Exchange			
Network Access			
Serial Port			
Synchronization			

4.2.7 Serial Port



The Bluetooth Serial Port service allows two Bluetooth devices to establish a wireless connection through virtual communications ports and then use that connection as if it were a hardwired serial cable between the devices.

To establish a Bluetooth serial port connection

Connections are initiated from the client:

- On the client, in the Folders pane of My Bluetooth Places, select Entire Bluetooth Neighborhood.
- In the right pane of Entire Bluetooth Neighborhood, right-click anywhere except on a device name and select Refresh from the pop-up menu.
- In the Folders pane of My Bluetooth Places, right-click the server you want to establish a connection with and select Discover Available Services from the pop-up menu to update the available services list. The available services will be displayed in the right pane of My Bluetooth Places.
- In the right pane of My Bluetooth Places, double-click Bluetooth Serial Port. A dialog box appears that contains the communications port number assigned to this connection by the client. The application that will use this connection must be configured to send data to this port.

Depending on the security configuration, the dialog box that provides communications port information may not appear until after Authentication and Authorization have been accomplished.

Determine the communications port being used by the server

The application on the server must be configured to use the correct communications port.

To determine the communications port being used by the service:

- On the server, in the Folders pane of My Bluetooth Places, right-click My Device and select Properties from the pop-up menu
- In the Bluetooth Configuration Panel, select the Local Services tab.

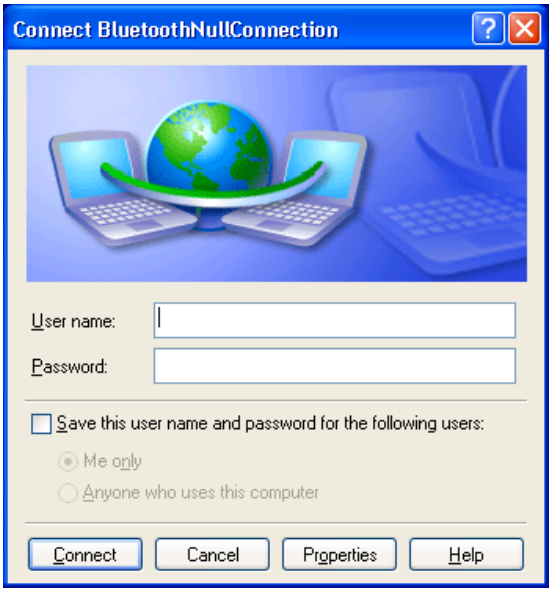
- Double-click the Bluetooth Serial Port service to display its Service Properties dialog box. The Service Properties dialog box shows the communications port that the connection is using.

Close a Bluetooth serial port connection

Connections are normally closed from the client:

- On the client, in the Folders pane of My Bluetooth Places, select (highlight) the device that is providing the Bluetooth Serial Port service.
- In the right pane of My Bluetooth Places, right-click Bluetooth Serial Port and then select Disconnect Bluetooth Serial Port from the pop-up menu.
- Though not recommended, connections can also be closed from the server:
- On the server, in the Folders pane of My Bluetooth Places, select (highlight) My Device.
- In the right pane of My Bluetooth Places, right-click Bluetooth Serial Port and then select Stop to close the service. The service must be restarted before it will be available to remote devices (right-click Bluetooth Serial Port and select Start from the pop-up menu).

4.2.8 Dial-Up Networking



The Dial-up Networking service permits a Bluetooth client to use a modem that is physically connected to a different Bluetooth device (the server).

After the Bluetooth wireless connection is established the client can use the server's modem as if it were a local device on the client.

Establish a Dial-up Networking session

Connections are initiated from the client:

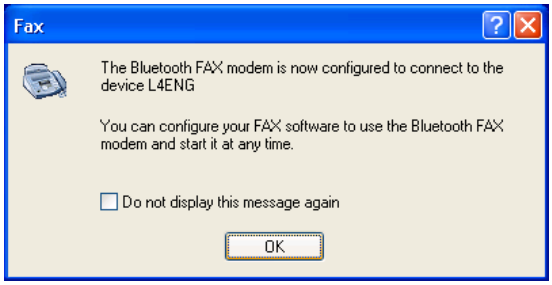
- On the client, in the Folders pane of My Bluetooth Places, select Entire Bluetooth Neighborhood.
- In the right pane of Entire Bluetooth Neighborhood, right-click anywhere except on a device name and select Refresh from the pop-up menu.
- In the Folders pane of My Bluetooth Places, right-click the server that will provide the Dial-up Networking Service and select Discover Available Services from the pop-up menu to update the available services list. The available services will be displayed in the right pane of My Bluetooth Places.
- In the right pane of My Bluetooth Places, double-click Dial-up Networking.
- In the Connect To dialog box, fill in your user name, password, and the phone number to be dialed, and then click the Dial button. Select the Save password check box and the dialog box will not appear for subsequent connections to the same phone number.

You can now open a web browser and connect to the Internet.

Close a Dial-up Networking connection

- On the client, in the Folders pane of My Bluetooth Places, select (highlight) the device that is providing the Dial-up Networking service.
- In the right pane of My Bluetooth Places, right-click Dial-up Networking and then select Disconnect Dial-up Networking from the pop-up menu.

4.2.9 Fax



The Fax service allows a Bluetooth client to wirelessly send a fax using a device that is physically attached to a Bluetooth server.

Send a Fax

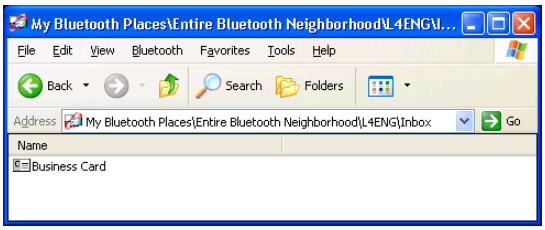
Connections are initiated from the client:

- On the client, in the Folders pane of My Bluetooth Places, select Entire Bluetooth Neighborhood.
- In the right pane of Entire Bluetooth Neighborhood, right-click anywhere except on a device name and select Refresh from the pop-up menu.
- In the Folders pane of My Bluetooth Places, right-click the server that will provide the Fax service and select Discover Available Services from the pop-up menu to update the available services list. The available services will be displayed in the right pane of My Bluetooth Places.
- In the right pane of My Bluetooth Places, double-click Fax.

After the Fax connection is established, open or create the document to be faxed and use the “Print” or “Send to Fax Recipient” option available in most applications.

The Fax connection closes automatically when the transmission is complete.

4.2.10 Inbox



The Information Exchange service provides a way to send and receive Microsoft Outlook items to and from another Bluetooth device.

Supported Outlook items are

- Business cards (*.vcf and *.vcd)
- Calendar entries (*.vcs)
- Notes (*.vnt)
- Messages (*.vmg)

There are three types of operation

- Send – sends an object to another device.
- Receive – requests an object from another device.
- Exchange – sends a client object and receives a server object.

The default location of your business card and the location where received items are placed can be configured in the Bluetooth Configuration Panel.

Send, receive or exchange an object

On the client, in the Folders pane of My Bluetooth Places, right-click the Inbox icon of the remote device and select an option from the pop-up menu.

Business cards are sent, received or exchanged without further intervention.

To send Calendar Items, Notes, and Messages, navigate to the folder that contains the item you want to send, select the item, and then click Open.

4.2.11 Network Access

The Network Access service permits a Bluetooth client to use a Local Area Network connection that is physically attached to another Bluetooth device (the server).

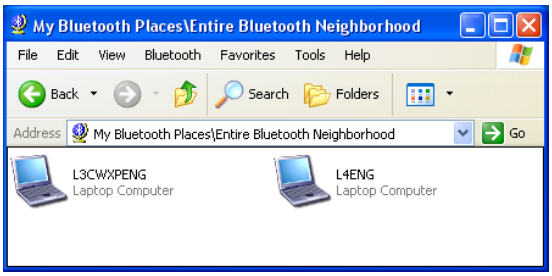
Possible Network Access servers include

- Bluetooth-enabled computers that have a hardwired Ethernet connection.
- Stand-alone Bluetooth Network Access Points.

The Bluetooth server must be specifically configured to provide the Network Access service.

After a Bluetooth device is configured as a Network Access server it cannot act as a Network Access client without being re-configured.

4.2.12 File Transfer



The File Transfer service allows one Bluetooth device to perform file operations on the default File Transfer directory (and the folders and files it contains) of another Bluetooth device.

Perform an operation on a folder or file

On the machine from which the File Transfer service will be used:

- In the Folders pane of My Bluetooth Places, select Entire Bluetooth Neighborhood.
- In the right pane of Entire Bluetooth Neighborhood, right-click anywhere except on a device name and select Refresh from the pop-up menu.
- In the Folders pane of My Bluetooth Places, right-click the device you want to Transfer Files with and select Discover Available Services from the pop-up menu to update the available services list. The available services will be displayed in the right pane of My Bluetooth Places.
- Still in the Folders pane of My Bluetooth Places, click the plus (+) sign in front of Public Folder to expand that folder. If there are additional folders inside the expanded folder then those additional folders may have to be expanded. Folder contents are displayed in the right pane of My Bluetooth Places.

Types of File Transfer operations

In the right pane of My Bluetooth Places, right-click a folder item and select an option from the pop-up menu. A dialog box (the title varies, depending on the operation being carried out) appears and the status line (bottom of the dialog box) indicates the operational step that is being carried out.

The types of operations that can be accomplished are:

Open:

- Files – are opened in the application associated with them.
- Folders – are expanded to show their contents.
- Print – sends the selected server file to the client's default printer.

Send to:

- 3.5” Floppy Drive – copies the selected item(s) from the server to the client’s 3.5” floppy drive.
- My Shared Folder – copies the selected item(s) from the server to the default File Transfer folder on the client.
- Cut – copies a folder and its contents, or individually selected files in a folder, to the Windows clipboard. When the clipboard contents are pasted to a new location, the originally selected file(s) on the server are deleted.
- Copy – copies a folder and its contents, or individually selected files in a folder, to the Windows clipboard.
- Delete – deletes selected file(s) and/or folder(s) on the server.
- Rename – allows you to change an empty folder’s name.
- Properties – displays the file or folder’s properties dialog box.

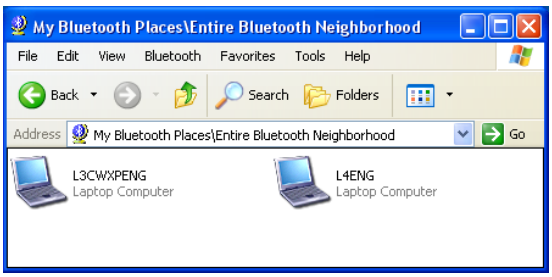
Other options that may appear

(depending on the context that the menu appears in)

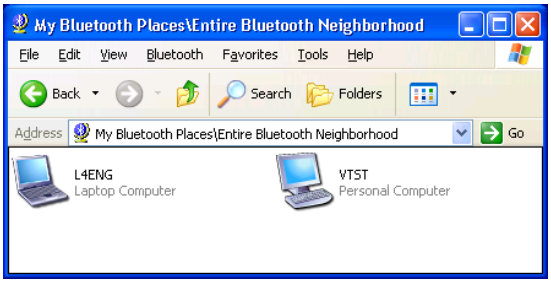
- Update – updates the contents of a folder
- New Folder – creates a new folder on the server
- Abort FTP Operation – aborts an in-process File Transfer operation.

See next page for file transfer example.

4.3 File Transfer Example (to Public Folder)

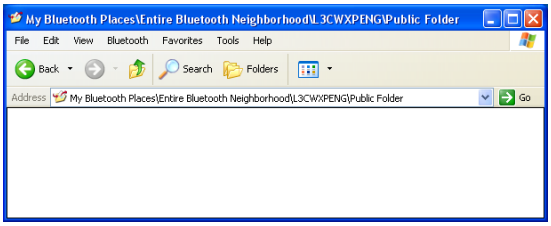


[Source] Selecting "Entire Bluetooth Neighborhood" will show available Bluetooth devices. You will not see yourself. The above example is a Personal Computer (Desktop PC) and only Laptop Computers (Notebook PC) are shown.

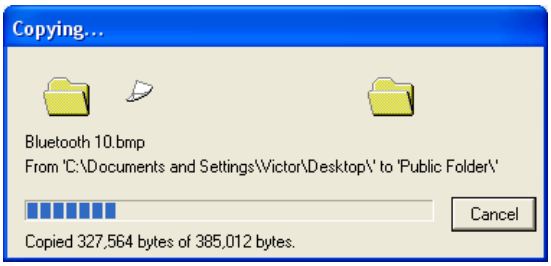


[Target] In this setup, there are two Laptop Computers and one Personal Computer. From one of the target Laptop Computers, you can see the Personal Computer that was not shown in the previous screen capture.

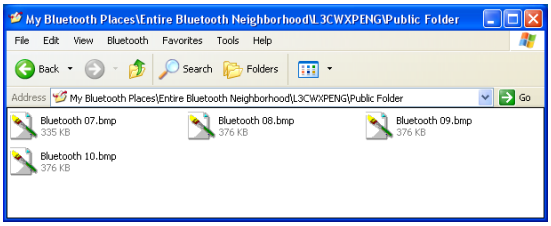
[Source] When you open the target device, the available services will be shown. Notice the device name in the "Address".



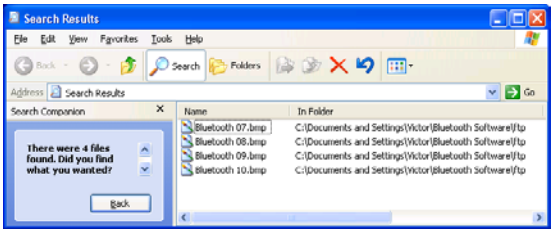
[Source] When you open the target device's "Public Folder" for the first time, it should be empty. Notice the device name in the "Address".



[Source] Drag and drop some files into the window to begin transferring files.

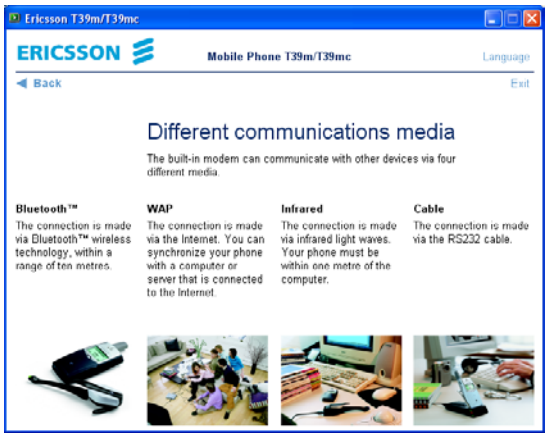


[Source] After copying, you will see the files in the other device. Notice the device name in the "Address".



[Target] You will find the files in the path similar to the one shown here. If the target device has a search option, you can use it to locate the files.

4.3.1 Bluetooth Cellular Phone



Modern cellular (also called mobile) phones have several connection options to make its features accessible to a wide range of devices and computers in several environments.

When using a Bluetooth Cellular phone such as the Ericsson T39, you can see target Bluetooth devices similar to using a computer. Under (5) Extras menu, there is (5) Bluetooth options.

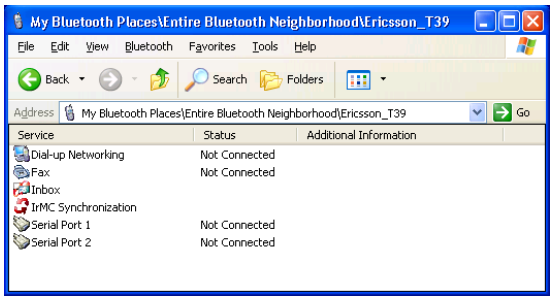
(1) Discoverable - use this to allow other to be able to see your Cellular phone. The Ericsson T39 will only enable this function for 3 mins at a time for security reasons.

(2) Paired devices - add Bluetooth devices to connect to

(3) Discover - use this to search for available Bluetooth devices.

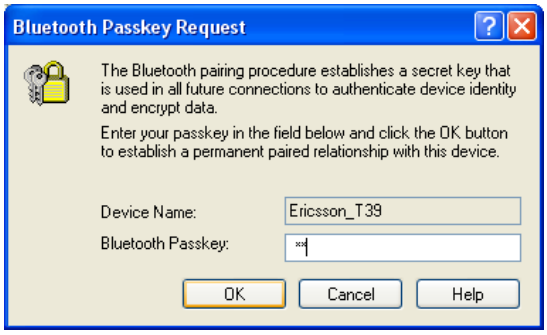
(4) Operation mode - set the operation mode for the Ericsson T39

Here we can see the Ericsson T39 in Windows "My Bluetooth Places" when using a computer equipped with Bluetooth.

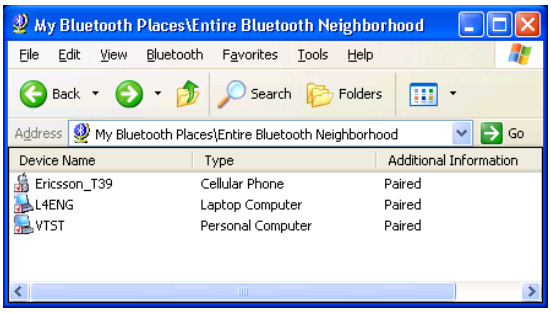


Here are the available services using the Ericsson T39.

Pairing



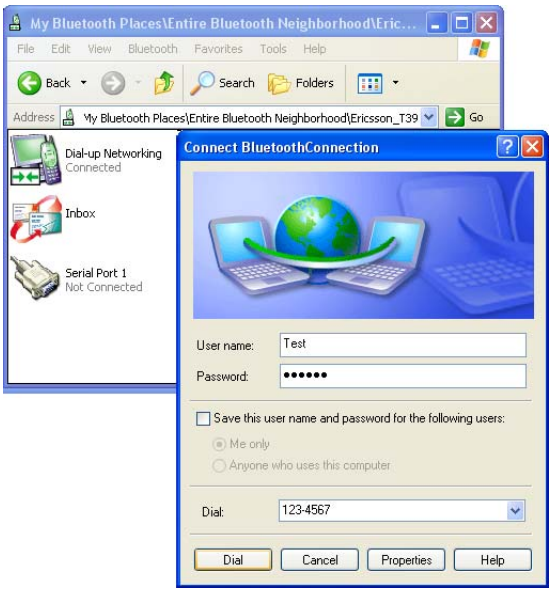
Pairing is necessary in order to utilize another device's resources. You will be asked to enter a password on both devices. The first device (a computer in this case) sets the password and the second device (the Ericsson T39 in this case) must enter the same password. Since the Ericsson T39 can only enter numbers as the password, make sure you also use numbers as the password on the computer.



When paired to another device, there will be a check mark on the device icon and "Paired" will be shown when folder view is set to "Details".

4.3.2 Dial-Up Networking with Bluetooth Cellular Phone

This is the same as one computer using another computer's resources to access the Internet. While on the road, you can borrow your Bluetooth cellular phone's modem without connecting a cable. This is like using a computer and a modem at home to access the Internet through an Internet Service Provider (ISP).



To access the Internet, you need to dial-up to your Internet Service Provider (ISP), double click "Dial-up Networking" in the Ericsson_T39 window. Enter your ISP account "User name", "Password", and Phone Number.

5. Troubleshooting

Wireless LAN

The below troubleshooting guides provide answers to some of the more common problems, which you may encounter while installing or using ASUS SpaceLink B&W PCI Card products. If you encounter difficulties that are not mentioned in this section, please contact ASUS Wireless LAN Technical Support.

Verify if the PCI Card is installed correctly.

When the ASUS SpaceLink B&W PCI Card setup task is complete, you can verify if the driver has been setup properly. Right click **My Computer**, select **Properties**, and click the **Device Manager** tab. Then double-click the **Network adapters** icon; you should see "ASUS 11a/b PCI Wireless Network Adapter" with an icon of expansion card. There should not be a "!" or "?" (problem) or "x" (disabled) symbol over this icon.

There is a yellow exclamation mark or a yellow question mark in Device Manager in front of my ASUS SpaceLink B&W PCI Card.

To resolve the problem, you should update/reinstall the ASUS SpaceLink B&W PCI Card driver. In "Device Manager", right click **ASUS 11a/b PCI Wireless Network Adapter**, select **Properties**, and select **Driver** tab. Click on **Update Driver** button, then follow the "Update Device Driver Wizard" to complete the driver installation.

In addition, you may be able to resolve this issue by reinstalling the driver. Choose **ASUS 11a/b PCI Wireless Network Adapter**, click **Remove** button in "Device Manager", and then run the **Add New Hardware Wizard** from the **Control Panel**.

Cannot connect to any Access Points

Follow the procedure below to configure your ASUS SpaceLink B&W PCI Card.

a. Verify that the "Network Type" is in "Infrastructure" mode.

b. Verify that the "SSID" of your ASUS SpaceLink B&W PCI Card is set to the same "SSID" of an Access Point.

c. Verify that the "Encryption" type is the same as that of an Access Point. If you enabled "WEP" encryption, you must also set the same WEP Keys on both sides.

Cannot connect to a Station (ASUS SpaceLink B&W PCI Card)

Follow the procedure below to configure your ASUS SpaceLink B&W PCI Card.

a. Verify that the “Network Type” is in “Ad Hoc” mode.

b. Verify that the “SSID” of your ASUS SpaceLink B&W PCI Card is set to the same “SSID” of the other station (or another ASUS SpaceLink B&W PCI Card).

c. Verify that the “channel” of the ASUS SpaceLink B&W PCI Card is “Auto” or set to the same “channel” of the other station (or another ASUS SpaceLink B&W PCI Card).

d. Verify that the “Encryption” type is the same as the other station (or another ASUS SpaceLink B&W PCI Card). If “WEP” encryption is enabled, you must set the same “WEP” Keys on both stations.

Bad link quality or bad signal strength

There are two possible reasons. First is radio interference, keep the environment around the ASUS SpaceLink B&W PCI Card away from microwave ovens and large metal objects. Then try to reorient the ASUS SpaceLink B&W PCI Card antenna. Second is the distance, decrease the distance between your ASUS SpaceLink B&W PCI Card and the Access Point or station (or another ASUS SpaceLink B&W PCI Card).

The TCP/IP protocol did not bind to the SpaceLink PC Card.

This will occur when the computer already has six TCP/IP bindings in Windows 98 or ten bindings in Windows Me. These limits are imposed by the Microsoft operating system.

Solution: If your computer already has the maximum number of TCP/IP bindings, remove one of the network adapters from the Network configuration before installing the ASUS SpaceLink B&W PCI Card driver.

Troubleshooting (Cont.)

Bluetooth

Cannot Connect to a Paired Device

Paired devices are always displayed in My Bluetooth Places, even if the remote device is out of range or not powered up.

- Verify that the remote member of the pair is within radio range and powered up and then attempt the connection again.

Cannot discover services on an unpaired remote device

The remote device may not be powered up or may be out of range.

- Verify that the remote device is powered up.
- Verify that the remote device is in Connectable mode (Bluetooth Configuration Panel > Accessibility tab).
- Perform a Search for Devices to verify that the device is within range.

Cannot discover services on an unpaired remote device

The remote device may not be powered up or may be out of range.

- Verify that the remote device is powered up.
- Verify that the remote device is in Connectable mode (Bluetooth Configuration Panel > Accessibility tab).
- Perform a Search for Devices to verify that the device is within range.

Dial-up Networking service does not start

The Dial-up Networking service will not start unless a properly configured modem is attached to the server.

- Verify that the modem is usable as a local device from the server. In the Bluetooth Configuration Panel, Local Services tab, double-click the Dial-up Networking service: Click the down arrow in the Modem field and select the modem that will be used to dial out | Click the OK button | Click the OK button to close the Bluetooth Configuration Panel.

Determine the BDA of installed hardware

In the Bluetooth Configuration Panel, on the Hardware tab, in the Devices section, select the device you want to determine the address of. In the Device

Properties section of the dialog box, the fourth entry, Device Address, is the BDA of the selected Bluetooth device.

Determine the HCI version number

In the Bluetooth Configuration Panel, on the Hardware tab, in the Device Properties section, the fifth entry provides Bluetooth Specification compliance information for the Host Controller Interface.

The sixth entry contains the Specification Revision information for the Host Controller Interface, if appropriate.

Determine the LMP version number

In the Bluetooth Configuration Panel, on the Hardware tab, in the Device Properties section, the seventh entry provides Link Manager Protocol version number information.

The eighth entry contains the Link Manager Protocol subversion number information, if appropriate.

Determine hardware information

In the Bluetooth Configuration Panel, select the Hardware tab. (To access the Bluetooth Configuration Panel: From the Windows System Tray, Right-click the Bluetooth icon | Click Setup | Select Configuration from the fly-out menu.)

Test a Network Access connection

If the client is hardwired to the LAN, unplug the hardwired connection to ensure that the test checks the wireless connection rather than the hardwired connection.

If the server has access to the Internet, open a browser on the client and connect to the World Wide Web.

You may also Ping the server from the DOS prompt.

Unknown Port error

The “Unknown Port” error message usually means an attempt was made to connect a port that was in use.

Additional Bluetooth Serial Ports can be added if they are required.

6. Glossary

Wireless LAN-Related

Access Point (AP)
An networking device that seamlessly connects wired and wireless networks. Access Points combined with a distributed system support the creation of multiple radio cells that enable roaming throughout a facility.

Broadband
A type of data transmission in which a single medium (such as cable) carries several channels of data at once.

Ad Hoc
A wireless network composed solely of stations within mutual communication range of each other (no Access Point).

Basic Service Area (BSS)
A set of stations controlled by a single coordination function.

Channel
An instance of medium use for the purpose of passing protocol data units that may be used simultaneously, in the same volume of space, with other instances of medium use (on other channels) by other instances of the same physical layer, with an acceptably low frame error ratio due to mutual interference.

Client
A client is the desktop or mobile PC that is connected to your network.

Device Name
Also known as DHCP client ID or network name. Sometimes provided by an ISP when using DHCP to assign addresses.

DHCP (Dynamic Host Configuration Protocol)
This protocol allows a computer (or many computers on your network) to be automatically assigned a single IP address from a DHCP server.

DNS Server Address (Domain Name System)
DNS allows Internet host computers to have a domain name and one or more IP addresses. A DNS server keeps a database of host computers and their respective domain names and IP addresses, so that when a user enters a domain name into the Internet browser, the user is sent to the proper IP address. The DNS server address used by the computers on your home network is the location of the DNS server your ISP has assigned.

Encryption
This provides wireless data transmissions with a level of security.

Extended Service Set (ESS)
A set of one or more interconnected basic service set (BSSs) and integrated local area networks (LANs) can be configured as an Extended Service Set.

ESSID (Extended Service Set Identifier)
You must have the same ESSID entered into the gateway and each of its wireless clients. The ESSID is a unique identifier for your wireless network.

Ethernet
The most widely used LAN access method, which is defined by the IEEE 802.3 standard. Ethernet is normally a shared media LAN meaning all devices on the network segment share total bandwidth. Ethernet networks operate at 10Mbps using CSMA/CD to run over 10Base-T cables.

Gateway
A network point that manages all the data traffic of your network, as well as to the Internet and connects one network to another.

IEEE
The Institute of Electrical and Electronics Engineers. The IEEE sets standards for networking, including Ethernet LANs. IEEE standards ensure interoperability between systems of the same type.

IEEE 802.11
IEEE 802.xx is a set of specifications for LANs from the Institute of Electrical and Electronic Engineers (IEEE). Most wired networks conform to 802.3, the specification for CSMA/CD based Ethernet networks or 802.5, the specification for token ring networks. 802.11 defines the standard for wireless LANs encompassing three incompatible (non-interoperable) technologies: Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), and Infrared. 802.11 specifies a carrier sense media access control and physical layer specifications for 1 and 2 Mbps wireless LANs.

IEEE 802.11a / IEEE 802.11b
See next few pages for detailed explanations.

Infrastructure
A wireless network centered about an access point. In this environment, the access point not only provides communication with the wired network but also mediates wireless network traffic in the immediate neighborhood.

IP (Internet Protocol)
The TCP/IP standard protocol that defines the IP datagram as the unit of information passed across an Internet and provides the basis for connectionless packet delivery service. IP includes the ICMP control and error message protocol as an integral part. It provides the functional equivalent of ISO OSI Network Services.

IP Address
An IP address is a 32-bit number that identifies each sender or receiver of information that is sent across the Internet. An IP address has two parts: the identifier of a particular network on the Internet and an identifier of the particular device (which can be a server or a workstation) within that network.

ISM Bands (Industrial, Scientific, and Medicine Bands)
Radio frequency bands that the Federal Communications Commission (FCC) authorized for wireless LANs. The ISM bands are located at 902 MHz, 2.400 GHz, and 5.7 GHz.

ISP (Internet Service Provider)
An organization that provides access to the Internet. Small ISPs provide service via modem and ISDN while the larger ones also offer private line hookups (T1, fractional T1, etc.).

LAN (Local Area Network)
A communications network that serves users within a defined geographical area. The benefits include the sharing of Internet access, files and equipment like printers and storage devices. Special network cabling (10 Base-T) is often used to connect the PCs together.

MAC Address (Media Access Control)
A MAC address is the hardware address of a device connected to a network.

NAT (Network Address Translation)
NAT masks a local network's group of IP addresses from the external network, allowing a local network of computers to share a single ISP account. This process allows all of the computers on your home network to use one IP address. This will enable access to the Internet from any computer on your home network without having to purchase more IP addresses from your ISP.

NIC (Network Interface Card)
A network adapter inserted into a computer so that the computer can be connected to a network. It is responsible for converting data from stored in the computer to the form transmitted or received.

Packet
A basic message unit for communication across a network. A packet usually includes routing information, data, and sometimes error detection information.

ISM Bands (Industrial, Scientific, and Medicine Bands)
Radio frequency bands that the Federal Communications Commission (FCC) authorized for wireless LANs. The ISM bands are located at 902 MHz, 2.400 GHz, and 5.7 GHz.

PPP (Point-to-Point Protocol)
PPP is a protocol for communication between computers using a serial interface, typically a personal computer connected by phone line to a server.

PPPoE (Point-to-Point Protocol over Ethernet)
Point-to-Point Protocol is a method of secure data transmission. PPP using Ethernet to connect to an ISP.

Radio Frequency (RF) Terms: GHz, MHz, Hz
The international unit for measuring frequency is Hertz (Hz), equivalent to the older unit of cycles per second. One megahertz (MHz) is one million Hertz. One gigahertz (GHz) is one billion Hertz. The standard US electrical power frequency is 60 Hz, the AM broadcast radio frequency band is 0.55-1.6 MHz, the FM broadcast radio frequency band is 88-108 MHz, and wireless 802.11 LANs operate at 2.4 GHz.

SSID (Service Set ID)
SSID is a group name shared by every member of a wireless network. Only client PCs with the same SSID are allowed to establish a connection.

Station
Any device containing IEEE 802.11 wireless medium access conformity.

Subnet Mask
A subnet mask is a set of four numbers configured like an IP address. It is used to create IP address numbers used only within a particular network.

TCP (Transmission Control Protocol)
The standard transport level protocol that provides the full duplex, stream service on which many application protocols depend. TCP allows a process or one machine to send a stream of data to a process on another. Software implementing TCP usually resides in the operating system and uses the IP to transmit information across the network.

WAN (Wide Area Network)
A system of LANs, connected together. A network that connects computers located in separate areas, (i.e., different buildings, cities, countries). The Internet is a wide area network.

WECA (Wireless Ethernet Compatibility Alliance)
An industry group that certifies cross-vender interoperability and compatibility of IEEE 802.11b wireless networking products and to promote that standard for enterprise, small business, and home environments.

WLAN (Wireless Local Area Network)
This is a group of computers and other devices connected wirelessly in a small area. A wireless network is referred to as LAN or WLAN.

Bluetooth-Related

Acceptor
The Bluetooth device receiving an action from another Bluetooth device. The device sending the action is called the initiator. The acceptor is typically part of an established link.

ACL
Asynchronous Connectionless Link. An Asynchronous (packet-switched) connection between two devices created on the LMP level. This type of link is used primarily to transmit ACL packet data.

AP
Access Point.

Application Layer
The group of protocols at the user level. The application layer in the Bluetooth protocol layers will contain those protocols involved with the user interface (UI).

AT Command Handler
A module that handles the AT commands which control a phone or modem (between a DTE and a DCE).

Authentication
The process of verifying 'who' is at the other end of the link. Authentication is performed for devices. In Bluetooth, this is achieved by the authentication procedure based on the stored link key or by pairing (entering a PIN).

Authentication device
A device whose identity has been verified during the lifetime of the current link based on the authentication procedure.

Authenticate using a passkey
The procedure where a user is requested to enter a passkey during the establishment procedure, where the devices did not share a common link key beforehand. This differs from the bonding procedure where the user enters the passkey without it being requested.

Authorization
The process of deciding if device X is allowed to have access to service Y. This is where the concept of trusted exists. Trusted devices (the device is authenticated and indicated as "trusted"), are allowed access to services. Untrusted or unknown devices may require authorization based on user interaction before it is allowed access to the services. This does not principally exclude that the authorization might be give by an application automatically. Authorization always includes authentication.

Baseband
The baseband describes the specifications of the digital signal processing part of the hardware -- the Bluetooth link controller, which carries out the baseband protocols and other low-level link routines.

Bluetooth
An open specification for wireless communication of data and voice. It is based on a low-cost short-range radio link facilitating protected ad hoc connections for stationary and mobile communication environments.

Bluetooth clock
The master timing mechanism defined by the master of the piconet.

Bluetooth device
A device that contains hardware and software allowing it to communicate with another Bluetooth device.

Bluetooth device class
A parameter that indicates the type of device and which types of services that is supported. The class is received during the discovery procedure. The parameter contains the major and minor device class fields. The term "Bluetooth device class" is used on the UI level.

Bluetooth device type
The term "Bluetooth device type" is used on the UI level. This term overrides the terms "Bluetooth device class" and "Bluetooth service type" when there is a mix of information containing both Bluetooth Device Class and Bluetooth Service Types.

Chapter 6 - Glossary

Bluetooth passkey
The name of the PIN. The term "Bluetooth passkey" is used in the UI. See PIN.

Bluetooth service type
One or more services a device can provide to other devices. The service information is defined in the service class field of the Bluetooth device class parameter.

Bluetooth Session
The activity and participation of a device on a piconet.

Bond
A link key that is exchanged between two devices. The key is used for future authentication between the devices. See also bonding.

Bonding
Bonding is the creation of a relationship between two devices. The bond is a link key The relationship is created when the link key is exchanged between two devices. The devices are known to each other prior to the bonding procedure. A user initiates the bonding procedure and enters a passkey with the explicit purpose of creating a bond between two devices. This differs from the authenticate using a passkey procedure where the user is requested to enter a passkey during the establishment of the link.

BT
Bluetooth.

Business card
The electronic date equivalent to a printed business card. This electronic version of the business card is treated like a file and can be exchanged between Bluetooth devices.

Channel
A logical connection on L2CAP level between two devices serving a single application or higher layer protocol.

Circuit Switched
The application of a network where a dedicated line is used to transmit information. Only one user may employ the resources of the line at a time.

Circuit Switched Bluetooth
The application of a network where a dedicated line is used to transmit Bluetooth data.

Class of device
See Bluetooth device class. Also abbreviated as CoD.

CODEC
Coder/Decoder. A device that converts analog to digital, and digital to analog for transmission over a digital communications system.

COF
Ciphering Offset Component. An architecture element denoting an identifiable set of software that performs a well-defined purpose.

Connect to service
The establishment of a connection to a service. If not already done, this includes establishment of a physical link, link and channel as well.

Connectable devices
Any device within range that will respond to paging from an initiator device.

Connectable mode
A device that responds to paging (an attempt to establish a communication link) is said to be in connectable mode. The opposite of connectable mode is non-connectable mode. Connected device A device that is currently connected to the (LocDev. connection A connection between two peer applications or higher layer protocols mapped onto a channel.

Connectionless packet
A packet of data is broadcast over the network without targeting a specific recipient to receive the packet.

Connecting
A phase in the communication between devices when a connection between them is being established. (Connecting phase follows after the link establishment phase is completed.)

Connectivity
A domain of interconnected components that adhere to a defined set of connection rules. The set of rules is termed Connectivity Architecture.

Connector
An architectural element denoting a path for control or information flow between components.

DCE
Data Circuit-Terminating Equipment. In serial communications, DCE refers to a device between the communication endpoints whose sole task is to facilitate the communications process; typically a modem.

Device Discovery
The mechanism to request and receive the Bluetooth address, clock, class of device, used page scan mode, and names of devices.

Device Layer
The group of protocols that handles the hardware in a Bluetooth device. The device layer handles components such as the display, keypad, and RF communications.

Device security level
Access to a device can be denied based on the required device security level. There are two levels of device security: trusted device and Untrusted device. See also service security level.

Discoverable device
A Bluetooth device in range that will respond to an inquiry (normally in addition to responding to page. discoverable mode A device that can respond to an inquiry is said to be in a discoverable mode. There are two types of discoverable modes: limited discoverable mode and general discoverable mode. The opposite of discoverable mode is non-discoverable mode. See also silent device. Dispatch Walkie-talkie mode where one-subscriber talks and other subscribers listen on the same talk group.

DSR
Data Set Ready. A device sets an RS-232 DSR signal when it is ready to accept data.

DTE
Data Terminal Equipment. In serial communications, DTE refers to a device at the endpoint of the communications path; typically a computer or terminal.

Dumb peripheral
A peripheral that does not communicate any information to the handset.

Typically, the only information the handset receives from a dumb peripheral is a signal that a connection has been made to a port on the handset. This signal is also called a cable detect.

DV
Data Voice. Data packet type for data and voice.

GAP
Generic Access Profile. This profile describes the mechanism by which one device discovers and accesses another device when they do not share a common application.

GIAC
General Inquire Access Code. See also general discoverable mode.

General discoverable mode
A device that can be discovered continuously or for no specific condition is said to be in general discoverable mode. See also discoverable mode.

GW
Gateway. A Bluetooth technology base station which is connected to external network.

HA
Host Application. A software program that uses Bluetooth.

Host
A software and hardware platform in which the Bluetooth package runs.

Idle mode
A device is in idle mode when it has no established links to other devices. In this mode, the device may discover other devices. In general, a device sends inquiry codes (GIAC, LIAC) to other devices. Any device that allows inquiries will respond with information. If the devices decide to form a link, then bonding will occur.

Initiator
The Bluetooth device initiating an action to another Bluetooth device. The device receiving the action is called the acceptor. The initiator is typically part of an established link.

Inquiry Procedure
The inquiry procedure enables a device to discover which devices are in range, and determine the addresses and clocks for the devices. After the inquiry procedure has completed, a connection can be established using the paging procedure.

Inquiry State
A mode that a LocDev enters when searching for services.

Inquiry Scan State
A mode that a RemDev enters when advertising that a service is available.

Intelligent peripheral
A peripheral that is capable of exchanging information with the handset. Information may include battery status, charging status, data storage status, or other high-level functionality. Also referred to as a smart peripheral.

Internet bridge
Method of using a wireless modem for connecting to Internet access.

IP
Internet Protocol.

Key Management
The handling and control of encryption keys.

Known device
A device for which at least the BD_ADDR is stored.

LAN
Local Area Network.

LAP
LAN Access Point.

LC
Link Controller. The Link Controller manages the link to the other Bluetooth devices. It is the low-level baseband protocol handler.

Limited discoverable mode
A device that responds to an inquiry for limited purposes. For example, a device may respond for a limited period of time, during temporary conditions, or for a specific event. Typically, the device is responding to a limited inquiry based on an inquiry using the LIAC. See also discoverable mode.

Link key
The authentication key used to establish a link between devices. See also bonding.

LM
Link Manager. The Link Manager software entity carries out link set-up, authentication, link configuration, and other protocols.

LMP
Link Manager Protocol. The LMP is used for peer-to-peer communication.

LMP-authentication
An LMP level procedure for verifying the identity of a remote device. The procedure is based on a challenge-response mechanism using a random number, a secret key and the BD_ADDR of the non-initiating device. The secret key used can be a previously exchanged link key or an initialization key created based on a PIN (as used when pairing).

LMP-pairing
A LMP procedure that authenticates two devices based on a PIN and subsequently creates a common link key that can be used as a basis for a trusted relationship or a (single) secure connection. The procedure consists of the steps: creation of an initialization key (based on a random number and a PIN), LMP-authentication based on the initialization key and creation of a common link key.

LocDev
Local Device. A Bluetooth device which initiates a SDP procedure. A Local Device is typically a master device on the piconet. However, a Local Device may not always have a master connection relationship to other devices. See also RemDev.

MAC
Media Access Control.

MAC Address
3-bit address to distinguish between units participating in the piconet.

Management Entity
Management Entity. The portion of the BT implementation that mediates the internal functions of the BT stack.

Master device
A device that initiates an action or requests a service on a piconet. See also LocDev.

Master Net
The device in a piconet whose clock and hopping sequence are used to synchronize all other devices in the piconet.

MUX
Multiplexer. A device that combines one or more data signals into a single composite signal for communication over one data channel.

Name Discovery
The mechanism to request and receive a device name.

New device
See unknown device.

Non-connectable mode
A device that does not responds to paging (an attempt to establish a communication link) is said to be in non-connectable mode. The opposite of connectable mode is connectable mode.

Non-discoverable
Same as non-discoverable mode.

Non-discoverable mode
A device that cannot respond to an inquiry is said to be in non-discoverable mode. The device will not enter the INQUIRY_RESPONSE state in this mode. See also discoverable mode.

Non-pairable mode
A device that does not accepts pairing is said to be in non-pairable mode. The opposite of non-pairing mode is pairable mode.

Packet Switched
A network that routes data packets based on an address contained in the data packet is said to be a packet switched network. Multiple data packets can share the same network resources.

Packet Switched Bluetooth
The application of routing Bluetooth data packets on a network using addresses contained in the Bluetooth data packets.

Packet Switched Cellular/Radio
The application of routing cellular/radio data packets on a network using addresses contained in the cellular/radio data packets.

Page
A baseband state where a device transmits page trains and processes any eventual responses to the page trains.

Page Scan State
A mode where a device listens for page trains containing its own device access code (DAC). A mode that a RemDev enters when advertising that a service is available.

Page State
A mode that a LocDev enters when searching for services. The LocDev sends out a page to notify other devices that it wants to know about the other devices and/or their services.

Page train
A series of paging messages sent over the baseband.

Paged device
A paged device is typically contacted by a paging device to establish a communication link. See acceptor.

Paging
The act of attempting to establish a communication link.

Paging device
A paging device is typically attempting to establish a communication link with other devices. See initiator.

Paging Procedure
With the paging procedure, an actual connection can be established. The paging procedure typically follows the inquiry procedure. Only the Bluetooth device address is required to set up a connection. Knowledge about the clock will accelerate the setup procedure. A unit that establishes a connection will carry out a page procedure and will automatically be the master of the connection.

Pairable mode
A device that accepts pairing is said to be in pairable mode. The opposite of pairing mode is non-pairable mode.

Paired device
A device with which a link key has been exchanged (either before connection establishment was requested or during connecting phase). See also pre-paired device and unpaired device.

Pairing
The creation and exchange of a link key between two devices. The devices (LocDev and RemDev) use the link key for future authentication when exchanging information. Pairing is also called an association between a LocDev and a RemDev based on a common link key. The link key is also referred to as a bond. Pairing can also establish a link by the user entering a PIN, which is authenticated by the device providing the service.

Parked Unit(s)
Devices in a piconet which are synchronized but do not have a MAC addresses.

Phone Services Database
The portion of the BT implementation that stores information about device services, both local services and remote services.

Physical channel
A synchronized Bluetooth baseband-compliant RF hoping sequence. Physical link A Baseband level association between two devices established using paging. A physical link comprises a sequence of transmission slots on a physical channel alternating between master and slave transmission slots.

Piconet
A collection of devices connected via Bluetooth technology in an ad hoc fashion. A piconet starts with two connected devices, such as a portable PC and cellular phone, and may grow to eight connected devices. All Bluetooth devices are peer units and have identical implementations. However, when establishing a piconet, one unit will act as a master and the other(s) as slave(s) for the duration of the piconet connection. All devices hare the same physical channel defined by the master device parameters (clock and BD_ADDR).

PIN
Personal Identification Number. The Bluetooth PIN is used to authenticate two devices that have not previously exchanged link key. By exchanging a PIN, the devices create a trusted relationship. The PIN is used in the pairing procedure to generate the initial link that is used for further identification.

Pre-paired device
A device with which a link key was exchanged, and the link key is stored, before link establishment. See also paired device and unpaired device.

Profile
A description of the operation of a device or application.

QoS
Quality of Service.

RemDev
Remote Device. A Bluetooth device that participates in the SDP process. A Remote Device must contain a SDP server along with a service record database. A Remote Device is typically a slave device, however, a Remote Device may not always have a slave connection with a LocDev. requestor An entity that requests information from another entity via the Bluetooth API.

RF
Radio Frequency.

RS-232 (Serial Port)
A serial communications interface. Serial communication standards are defined by the Electronic Industries Association (EIA).

RSSI
Received Signal Strength Indication.

RX
Receiver.

Scatternet
Multiple independent and non-synchronized piconets form a scatternet.

SCO
Synchronous Connection Oriented link. A synchronous (circuit-switched) connection for reserved bandwidth communications, e.g. voice, between two devices created on the LMP level by reserving slots periodically on a physical channel. This type of link is used primarily to transport SCO packets (voice data). Supports time-bounded information like voice. (Master to single slave.) SCO links can be established only after an ACL link has first been established.

SDA
Service Discovery Application. Also sometimes called the Service Discovery User Application.

SDP client
The SDP in a Local Device (LocDev). The SDP client requests service information from SDP servers.

SDP server
The SDP in a Remote Device (RemDev). The SDP server responds to requests made by SDP clients.

SDP Session
The exchange of information between an SDP client and an SDP server. The exchange of information is referred to as an SDP transaction.

SDP Transaction
The exchange of an SDP request from an SDP client to an SDP server, and the corresponding SDP response from an SDP server back to the SDP client.

Security Manager
The module in a Bluetooth device that controls security aspects of communications to other Bluetooth devices.

Security Mode 1
A device will not initiate any security. A non-secure mode.

Security Mode 2
A device does not initiate security procedures before channel establishment on

Security Mode 3
A device initiates security procedures before the link setup on LMP level is completed. A link level enforced security mode.

Serial Interface
An interface to provide serial communications. Service this term refers to a service that one device provides for others. Examples are printers, PIM. Synchronization servers, modems (or modem emulators).

Service Advisor
The portion of the UI that handles BT services for the UI.

Service Layer
The group of protocols that provides services to the application layer and the driver layer in a Bluetooth device.

Service Record Database
A database that contains the service discovery-related information.

Service security level
Access to services can be denied based on the required service security level. There are three levels of service security: authorization and authentication; authentication only, and no security (open to all). Encryption can be another security requirement for service use in addition to the requirements listed above. Encryption is typically applied at the physical level (baseband). See also device security level.

SIG
Special Interest Group. The Bluetooth standards body & steering committee.

Silent device
A device that is in discoverable mode but cannot respond due to other baseband activity is said to be a silent device. The device could also be in non-discoverable mode and would also not respond to an inquiry.

SIM
Subscriber Identity Module. The SIM is a nonvolatile storage device that contains information about your phone. This allows the SIM to be used in any GSM phone.

Slave Unit
All devices in a piconet that are not the master.

Smart peripheral
See intelligent peripheral.

SMS
Short Message Service. Similar to paging, a short text message can be delivered to a subscriber's cellular handset. Sniff and hold mode Devices synchronized to a piconet can enter power-saving modes in which device activity is lowered.

TDMA
An improvement over standard analog cellular service by digitizing the voice stream thereby providing more calls per channel.

TTCN
Tree and Tabular Combined Notation. It is a special purpose notation to describe test suites. TTCN is a language standardized by ISO for the specification of tests for communicating systems.

TX
Transmit.

UART
Universal Asynchronous Receiver Transmitter. A device which converts parallel

data into serial data for transmission, or it converts serial data into parallel data for receiving data.

UI
User Interface. The area on a device that contains interface mechanisms such as displays, dialog boxes, manuals, packaging, advertising, etc., where the user is likely to encounter Bluetooth terminology and parameters.

Unknown device
A device that is currently not connected with the (LocDev and the LocDev has not paired with it in the past. Also called a new device. No information about the device is stored (e.g., BD_ADDR, link key, or other information).

IEEE 802.11b (11Mbits/sec)

In 1997, the Institute of Electrical and Electronics Engineers (IEEE) adopted the 802.11 standard for wireless devices operating in the 2.4 GHz frequency band. This standard includes provisions for three radio technologies: direct sequence spread spectrum, frequency hopping spread spectrum, and infrared. Devices that comply with the 802.11 standard operate at a data rate of either 1 or 2 Mbps.

In 1999, the IEEE created the 802.11b standard. 802.11b is essentially identical to the 802.11 standard except 802.11b provides for data rates of up to 11 Mbps for direct sequence spread spectrum devices. Under 802.11b, direct sequence devices can operate at 11 Mbps, 5.5 Mbps, 2 Mbps, or 1 Mbps. This provides interoperability with existing 802.11 direct sequence devices that operate only at 2 Mbps.

Direct sequence spread spectrum devices spread a radio signal over a range of frequencies. The IEEE 802.11b specification allocates the 2.4 GHz frequency band into 14 overlapping operating Channels. Each Channel corresponds to a different set of frequencies. See the Appendix to determine the center frequency used by each Channel.

If operating multiple 802.11b Wireless PCI Cards in the same vicinity, the distance between the center frequencies must be at least 25 MHz to avoid interference. Note that the Channels available to an 802.11b Wireless PCI Card will vary from country to country. In the United States, the 802.11b standard allocates 11 operating Channels for direct sequence devices. Channels 1, 6, and 11 are independent and do not overlap with each other. To avoid interference between 802.11b Wireless PCI Cards, It is recommended that you configure the Wireless PCI Cards using only Channels 1, 6, and 11.

Direct-Sequence Spread Spectrum (for 802.11b)

Spread spectrum (broadband) uses a narrowband signal to spread the transmission over a segment of the radio frequency band or spectrum. Direct-sequence is a spread spectrum technique where the transmitted signal is spread over a particular frequency range. The Space Link Wireless PCI Card uses Direct-Sequence Spread Spectrum (DSSS) for radio communication.

Direct-sequence systems communicate by continuously transmitting a redundant pattern of bits called a chipping sequence. Each bit of transmitted data is mapped into chips by the Wireless PCI Card and rearranged into a pseudorandom spreading code to form the chipping sequence. The chipping sequence is combined with a transmitted data stream to produce the Wireless PCI Card output signal.

Wireless mobile clients receiving a direct-sequence transmission use the spreading code to map the chips within the chipping sequence back into bits to recreate the original data transmitted by the Wireless PCI Card. Intercepting and decoding a direct-sequence transmission requires a predefined algorithm to associate the spreading code used by the transmitting Wireless PCI Card to the receiving wireless mobile client.

This algorithm is established by IEEE 802.11b specifications. The bit redundancy within the chipping sequence enables the receiving wireless mobile client to recreate the original data pattern, even if bits in the chipping sequence are corrupted by interference. The ratio of chips per bit is called the spreading ratio. A high spreading ratio increases the resistance of the signal to interference. A low spreading ratio increases the bandwidth available to the user. The Wireless PCI Card uses a constant chip rate of 11Mchips/s for all data rates, but uses different modulation schemes to encode more bits per chip at the higher data rates. The Wireless PCI Card is capable of an 11 Mbps data transmission rate, but the coverage area is less than a 1 or 2 Mbps Wireless PCI Card since coverage area decreases as bandwidth increases.

IEEE 802.11a (54Mbits/sec)

The 802.11b standard was designed to operate in the 2.4GHz ISM (Industrial, Scientific and Medical) band using direct-sequence spread-spectrum technology. The 802.11a standard, on the other hand, was designed to operate in the more recently allocated 5GHz UNII (Unlicensed National Information Infrastructure) band. And unlike 802.11b, the 802.11a standard departs from the traditional spread-spectrum technology, instead using a frequency division multiplexing scheme that's intended to be friendlier to office environments.

The 802.11a standard, which supports data rates of up to 54 Mbps, is the Fast Ethernet analog to 802.11b, which supports data rates of up to 11 Mbps. Like Ethernet and Fast Ethernet, 802.11b and 802.11a use an identical MAC (Media Access Control). However, while Fast Ethernet uses the same physical-layer encoding scheme as Ethernet (only faster), 802.11a uses an entirely different encoding scheme, called OFDM (orthogonal frequency division multiplexing).

The 802.11b spectrum is plagued by saturation from wireless phones, microwave ovens and other emerging wireless technologies, such as Bluetooth. In contrast, 802.11a spectrum is relatively free of interference.

The 802.11a standard gains some of its performance from the higher frequencies at which it operates. The laws of information theory tie frequency, radiated power and distance together in an inverse relationship. Thus, moving up to the 5GHz spectrum from 2.4 GHz will lead to shorter distances, given the same radiated power and encoding scheme.

COFDM (for 802.11a)

Power alone is not enough to maintain 802.11b-like distances in an 802.11a environment. To compensate, vendors specified and designed a new physical-layer encoding technology that departs from the traditional direct-sequence technology being deployed today. This technology is called COFDM (coded OFDM). COFDM was developed specifically for indoor wireless use and offers performance much superior to that of spread-spectrum solutions. COFDM works by breaking one high-speed data carrier into several lower-speed subcarriers, which are then transmitted in parallel. Each high-speed carrier is 20 MHz wide and is broken up into 52 subchannels, each approximately 300 KHz wide. COFDM uses 48 of these subchannels for data, while the remaining four are used for error correction. COFDM delivers higher data rates and a high degree of multipath reflection recovery, thanks to its encoding scheme and error correction.

Each subchannel in the COFDM implementation is about 300 KHz wide. At the low end of the speed gradient, BPSK (binary phase shift keying) is used to encode 125 Kbps of data per channel, resulting in a 6,000Kbps, or 6 Mbps, data rate. Using quadrature phase shift keying, you can double the amount of data encoded to 250 Kbps per channel, yielding a 12Mbps data rate. And by using 16-level quadrature amplitude modulation encoding 4 bits per hertz, you can achieve a data rate of 24 Mbps. The 802.11a standard specifies that all 802.11a-compliant products must support these basic data rates. The standard also lets the vendor extend the modulation scheme beyond 24 Mbps. Remember, the more bits per cycle (hertz) that are encoded, the more susceptible the signal will be to interference and fading, and ultimately, the shorter the range, unless power output is increased.

7. Safety Information

Federal Communications Commission Statement

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

- This device may not cause harmful interference, and
- 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 for a class B digital device, pursuant to Part 15 of the Federal Communications Commission (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. 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 separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING! The use of a shielded-type power cord is required in order to meet FCC emission limits and to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used. Use only shielded cables to connect I/O devices to this equipment. You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

Reprinted from the Code of Federal Regulations #47, part 15.193, 1993. Washington DC: Office of the Federal Register, National Archives and Records Administration, U.S. Government Printing Office.

Canadian Department of Communications

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 the Canadian Department of Communications.

This Class B digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Regulatory Information / Disclaimers

Installation and use of this Wireless LAN device must be in strict accordance with the instructions included in the user documentation provided with the product. Any changes or modifications (including the antennas) made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment. The manufacturer is not responsible for any radio or television interference caused by unauthorized modification of this device, or the substitution of the connecting cables and equipment other than manufacturer specified. It is the responsibility of the user to correct any interference caused by such unauthorized modification, substitution or attachment. Manufacturer and its authorized resellers or distributors will assume no liability for any damage or violation of government regulations arising from failing to comply with these guidelines.

CAUTION: To maintain compliance with FCC's RF exposure guidelines, this equipment should be installed and operated with minimum distance [20cm] between the radiator and your body. Use on the supplied antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations.

Safety Information

In order to maintain compliance with the FCC RF exposure guidelines, this equipment should be installed and operated with minimum distance **[20cm]** between the radiator and your body. Use only with supplied antenna. Unauthorized antenna, modification, or attachments could damage the transmitter and may violate FCC regulations.

CAUTION: Any changes or modifications not expressly approved in this manual could void your authorization to use this device.

MPE Statement

Your device contains a low power transmitter. When device is transmitted it sends out Radio Frequency (RF) signal.

Caution Statement of the FCC Radio Frequency Exposure

This Wireless LAN radio device has been evaluated under FCC Bulletin OET 65C and found compliant to the requirements as set forth in CFR 47 Sections 2.1091, 2.1093, and 15.247(b)(4) addressing RF Exposure from radio frequency devices. The radiation output power of this Wireless LAN device is far below the FCC radio frequency exposure limits. Nevertheless, this device shall be used in such a manner that the potential for human contact during normal operation – as a mobile or portable device but use in a body-worn way is strictly prohibit. When using this device, a certain separation distance between antenna and nearby persons has to be kept to ensure RF exposure compliance. In order to comply with the RF exposure limits established in the ANSI C95.1 standards, the distance between the antennas and the user should not be less than **[20cm]**.

SAR Exposure

This device has been tested for compliance with FCC RF Exposure (SAR) limits in typical laptop configurations.

In order to comply with SAR limits established in the ANSI C95.1 standards, it is recommended when using a PC card adapter that the integrated antenna is positioned more than **[2.5cm]** from your body or nearby persons during extended periods of operation. If the antenna is positioned less than **[2.5cm]** from the user, it is recommended that the user limit the exposure time.

Radio Frequency Interference Requirements

This device is restricted to INDOOR USE due to its operation in the 5.15 to 5.25GHz frequency range. FCC requires this product to be used indoors for the frequency range 5.15 to 5.25GHz to reduce the potential for harmful interference to co-channel of the Mobile Satellite Systems.

High power radars are allocated as primary user of the 5.25 to 5.35GHz and 5.65 to 5.85GHz bands. These radar stations can cause interference with and / or damage this device.